HALEY ALDRICH

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REPORT ON

NPDES RGP APPLICATION FOR TEMPORARY CONSTRUCTION DEWATERING
BOSTON COLLEGE CENTRAL HEATING PLANT EXPANSION
CHESTNUT HILL, MASSACHUSETTS

by Haley & Aldrich, Inc.
Boston, Massachusetts

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

File No. 128271-018
July 2018

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

31 July 2018
File No. 128271-018

Environmental Protection Agency (EPA) Region 1
5 Post Office Square, Suite 100
Mail Code OEP06-1
Boston, Massachusetts 02109-3912

Attention: EPA/OEP RGP Applications Coordinator

Subject: Notice of Intent
NPDES RGP Application for Temporary Construction Dewatering
Boston College Central Heating Plant Expansion
Chestnut Hill, Massachusetts

Ladies and Gentlemen:

On behalf of our client, Boston College, Haley & Aldrich, Inc. (Haley & Aldrich) is submitting this Notice of Intent (NOI) 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 Central Heating Plant Expansion Project, located on the Boston College Campus in Chestnut Hill, Massachusetts (herein referred to as the "Work Area"). A copy of the Notice of Intent form is included in Appendix A.

A. GENERAL SITE INFORMATION

The Work Area is an approximately 16,600 sq. ft. area adjacent to the Central Heating Plant building located east of Cushing Hall on the Boston College campus. A portion of the Work Area is paved asphalt parking and driveway, and the remainder of the Work Area consists of a steeply sloped grass area and retaining wall. Ground surface elevations of the Work Area ranges from approximately El. 177. 5 Boston City Base (BCB) at the northwest boundary, to approximately El. 151 BCB at the base of the retaining wall and across the level paved portion of the site to the southeast boundary. The Work Area is bound to the east by Alumni Stadium, to the west by paved parking and Cushing Hall, to the north by a paved walking path and Higgins Hall, and to the south by the currently existing Central Heating Plant building.

The Central Heating Plant will undergo updates and an expansion to the north of the building that will house new mechanical equipment. Below-grade space is not planned. Existing utilities will be moved/removed and new utilities will be installed.

Dewatering is anticipated to be required for construction of the building foundations, utilities, and drainage improvements. Groundwater has been encountered at the site at approximately El. 144 BCB. Excavations for building foundations and utilities are expected to extend through fill deposits up to 6 ft

below existing site grade in the paved portion of the Work Area, or approximately 1ft above the groundwater table.

Additional water may also be generated from surface runoff from precipitation, groundwater seepage, and construction-generated water (e.g., wheel washes, dust control, decontamination activities, water utility testing, etc.). Temporary construction dewatering is anticipated to begin in August 2018 and is estimated to occur intermittently over a period of approximately 12 months.

An Activity and Use Limitation (AUL) exists beneath the existing building and beneath a portion of the proposed expansion area, as shown on Figure 2. This AUL is associated with a previous fuel oil release reported to the Massachusetts Department of Environmental Protection (MassDEP) under Release Tracking Number (RTN) 3-10103:

In September 1980, oil was discovered in Leverett Pond and the release was traced back via the sewer line to the Boston College Service Building (Central Heating Plant) where No. 6 fuel oil had entered a storm drain. A cracked boiler feed line released the fuel oil to a condensate line that ultimately discharged to the sewer system leading to Leverett Pond. Approximately 5,000 to 10,000 gallons of water and No. 6 fuel oil were recovered from the pond and flushed from the lines. Oil-impacted soil from around the broken condensate line was also removed and Boston College installed observation ports in the condensate lines for regular monitoring. In 1993, separate-phase floating oil was observed in the adjacent manhole. Approximately 90 gallons of oil-impacted water was removed from the manhole; however, a sheen persisted and as a result, MassDEP assigned RTN 3-10103 to the release.

Findings of the subsequent subsurface investigations indicated that soil and groundwater were impacted by residual product released from the 1980 condensate line release. The impacted area consisted of an approximately 0.5-ft thick horizon of oil-stained soil over the bedrock surface approximately 4 to 6 ft below ground surface. The entire impacted area (approximately 30 ft across) was asphalt-paved and the proximate building prevented delineation of the extent of oil impacts to the east or south of the source area. A Method 1 Risk Characterization performed for the Site indicated that there was no imminent threat to humans or the environment and the cost of remediation was not justified based on the limited nature of remaining oil impacts, therefore an AUL was implemented for the Site.

In April 2018, a subsurface explorations program consisting of six test borings, designated as HA18-B9 through HA18-B12 and HA-SS1 and HA-SS2, was conducted to characterize in-situ soil anticipated to be excavated and transported off-site as part of construction activities. Two borings were completed west of the proposed building footprint and at the top of the adjacent slope. The four other explorations were shallow (less than4 ft) and were completed with either a vacuum truck or hand auger.

A total of 13 soil samples were collected for site soil characterization. Soil samples were submitted to Alpha Analytical Laboratory for chemical analysis for one or more of the following parameters: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), MCP 14 metals, total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), pesticides, waste characteristics, specific conductance total sulfur, sulfide and sulphate.

In addition, groundwater data was collected from a monitoring well, HA-B1 (OW) on 11 April 2018 and is presented on Table I.

B. SOURCE WATER INFORMATION

To evaluate groundwater (source water) quality at the Work Area, one representative groundwater sample was obtained on 11 April 2018 from the monitoring well designated HA-B1 (OW), recently installed by Haley & Aldrich within the Work Area as part of a site characterization program. The well location is shown on Figure 2.

The groundwater sample was sent to a MassDEP-certified laboratory, Alpha Analytical, for analysis of constituents consistent with requirements of the 2017 NPDES Remediation General Permit, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), total metals, total petroleum hydrocarbons, pesticides, polychlorinated biphenyls (PCBs), total suspended solids, chloride, total cyanide, total phenolics, and total residual chlorine.

A summary of the groundwater chemical analytical data is provided as Table I. The laboratory data report is provided in Appendix F.

Volatile and semi-volatile organic compounds were not detected in the groundwater sample above the laboratory detection limits. Three metals, total chromium, total copper, and total iron were detected at concentrations below the site-specific effluent criteria.

C. RECEIVING WATER INFORMATION

Receiving water quality data was collected in support of this NOI on 29 May 2018, the results of which are summarized in Table II. Receiving water temperature was obtained in the field at 13 °C, and is noted on the effluent limitations input calculation page in Appendix B. The sample was collected from Leverett Pond approximately 200 ft from the proposed discharge area. The laboratory data report is provided in Appendix F.

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 Massachusetts Department of Environmental Protection (MassDEP) on 10 July 2018. The StreamStats report, Dilution Factor calculations, and MassDEP confirmation of the 7Q10 and Dilution Factor are included in Appendix B.

The EPA suggested WQBEL Calculation spreadsheet was used to calculate the effluent criteria for the site. Groundwater and Receiving Water data were input and the resulting criteria were tabulated in the attached Table I. 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.

D. DISCHARGE INFORMATION

During the excavation activities, it will be necessary to perform temporary construction dewatering to control surface water runoff from precipitation, groundwater seepage, and construction-generated water to enable excavations in-the-dry. Dewatering activities are anticipated to start in August 2018 and are anticipated to be required for up to 7 months. Construction dewatering will include piping and discharging water to a catch basin on-site. The catch basin drains to Leverett Pond via the Boston and Brookline sewer systems, which connect at Cleveland Circle. Refer to Figure 4 for the discharge route. We anticipate effluent discharge rates to be about 50 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 excavations and will be conducted with sumps located in excavations or from dewatering wells installed at the Site. 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 as requested by EPA.

E. DEWATERING TREATMENT SYSTEM INFORMATION

An effluent treatment system will be designed and implemented by the Contractor to meet the applicable 2017 RGP Discharge Effluent Criteria. Prior to discharge, collected water will be routed through a sedimentation tank and bag filters to remove suspended solids and undissolved chemical constituents, as shown on Figure 3. The treatment system may be modified, as necessary to include granulated activated carbon (GAC), ion exchange, and pH adjustment.

F. ADDITIONAL TREATMENT INFORMATION

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. Actual products used in the field may differ slightly. If different products are used, additional information will be provided to EPA. These systems may be mobilized if necessary to achieve necessary effluent limits. If required, pH adjustments will be conducted using sulfuric acid (70-100%), dosed to reduce pH using a metered system. 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 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 to reduce pH concentrations 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.

G. 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 action area are considered to meet FWS Criterion A as no listed species or critical habitat have been established to be present within the project action area.

H. 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 Work Area; however, Leverett Pond is located within the Olmsted Park System, which is referenced in the National Register of Historic Places under Reference Number: 71000086. The discharges and discharge-related activities are not considered to have the potential to negatively affect Olmsted Park, and the discharge is considered to meet Criterion B. Documentation is included in Appendix E.

I. SUPPLEMENTAL INFORMATION

Owner and operation information are provided below for reference:

Owner:
Boston College
Clements Hall
140 Commonwealth Avenue
Chestnut Hill, Massachusetts 02467
Attn: Dan Diorio

Operator:
Consigli Construction Company, Inc.
266 Summer Street
Boston, MA 02210

Attn: Matthew Harting

Consigli is seeking coverage under the RGP as permittee.

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.

Kimberly Scalise	Kenneth N. Alepidis	Cole E. Worthy, III, LSP
Staff Geologist	Senior Technical Specialist	Senior Associate

Enclosures:

- Table I – Summary of Source Water Quality Data
- Table II – Summary of Receiving Water Quality Data
- Figure 1 – Project Locus
- Figure 2 – Site and Subsurface Exploration Location Plan
- Figure 3 – Proposed Treatment System Schematic
- Figure 4 – Discharge Route – Boston Water and Sewer Commission and Brookline Sewer
- 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 – Laboratory Data Reports

c: Boston College Capital Projects Management; Attn: Dan Diorio
Consigli Construction Company, Inc.; Attn: Matt Harting

TABLES

TABLE I
SUMMARY OF GROUNDWATER DATA
BOSTON COLLEGE CENTRAL HEAT
NEWTON, MASSACHUSETTS
FILE NO. 128271-018

LOCATION SAMPLING DATE LAB SAMPLE ID SAMPLE TYPE	2017 NPDES RGP Site-Specific Criteria	HA-B1(OW)_04112018 4/11/2018 L1812596-01 WATER
Volatile Organics (ug/l)		
Total BTEX	100	ND
SUM of Volatile Organic Compounds	NA	ND
Volatile Organics by SIM (ug/l)		
1,4-Dioxane	200	ND(3)
Semivolatile Organics (ug/l)		
SUM of Semi-Volatile Organic Compounds	NA	ND
Semivolatile Organics By SIM (ug/l)		
SUM of Group I PAHs	1	ND
SUM of Group II PAHs	100	ND
SUM of Semi-Volatile Organic Compounds (SIM	NA	ND
Total Petroleum Hydrocarbons (ug/l)		
TPH, SGT-HEM	5000	ND(4000)
Total Metals (ug/l)		
Antimony, Total	206	ND(4)
Arsenic, Total	104	ND(1)
Cadmium, Total	10.2	ND(0.2)
Chromium, Total	NA	1.14
Copper, Total	242	1.46
Iron, Total	5000	341
Lead, Total	160	ND(0.5)
Mercury, Total	0.739	ND(0.2)
Nickel, Total	1450	ND(2)
Selenium, Total	235.8	ND(5)
Silver, Total	35.1	ND(0.4)
Zinc, Total	420	ND(10)
Pesticides (ug/l)		
1,2-Dibromo-3-chloropropane (DBCP)	NA	ND(0.01)
1,2-Dibromoethane (Ethylene Dibromide)	0.05	ND(0.01)
Polychlorinated Biphenyls (ug/l)		
SUM of PCBs	0.000064	ND(0.25)
Other (ug/l)		
Chloride	Report	478000
Chlorine, Total Residual	15	ND(20)
Chromium, Hexavalent	323	ND(10)
Chromium, Trivalent	323	ND(10)
Cyanide, Total	178000	ND(5)
Ethanol	Report	ND(500)
Hardness	NA	247000
Nitrogen, Ammonia	Report	ND(75)
Ph (SU)	NA	ND(7.4)
Phenolics, Total	NA	ND(30)
Total Suspended Solids	30000	9000

ABBREVIATIONS:
- : Not analyzed
ug/l: micrograms per liter
NA: Not Applicable
ND (2.5): Result not detected above reporting limit (shown in parentheses)
SU: Standard Units

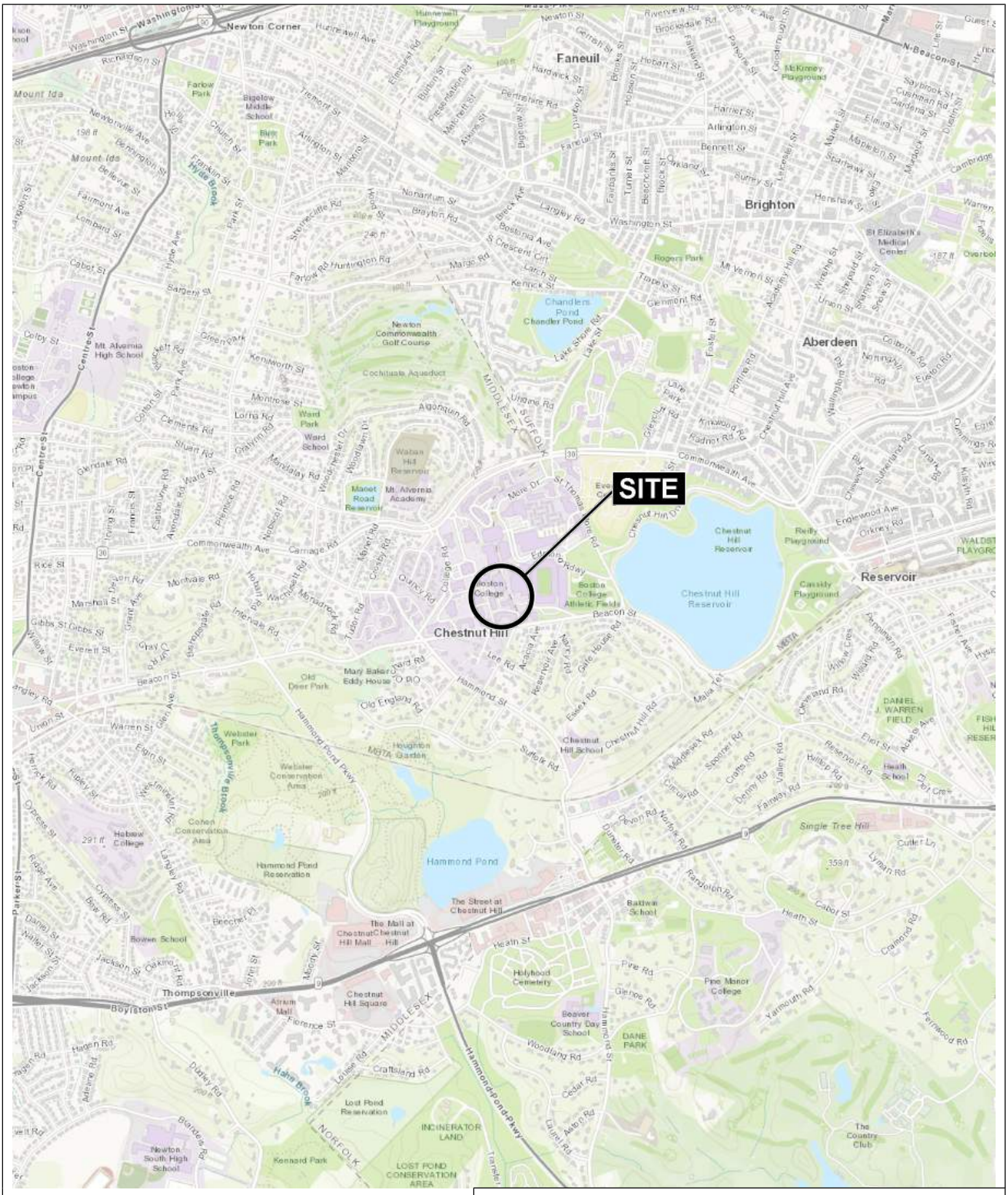
NOTES:
1. Analytes detected in at least one sample are reported herein. For a complete list of analytes see the laboratory data sheets.

TABLE II
SUMMARY OF RECEIVING WATER QUALITY DATA
BOSTON COLLEGE CENTRAL HEATING PLANT
CHESTNUT HILL, MA
FILE NO. 128271-018

LOCATION	**2018 LEVERETT POND**
SAMPLING DATE	**5/29/2018**
LAB SAMPLE ID	**L1819674-01**
SAMPLE TYPE	**WATER**
Total Metals (ug/l)	
Antimony, Total	ND(4)
Arsenic, Total	ND(1)
Cadmium, Total	ND(0.2)
Chromium, Total	ND(1)
Copper, Total	1.92
Iron, Total	658
Lead, Total	1.59
Mercury, Total	ND(0.2)
Nickel, Total	ND(2)
Selenium, Total	ND(5)
Silver, Total	ND(0.4)
Zinc, Total	ND(10)
General Chemistry	
Chromium, Hexavalent (ug/l)	ND(10)
Chromium, Trivalent (ug/l)	ND(10)
Nitrogen, Ammonia (ug/l)	118
pH (H) (SU)	7.2
Total Hardness by SM 2340B (ug/l)	
Hardness	180000

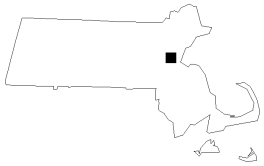
NOTES & ABBREVIATIONS:
ug/l: micrograms per liter
ND (1): not detected, number in parentheses is the reporting limit

FIGURES



MAP SOURCE: ESRI

SITE COORDINATES: 42°20'4"N, 71°10'7"W



HALEY ALDRICH

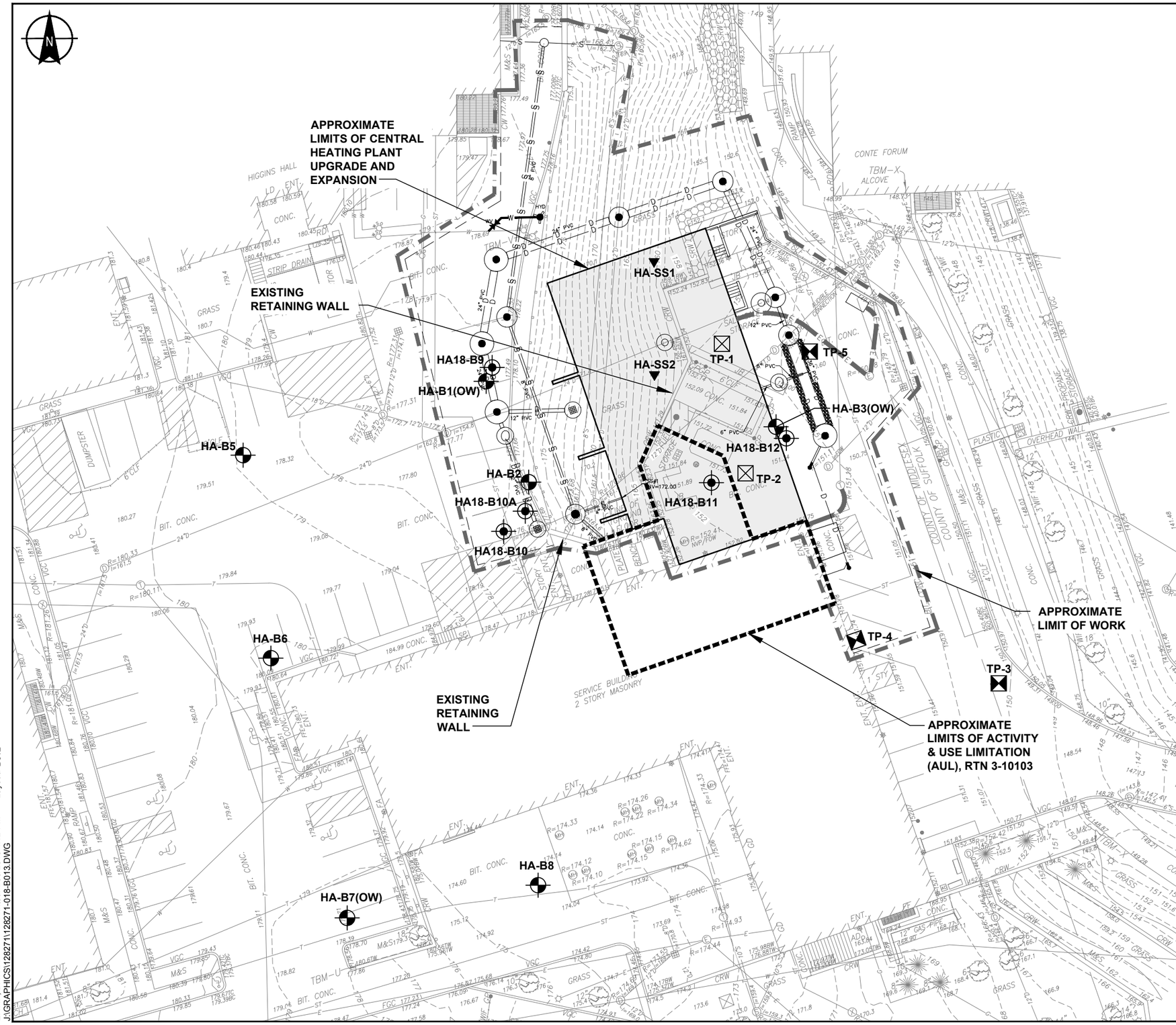
CENTRAL HEATING PLANT UPGRADE AND EXPANSION
BOSTON COLLEGE
CHESTNUT HILL, MASSACHUSETTS

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
JULY 2018

FIGURE 1

128271-018_1_LOCUS.PDF



LEGEND

HA-SS1▼	DESIGNATION AND APPROXIMATE LOCATION OF HAND EXCAVATION PERFORMED BY NEW ENGLAND BORING CONTRACTORS BETWEEN 5 APRIL AND 6 APRIL 2018
HA18-B9 ⊕	DESIGNATION AND APPROXIMATE LOCATION OF BORING DRILLED BY NEW ENGLAND BORING CONTRACTORS BETWEEN 5 APRIL AND 9 APRIL 2018
HA-B2 ⊕	DESIGNATION AND APPROXIMATE LOCATION OF BORINGS CONDUCTED BY NEW ENGLAND BORING CONTRACTORS, INC. BETWEEN 7 MARCH 2016 AND 10 MARCH 2016
TP-3 ⊠	DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT CONDUCTED BY J. MARCHESE & SONS FROM 7 TO 8 MARCH 2016
TP-1 ⊠	DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT CONDUCTED BY J. MARCHESE & SONS ON 22 NOVEMBER 2015
(OW)	INDICATES OBSERVATION WELL INSTALLED IN COMPLETED BOREHOLE

NOTE

1. BASE DRAWING ENTITLED “SITE UTILITY PLAN, C-500” TRANSMITTED ELECTRONICALLY TO HALEY & ALDRICH, INC. ON 27 APRIL 2018 FROM CANNON DESIGN.

0 30 60
SCALE IN FEET

HALEY ALDRICH

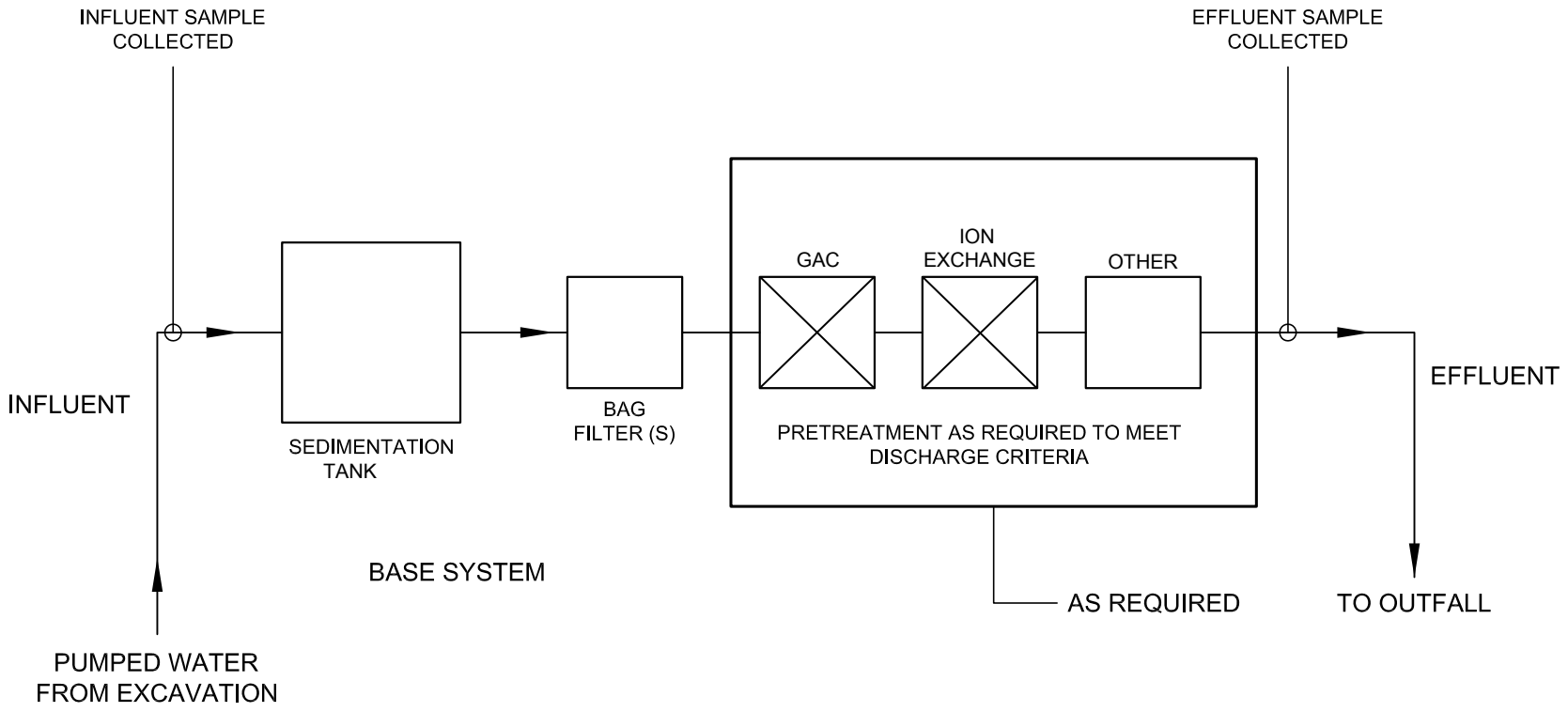
CENTRAL HEATING PLANT UPGRADE AND EXPANSION
BOSTON COLLEGE
CHESTNUT HILL, MASSACHUSETTS

SITE AND SUBSURFACE EXPLORATION LOCATION PLAN

SCALE: AS SHOWN
JULY 2018

FIGURE 2

ERVIN, DAYNA Printed: 4/30/2018 4:12 PM Layout: B012
J:\GRAPHICS\128271\128271-018-B013.DWG



LEGEND:

→ DIRECTION OF FLOW

☒ INDICATES TECHNOLOGY EXPECTED TO BE USED ON THIS PROJECT

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

BOSTON COLLEGE CENTRAL HEATING PLANT EXPANSION
CHESTNUT HILL, MASSACHUSETTS

PROPOSED TREATMENT SYSTEM SCHEMATIC

SCALE: NONE
JULY 2018

FIGURE 3

21C

21D

20D

19C

19D

PROJECT SITE

BEACON ST

SAINT THOMAS MORE RD

PRIVATE RD

CHESTNUT HILL DRWY

WADE ST

HOUSE RD

CHESTNUT HILL RESERVOIR

BOSTON COLLEGE MODULAR HOUSING

BOSTON COLLEGE

PARKING

SCALE IN FEET

NOTE: Spot Elevations shown are plotted in Boston City Base

DATE OF PHOTOGRAPHY - MARCH 30, APRIL 1 & 17, 1995
VERTICAL DATUM BASED ON THE BOSTON CITY BASE

THE LANDBASE ON THIS MAP WAS COMPILED TO MEET THE ASPRS STANDARD FOR CLASS 1 MAP ACCURACY

Date Produced:
4/25/2018

BOSTON WATER AND SEWER COMMISSION

SEWER SYSTEM

ALLSTON/BRIGHTON

SHEET NO.
20C

20C

20D

19D

NOTE: Spot Elevations shown are plotted in Boston City Base

DATE OF PHOTOGRAPHY - MARCH 30, APRIL 1 & 17, 1995
VERTICAL DATUM BASED ON THE BOSTON CITY BASE

THE LANDBASE ON THIS MAP WAS COMPILED TO MEET THE ASPRS STANDARD FOR CLASS 1 MAP ACCURACY

Date Produced:
4/25/2018

BOSTON WATER AND SEWER COMMISSION

SEWER SYSTEM

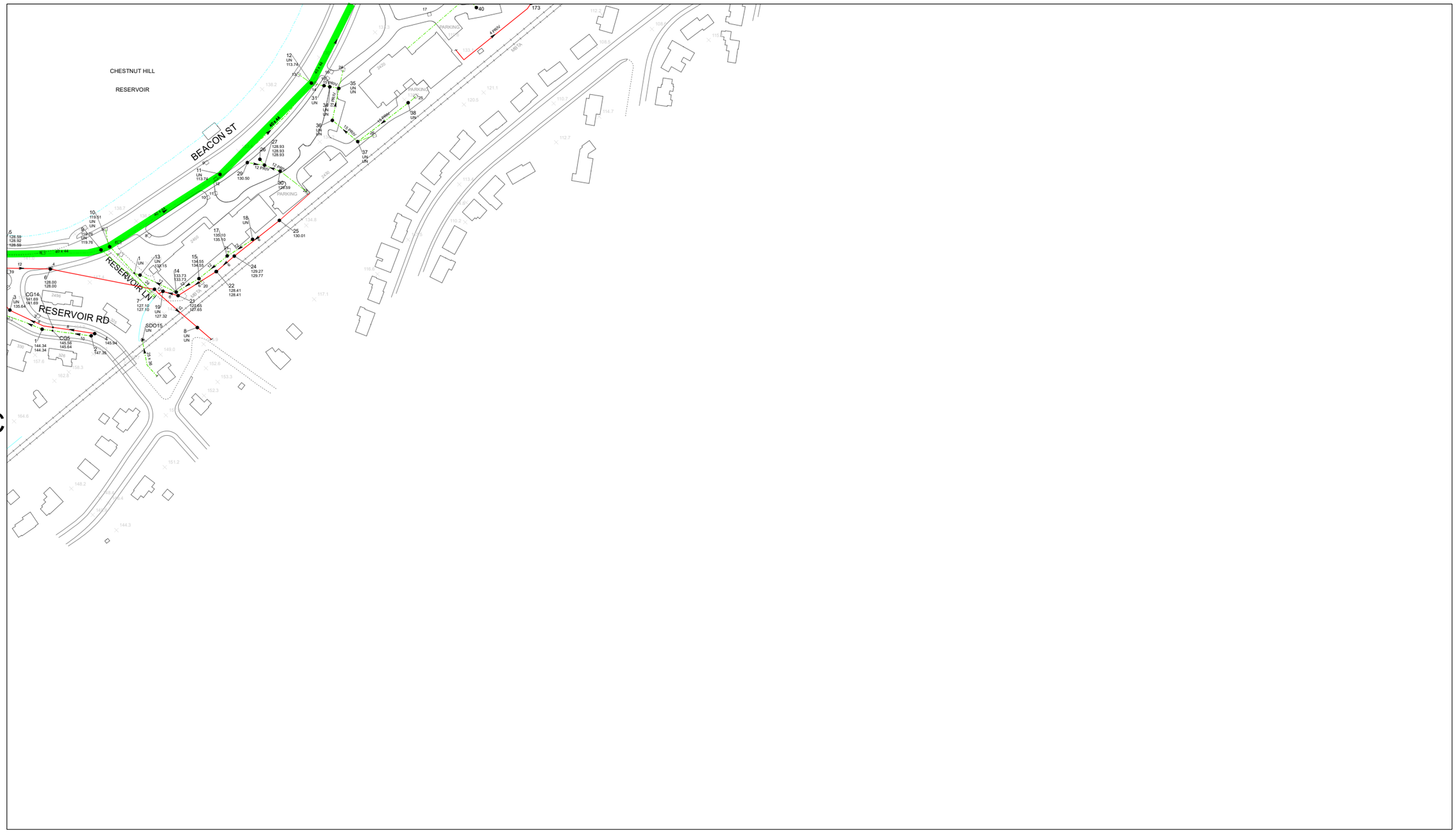
ALLSTON/BRIGHTON

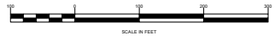
SHEET NO.
19C

20C

20D

19C





NOTE: Spot Elevations shown are plotted in Boston City Base

DATE OF PHOTOGRAPHY - MARCH 30, APRIL 1 & 17, 1995
VERTICAL DATUM BASED ON THE BOSTON CITY BASE

THE LANDBASE ON THIS MAP WAS COMPILED TO MEET THE ASPRS STANDARD FOR CLASS 1 MAP ACCURACY

Date Produced:
4/25/2018

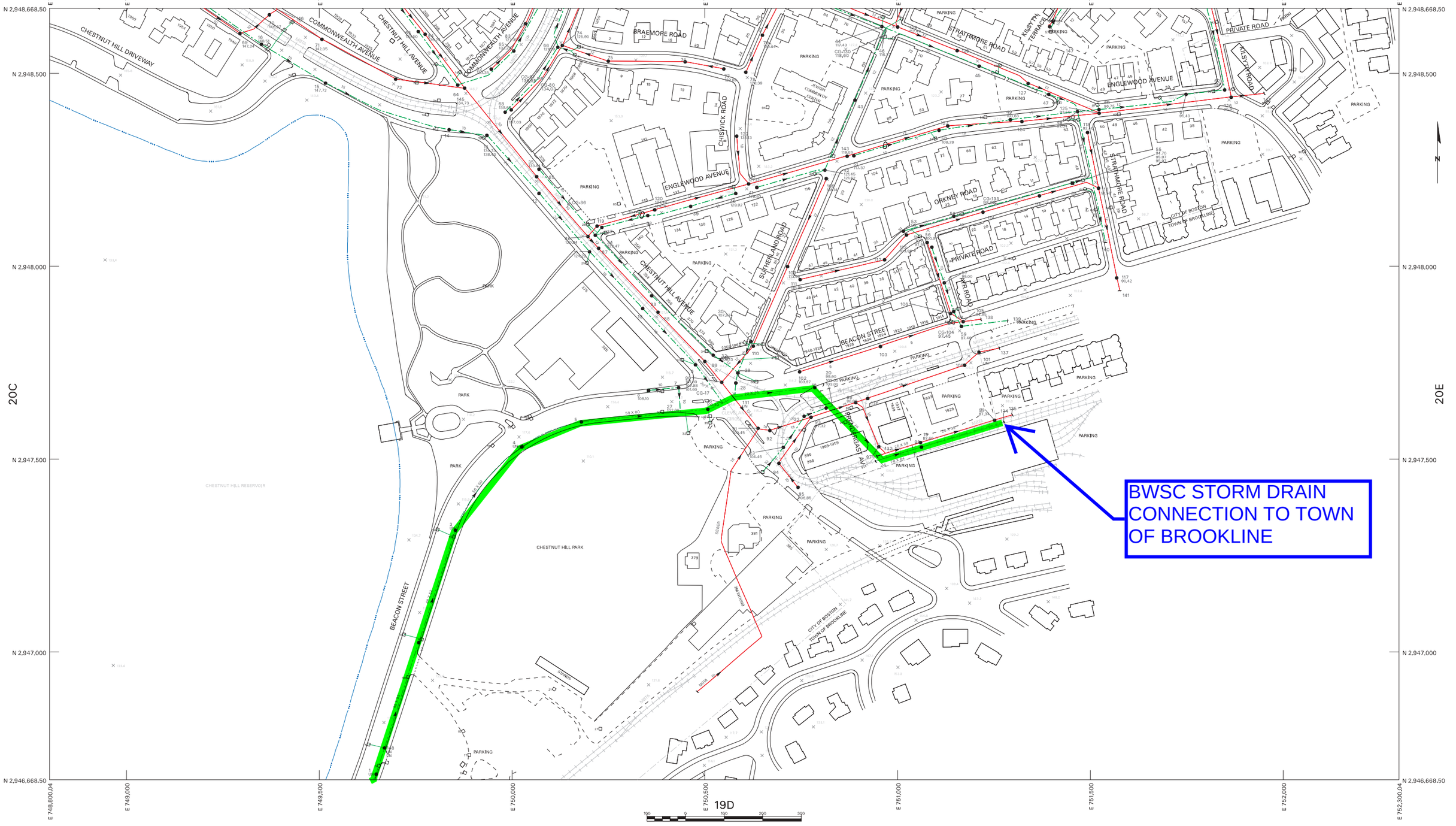
BOSTON WATER AND SEWER COMMISSION

SEWER SYSTEM

ALLSTON/BRIGHTON

SHEET NO.
19D

FIGURE 4: DISCHARGE ROUTE



NOTE: Spot Elevations shown are plotted in Boston City Base

500 FOOT GRID BASED ON MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, NAD 83

DATE OF PHOTOGRAPHY - MARCH 30, APRIL 1 & 17, 1995
VERTICAL DATUM BASED ON THE BOSTON CITY BASE

THE LANDBASE ON THIS MAP WAS COMPILED TO MEET THE ASPRS STANDARD FOR CLASS 1 MAP ACCURACY

Date Produced
August 26, 2005

BOSTON WATER AND SEWER COMMISSION

SEWER SYSTEM MAP

ALLSTON/BRIGHTON

SHEET NO.
20D

FIGURE 4: DISCHARGE ROUTE

BWSC Storm Drain (Cleveland Circle) to Village Brook to Leverett Pond

APPENDIX A

Notice of Intent

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

A. General site information:

<table>
<tr><td rowspan="4">1. Name of site:
Boston College Central Heating Plant Expansion</td><td colspan="3">Site address: Central Heating Plant
Boston College, Service
Street:</td></tr>
<tr><td>City: Chestnut Hill</td><td>State: MA</td><td>Zip: 02467</td></tr>
<tr><td colspan="3">Contact Person: Dan Diorio</td></tr>
<tr><td colspan="3">Telephone: 617-552-8772 Email: dan.diorio@bc.edu</td></tr>
<tr><td rowspan="4">2. Site owner
Boston College

Owner is (check one): ☐ Federal ☐ State/Tribal ■ Private
■ Other; if so, specify: Institutional</td><td colspan="3">Mailing address: St. Clements Hall
140 Commonwealth Avenue
Street:</td></tr>
<tr><td>City: Chestnut Hill</td><td>State: MA</td><td>Zip: 02467</td></tr>
<tr><td colspan="3">Contact Person: Matthew Harting</td></tr>
<tr><td colspan="3">Telephone: 978-578-7010 Email: mharting@consigli.com</td></tr>
<tr><td rowspan="3">3. Site operator, if different than owner
Consigli Construction Company, Inc.</td><td colspan="3">Mailing address:
72 Sumner Street
Street:</td></tr>
<tr><td>City: Milford</td><td>State: MA</td><td>Zip: 01757</td></tr>
<tr><td colspan="3">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="3">5. Other regulatory program(s) that apply to the site (check all that apply):
■ MA Chapter 21e; list RTN(s):
3-10103
☐ 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):
Leverett Pond	MA72-11	Class B (CSO)

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.

Bottom Deposits, non-native aquatic plants, flow regime or substrate habitat alterations, DDT + PCB in Fish Tissue, E. coli (TMDL), Oil and Grease, DO, Phosphorus, Taste and Odor. Final TMDL not required or listed.

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.	0.0788 MGD
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.	1.36

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: 10 July 2018

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 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	☐ Contaminated surface water 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	☐ The receiving water ☐ A surface water other than the receiving water; if so, indicate waterbody:	☐ Potable water; if so, indicate municipality or origin: ■ Other; if so, specify: Although "Contaminated Groundwater" is listed, see table for compounds actually detected

2. Source water contaminants: None above RGP effluent criteria: Total Cr, Cu, Fe, total chloride, total suspended solids; attributable to urban fill on-site. Refer	
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): Leverett Pond, Brookline, MA	Outfall location(s): (Latitude, Longitude) 42.3303, -71.1138
Discharges enter the receiving water(s) via (check any that apply): ☐ Direct discharge to the receiving water ■ Indirect discharge, if so, specify: Pump to catch basin that flows to Leverett Pond ☐ 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: 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): August 2018 to March 2019 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	✔		1	121,4500N	75	<75	<75	Report mg/L	---
Chloride		✔	1	44300.0	12500	478000	478000	Report µg/l	---
Total Residual Chlorine	✔		1	121,4500C	20	<20	<20	0.2 mg/L	15 µg/l.
Total Suspended Solids		✔	1	1212540D	5000	9000	9000	30 mg/L	---
Antimony	✔		1	3200.8	4	<4	<4	206 µg/L	873 µg/l
Arsenic		✔	1	3200.8	1	0	0	104 µg/L	14 µg/l
Cadmium		✔	1	3200.8	0.2	0	0	10.2 µg/L	0.6826 µg/l
Chromium III	✔		1	107<-	10	<10	<10	323 µg/L	231.9 µg/l
Chromium VI	✔		1	1.7196A	10	<10	<10	323 µg/L	15.6 µg/l
Copper		✔	1	3200.8	1	1.46	1.46	242 µg/L	25.2 µg/l
Iron		✔	1	19200.7	50	341	341	5,000 µg/L	1125 µg/l
Lead		✔	1	3200.8	0.5	1.59	1.59	160 µg/L	11.89 µg/l
Mercury		✔	1	3245.1	0.2	0	0	0.739 µg/L	1.24 µg/l
Nickel		✔	1	3200.8	2	0	0	1,450 µg/L	143.5 µg/l
Selenium	✔		1	3200.8	5	<5	<5	235.8 µg/L	6.8 µg/l
Silver	✔		1	3200.8	0.4	<0.4	<0.4	35.1 µg/L	21.5 µg/l
Zinc		✔	1	3200.8	10	0	0	420 µg/L	330.1 µg/l
Cyanide	✔		1	121,4500C	5	<5	<5	178 mg/L	7.1 µg/l
B. Non-Halogenated VOCs									
Total BTEX	✔		1	NA	NA	NA	NA	100 µg/L	---
Benzene	✔		1	18260C	0.5	<0.5	<0.5	5.0 µg/L	---
1,4 Dioxane	✔		1	18260C-SI	3	<3	<3	200 µg/L	---
Acetone		✔	1	18260C	5	0	0	7.97 mg/L	---
Phenol	✔		1	18270D	5	<0.5	<0.5	1,080 µg/L	409 µg/l

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	✔		1	18260C	0.5	<0.5	<0.5	4.4 µg/L	2.2 µg/l
1,2 Dichlorobenzene	✔		1	18260C	2.5	<2.5	<2.5	600 µg/L	---
1,3 Dichlorobenzene	✔		1	18260C	2.5	<2.5	<2.5	320 µg/L	---
1,4 Dichlorobenzene	✔		1	18260C	2.5	<2.5	<2.5	5.0 µg/L	---
Total dichlorobenzene	✔		1	NA	NA	NA	NA	763 µg/L in NH	---
1,1 Dichloroethane	✔		1	18260C	0.75	<0.75	<0.75	70 µg/L	---
1,2 Dichloroethane	✔		1	18260C	0.5	<0.5	<0.5	5.0 µg/L	---
1,1 Dichloroethylene	✔		1	18260C	0.5	<0.5	<0.5	3.2 µg/L	---
Ethylene Dibromide	✔		1	18260C	2	<2	<2	0.05 µg/L	---
Methylene Chloride	✔		1	18260C	3	<3	<3	4.6 µg/L	---
1,1,1 Trichloroethane	✔		1	18260C	0.5	<0.5	<0.5	200 µg/L	---
1,1,2 Trichloroethane	✔		1	18260C	0.75	<0.75	<0.75	5.0 µg/L	---
Trichloroethylene	✔		1	18260C	0.5	<0.5	<0.5	5.0 µg/L	---
Tetrachloroethylene	✔		1	18260C	0.5	<0.5	<0.5	5.0 µg/L	4.5 µg/l
cis-1,2 Dichloroethylene	✔		1	18260C	0.5	<0.5	<0.5	70 µg/L	---
Vinyl Chloride	✔		1	18260C	1	<1	<1	2.0 µg/L	---
D. Non-Halogenated SVOCs									
Total Phthalates	✔		1	18270D	NA	0	0	190 µg/L	---
Diethylhexyl phthalate	✔		1	18270D	5	<5	<5	101 µg/L	
Total Group I PAHs		✔	1	18270D-SI	NA	0	0	1.0 µg/L	---
Benzo(a)anthracene		✔	1	18270D-SI	0.1	0	0	As Total PAHs	0.0052 µg/l
Benzo(a)pyrene		✔	1	18270D-SI	0.1	0	0		0.0052 µg/l
Benzo(b)fluoranthene		✔	1	18270D-SI	0.1	0	0		0.0052 µg/l
Benzo(k)fluoranthene		✔	1	18270D-SI	0.1	0	0		0.0052 µg/l
Chrysene		✔	1	18270D-SI	0.1	0	0		0.0052 µg/l
Dibenzo(a,h)anthracene		✔	1	18270D-SI	0.1	0	0		0.0052 µg/l
Indeno(1,2,3-cd)pyrene		✔	1	18270D-SI	0.1	0	0		0.0052 µg/l

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		✔	1	18270D-SI	NA	0	0	100 µg/L	---
Naphthalene		✔	1	18270D-SI	0.1	0	0	20 µg/L	---
E. Halogenated SVOCs									
Total PCBs	✔		1	5,608	0.25	<0.25	<0.25	0.000064 µg/L	---
Pentachlorophenol	✔		1	18270D-SI	0.8	<0.8	<0.8	1.0 µg/L	---
F. Fuels Parameters									
Total Petroleum Hydrocarbons		✔	1	741664A	4000	0	0	5.0 mg/L	---
Ethanol	✔		1	1671A	2000	<2000	<2000	Report mg/L	---
Methyl-tert-Butyl Ether	✔		1	18260C	1	<1	<1	70 µg/L	27 µg/l
tert-Butyl Alcohol	✔		1	18260C	10	<10	<10	120 µg/L in MA 40 µg/L in NH	---
tert-Amyl Methyl Ether	✔		1	18260C	2	<2	<2	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:									
Hardness		✔	1	19200.7	660	247000	247000		
Total Chromium		✔	1	3200.8	1	1.14	1.14		
Barium		✔	1	976010C	422	0	0		
2-Methylnaphthalene		✔	1	18270D-SI	0.1	0	0		
Acenaphthene		✔	1	18270D-SI	0.1	0	0		
Acenaphthylene		✔	1	18270D-SI	0.1	0	0		
Anthracene		✔	1	18270D-SI	0.1	0	0		
Benzo(g,h,i)perylene		✔	1	18270D-SI	0.1	0	0		
Dibenzofuran		✔	1	18270D-SI	0.1	0	0		
Fluoranthene		✔	1	18270D-SI	0.1	0	0		
Fluorene		✔	1	18270D-SI	0.1	0	0		
Phenanthrene		✔	1	18270D-SI	0.1	0	0		
Pyrene		✔	1	18270D-SI	0.1	0	0		

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (ug/l)	Influent		Effluent Limitations	
						Daily Maximum (ug/l)	Daily average (ug/l)	TBEL	WQBEL
Beryllium		√	13	976010C	211	0	0		
Vanadium		√	13	976010C	422	0	0		
4,4'-DDE		√	13	978081B	1.67	0	0		
4,4'-DDT		√	13	978081B	1.67	0	0		
Dieldrin		√	13	978081B	1.03	0	0		
Endosulfan II		√	13	978081B	1.64	0	0		

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:

Applied as necessary 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 is routed through a sedimentation tank and bag filters to remove suspended solids and undissolved chemical constituents. Additional treatment may include granulated activated carbon (GAC), ion exchange, and/or pH adjustment, as needed to meet necessary effluent limits. After treatment, constituent concentrations in effluent expected to range from non-detectable to less than effluent criteria. If authorized under the RGP, parameters to be monitored include one or more VOCs, SVOCs, metals/inorganics, pH, and other compounds known or believed present in the source water.

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:

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:	150 gpm
Provide the proposed maximum effluent flow in gpm.	150 gpm
Provide the average effluent flow in gpm.	50 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 conditioners 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:

See attached manufacturers cut sheets and SDS for equipment which may be used if necessary. This information is only included as a contingency and is not currently needed based on groundwater data. Exact specifications on frequency, duration, quantity, and method of application are not known at this time. If the system eventually requires these additives, additional details will be provided to EPA.

b. Purpose of 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.

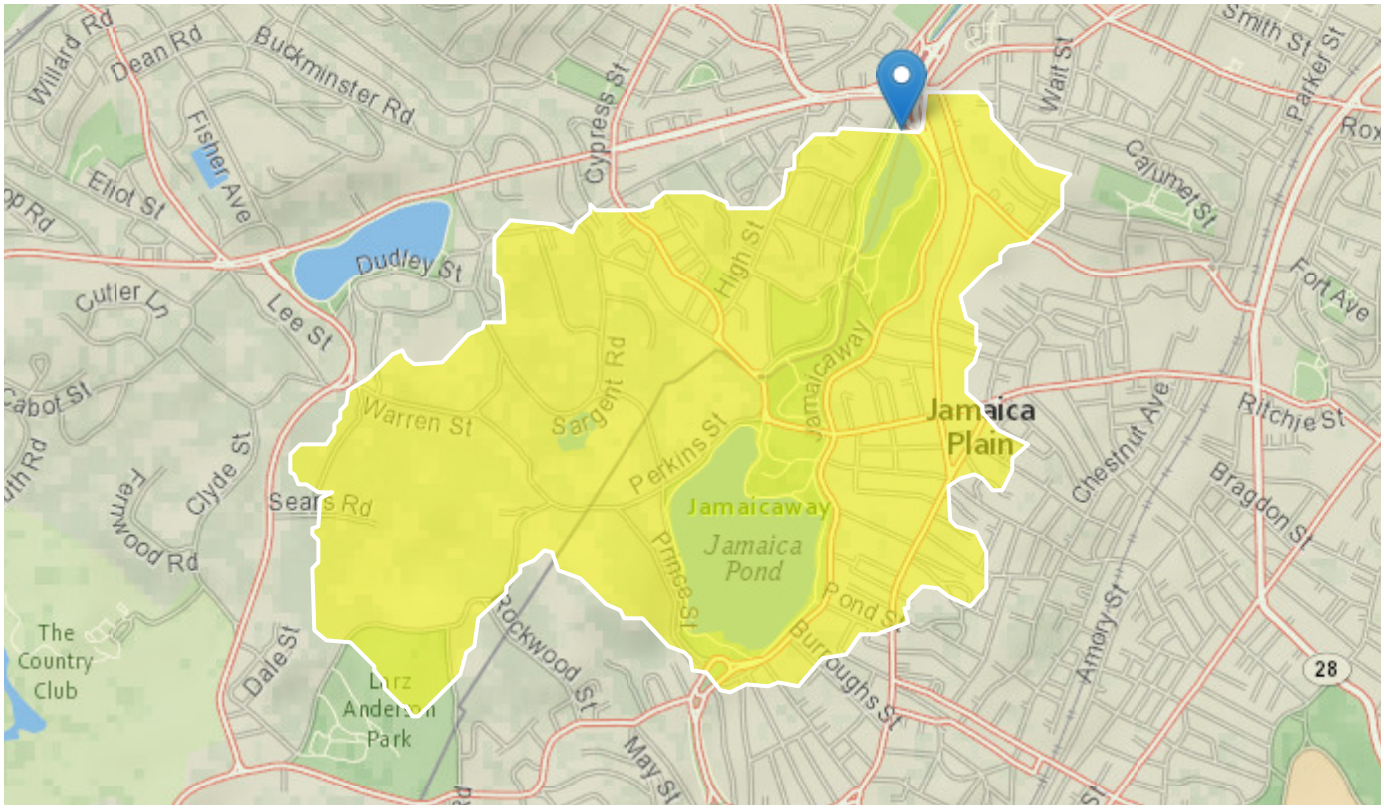
BMPP certification statement:	A BMPP meeting the requirements of this general permit will be implemented at the site upon initiation of discharge.
Notification provided to the appropriate State, including a copy of this NOI, if required.	Check one: Yes ☐ No ☐ N/A
Notification provided to the municipality in which the discharge is located, including a copy of this NOI, if requested.	Check one: Yes ■ No ☐
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 ☐
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: 7/30/2018
Print Name and Title: Matthew Harting, Superintendent, Consigli Construction	

APPENDIX B

Effluent Limitations Documentation

StreamStats Report

Region ID: MA
Workspace ID: MA20180710144718814000
Clicked Point (Latitude, Longitude): 42.33063, -71.11375
Time: 2018-07-10 10:47:32 -0400



Outlet from Leverett Pond, Brookline

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.36	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	3.309	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.48	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	1.36	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	3.309	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.48	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	0.212	ft^3/s
7 Day 10 Year Low Flow	0.112	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/)

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Application Version: 4.2.1

HALEY & ALDRICH, INC.		**CALCULATIONS**	**FILE NO.**	**128271-018**	
			SHEET	**1 of 1**	
CLIENT	**BOSTON COLLEGE**		**DATE**	**10-Jul-18**	
PROJECT	**CENTRAL HEATING PLANT EXPANSION**		**COMPUTED BY**	**KCS**	
SUBJECT	**DILUTION FACTOR CALCULATIONS**		**CHECKED BY**	**CV**	

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 0.112 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)

$$Q_S = \frac{0.112\ ft^3}{sec} \times \frac{7.48\ gallons}{ft^3} \times \frac{86{,}400\ sec}{day} \times \frac{1\ MG}{1{,}000{,}000\ gallons}$$

Q_S = 0.0788 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)

$$DF = \frac{Q_S + Q_D}{QD} = \frac{0.0788\ MGD + 0.216\ MGD}{0.216\ MGD} = 1.36$$

CONCLUSION: The dilution factor for this project is calculated to be 1.36 based on the provided 7Q10 low flow value and discharge flowrate.

Dilution Factor	1.4			
	TBEL applies if bolded		WQBEL applies if bolded	
A. Inorganics				
Ammonia	**Report**	mg/L	---	
Chloride	**Report**	µg/L	---	
Total Residual Chlorine	0.2	mg/L	**15**	µg/L
Total Suspended Solids	**30**	mg/L	---	
Antimony	**206**	µg/L	873	µg/L
Arsenic	**104**	µg/L	14	µg/L
Cadmium	**10.2**	µg/L	0.6826	µg/L
Chromium III	**323**	µg/L	231.9	µg/L
Chromium VI	**323**	µg/L	15.6	µg/L
Copper	**242**	µg/L	25.2	µg/L
Iron	**5000**	µg/L	1125	µg/L
Lead	**160**	µg/L	11.89	µg/L
Mercury	**0.739**	µg/L	1.24	µg/L
Nickel	**1450**	µg/L	143.5	µg/L
Selenium	**235.8**	µg/L	6.8	µg/L
Silver	**35.1**	µg/L	21.5	µg/L
Zinc	**420**	µg/L	330.1	µg/L
Cyanide	**178**	mg/L	7.1	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	409	µg/L
C. Halogenated VOCs				
Carbon Tetrachloride	**4.4**	µg/L	2.2	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	4.5	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	3.0	µg/L
Total Group I Polycyclic Aromatic Hydrocarbons	**1.0**	µg/L	---	
Benzo(a)anthracene	**1.0**	µg/L	0.0052	µg/L
Benzo(a)pyrene	**1.0**	µg/L	0.0052	µg/L
Benzo(b)fluoranthene	**1.0**	µg/L	0.0052	µg/L
Benzo(k)fluoranthene	**1.0**	µg/L	0.0052	µg/L
Chrysene	**1.0**	µg/L	0.0052	µg/L
Dibenzo(a,h)anthracene	**1.0**	µg/L	0.0052	µg/L
Indeno(1,2,3-cd)pyrene	**1.0**	µg/L	0.0052	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	---	
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	27	µg/L
tert-Butyl Alcohol	**120**	µg/L	---	
tert-Amyl Methyl Ether	**90**	µg/L	---	

Compliance Level applies if shown		
50	µg/L	
---	µg/L	

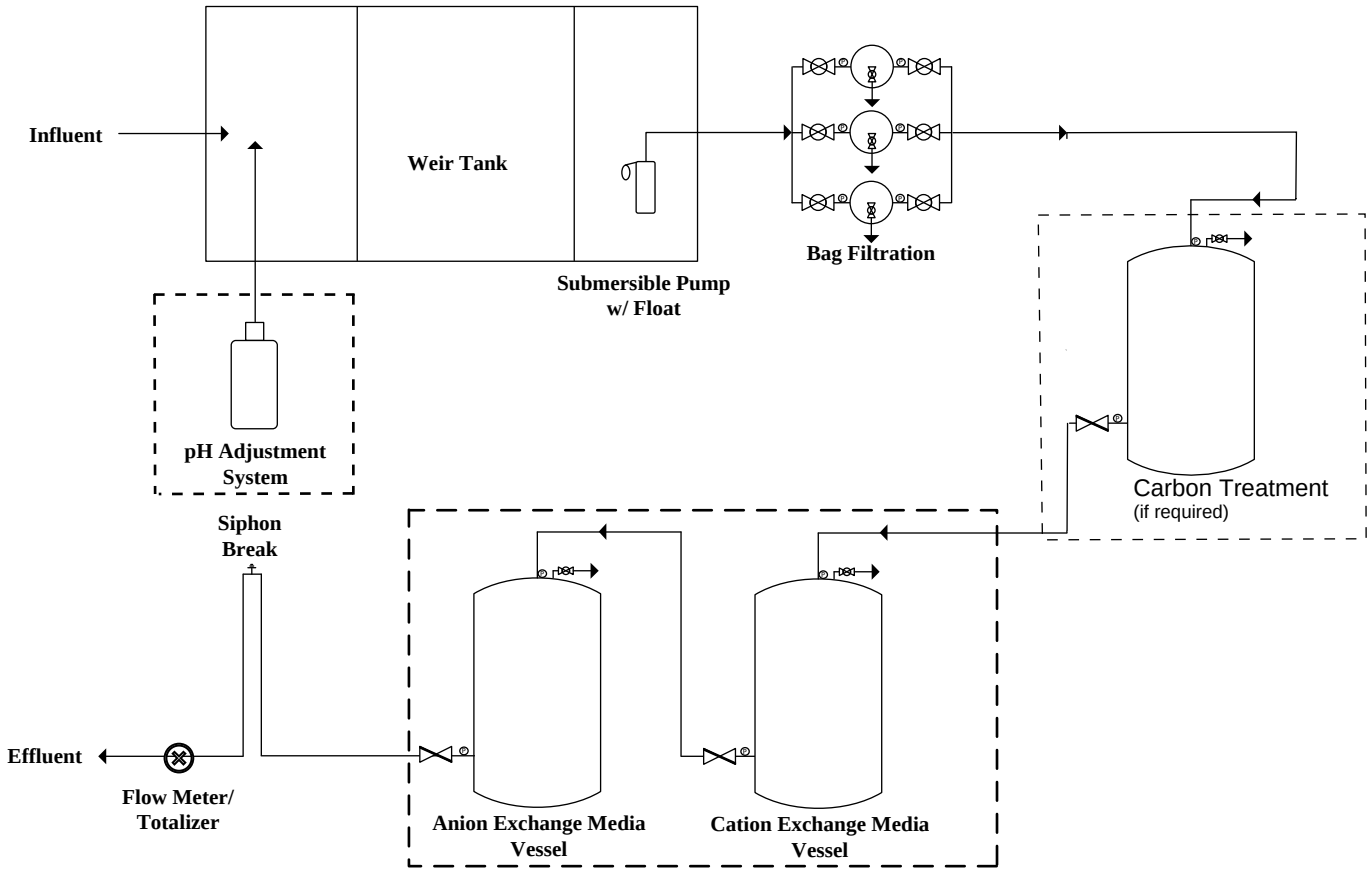
---	µg/L
---	µg/L
---	µg/L
---	µg/L
---	µg/L
---	µg/L
---	µg/L

0.5	µg/L

APPENDIX C

Additional Treatment Information

ADDITIONAL TREATMENT SYSTEMS SCHEMATIC LAYOUT



Notes:

1.) Figure is not to scale
2.) System is rated for 100 gallons per minute.
3.) Sampling ports located on all treatment system components

Key:
Piping/Hose
Contingency

Lockwood Remediation Technologies, LLC
89 Crawford Street
Leominster, MA 01453
Office: 774-450-7177

DESIGNED BY: LRT **DRAWN BY:** B. Watkins

CHECKED BY: **DATE:**

Figure 4 - Water Treatment System Schematic

PROJECT No. 2-1494

FIGURE No. 4

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.

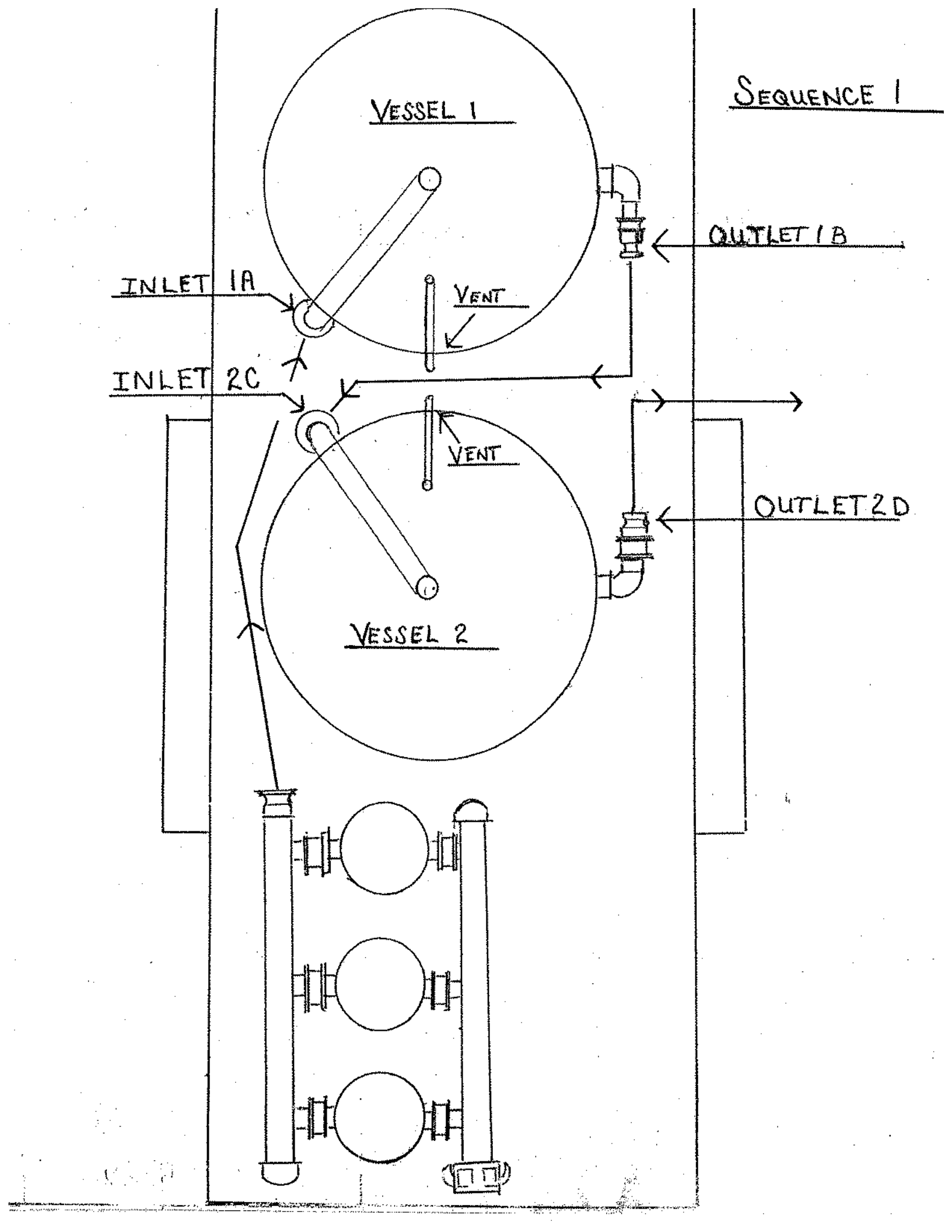
The system is mounted on a 12,230lb GVWR / 9600lb LC equipment hauler manufactured by Superior Trailers of Georgia. The main frame is 7" channel with two (2) 6000lb brake axles. There are four (4) 12000lb drop leg jackets with one mounted in each corner of the trailer. The combined dry weight of the 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

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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.

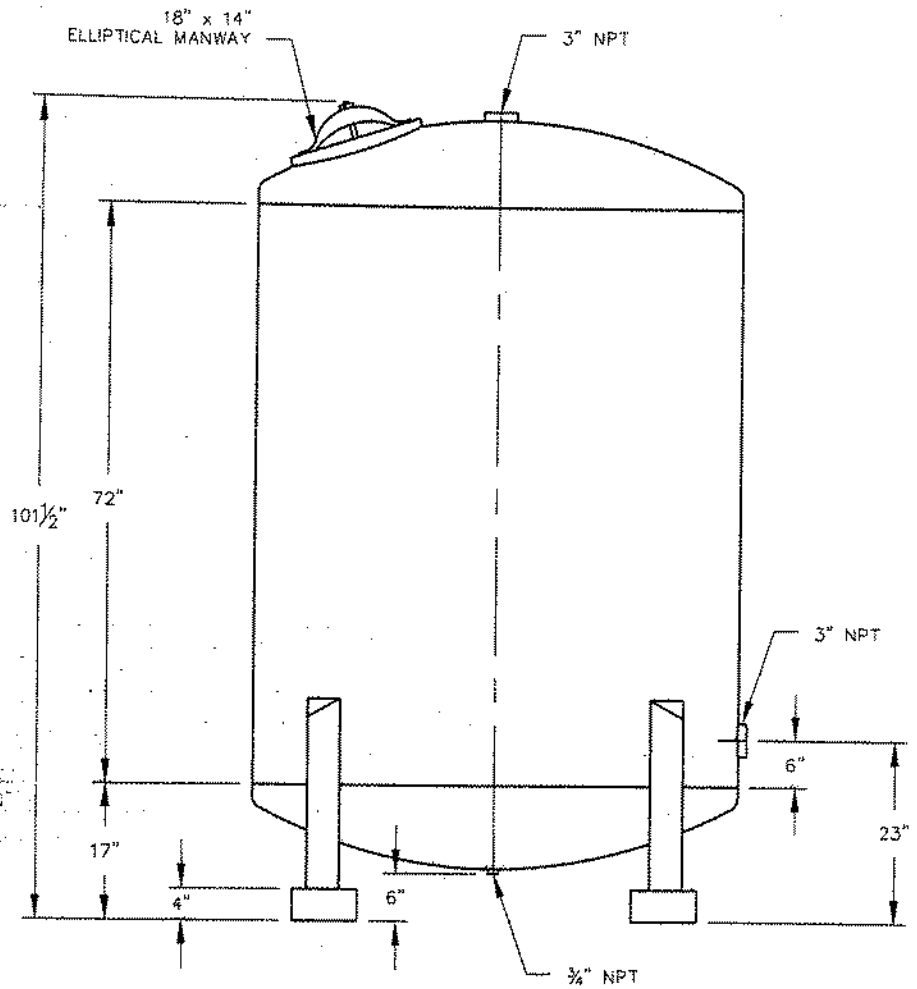
1) Superior Trailers 12,232lb GVWR trailer equipped with two (2) 6000lb AXIS Products brake axles.

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

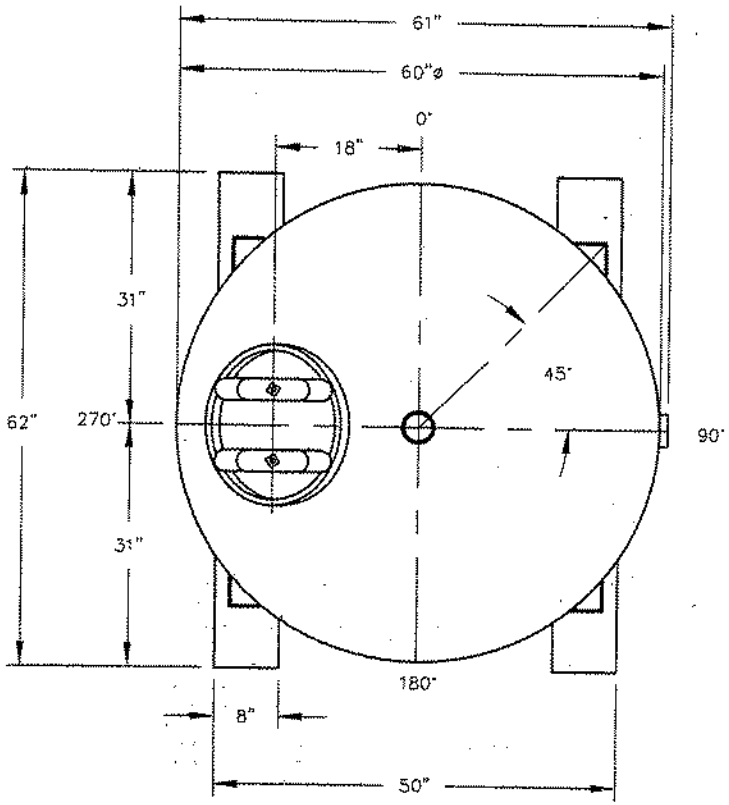
6) Legend Mfg. 2" Butterfly valves model T-335AB with EPDM seat, Aluminum/Bronze construction.

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

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 low (the water in 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 or the inlet nozzle. This step removes the air that is in the adsorber and it is now ready to be placed into service.

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 Section 4.0 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 after 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

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$^{foot\text{-}lbs}$. 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.

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 removal of seal or flow of fluid being filtered.
8. Remove basket seal and inspect. Replace if necessary. Clean basket seal groove and replace

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$^{\text{foot-lbs}}$. 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.

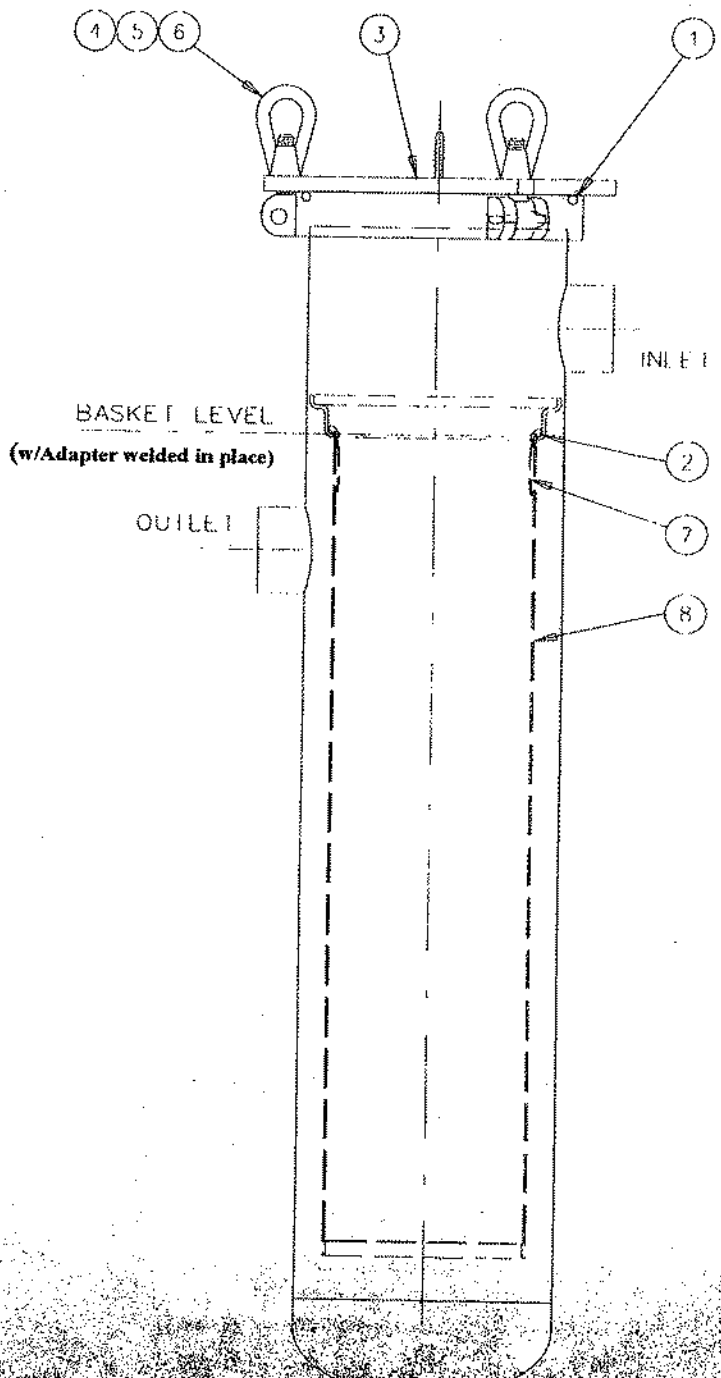
III. Spare Parts List

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

IV. Spare Parts Diagram



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

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

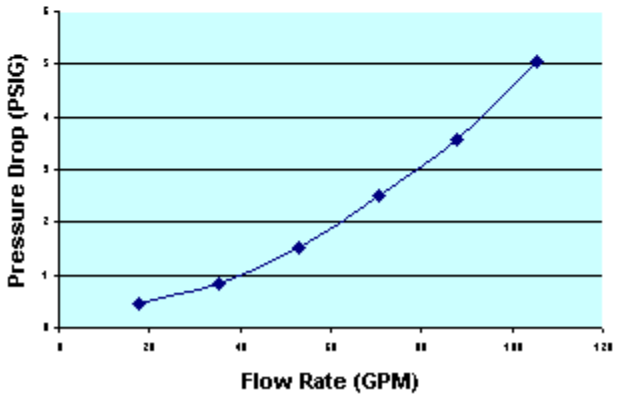
HPAF SERIES FILTERS
MODEL HPAF-2000

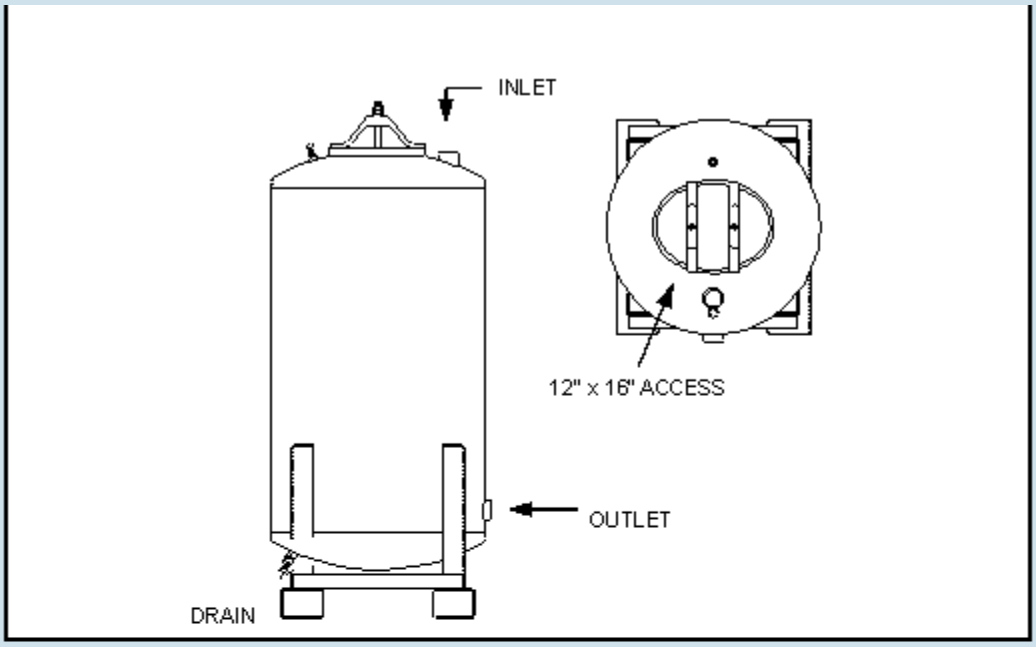
The HPAF-2000 filter is a media filter vessel designed to treat liquid streams. While the typical design application is a activated carbon adsorbtion unit, the filter can easily accommodate many medias. Some applications include:

- 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

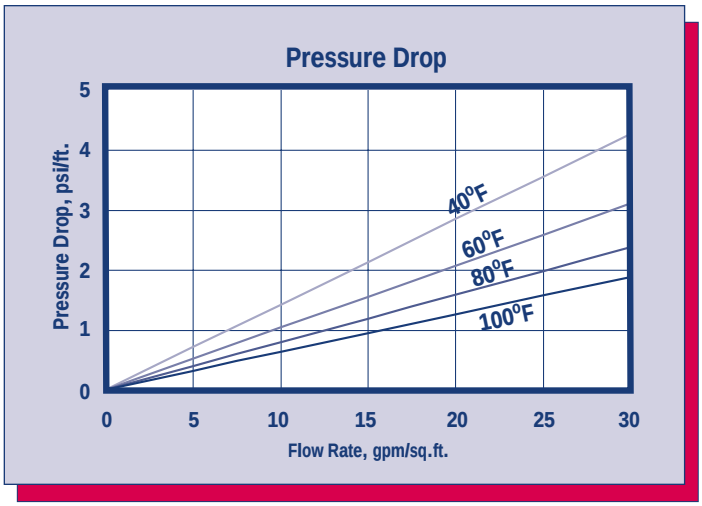
RESINTECH CGS is a high purity, light colored, high capacity, gel type sulfonated polystyrene cation resin supplied in the sodium form as moist, tough uniform spherical beads. *ResinTech CGS* specifically is intended for use in all water softening applications,including beverages, potable water and water 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.)

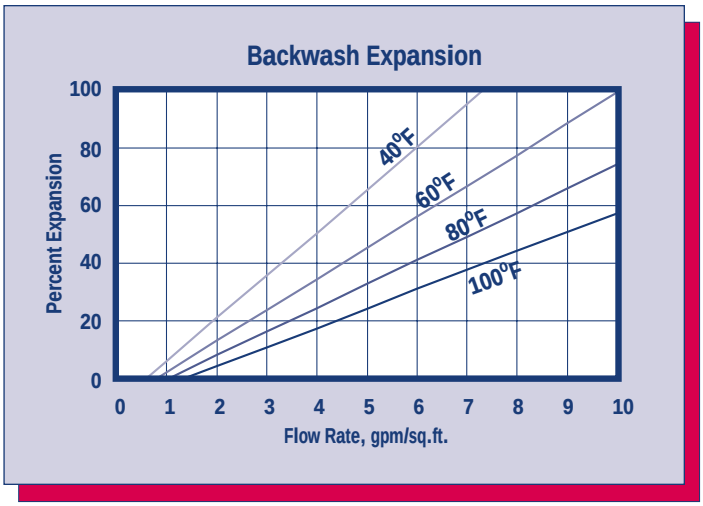
FEATURES & BENEFITS

- **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.

SBG1

ANION EXCHANGE RESIN TYPE ONE GEL Cl OR OH FORM

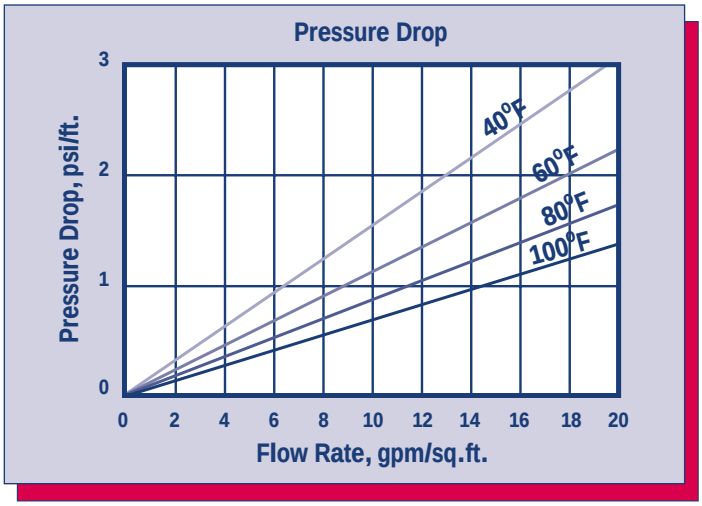
ResinTech SBG1 is a high capacity, shock resistant, gelular, Type 1, strongly basic anion exchange resin supplied in the chloride or hydroxide form as moist, tough, uniform, spherical beads. *ResinTech SBG1* is intended for use in all types of deionization systems and chemical processing applications. 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.

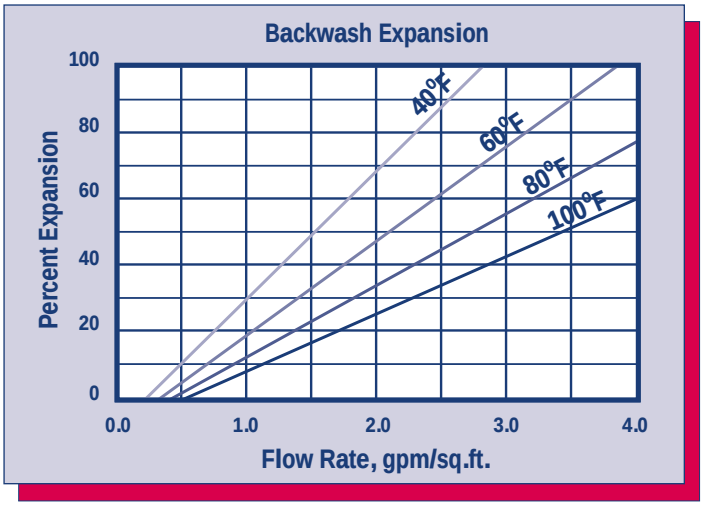
FEATURES & BENEFITS

- **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 $NaOH/ft^3$	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.

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.

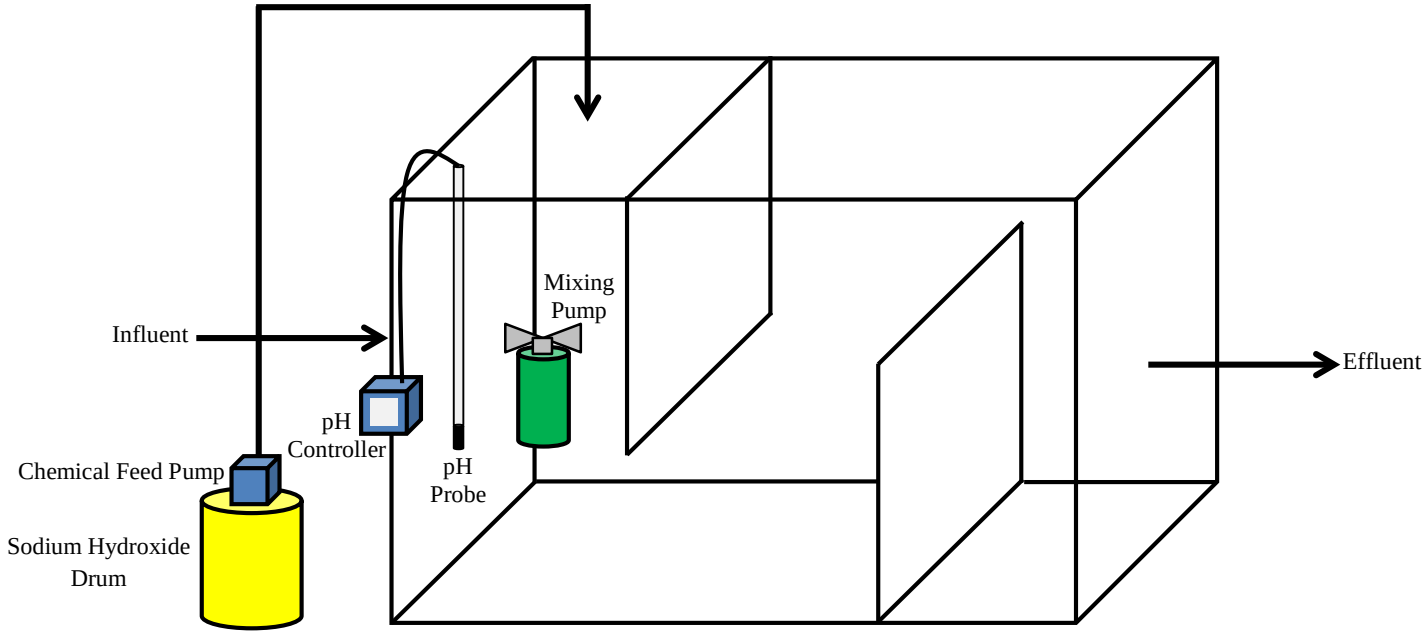
Section 15: Regulatory Information

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

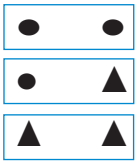
Choose from Hach's Broad Range of Digital and Analog Sensors

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	▲

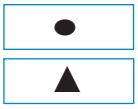
● = Digital ▲ = Analog

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



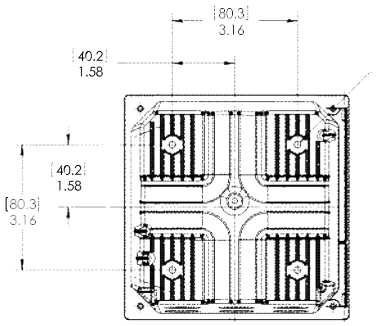
Specifications*

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.*

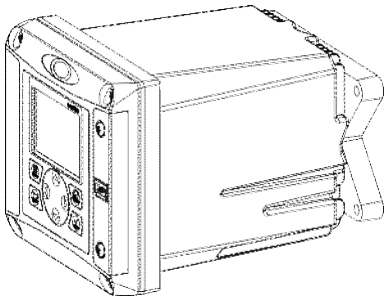
Dimensions

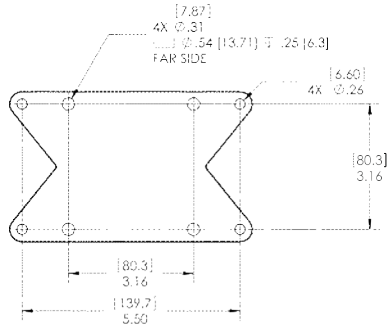
Surface Mounting Dimensions



Mounting Dimensions
(Rear View)

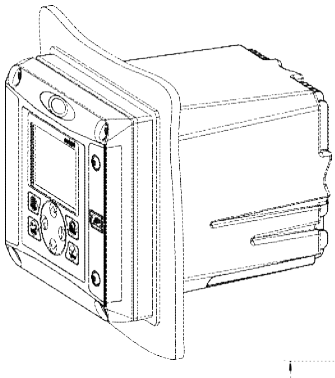
OR

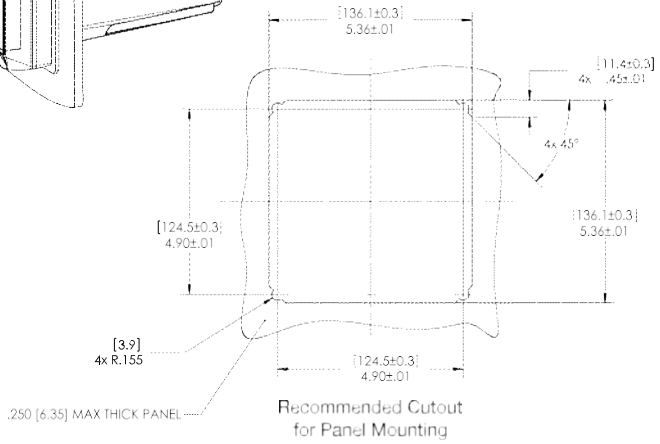




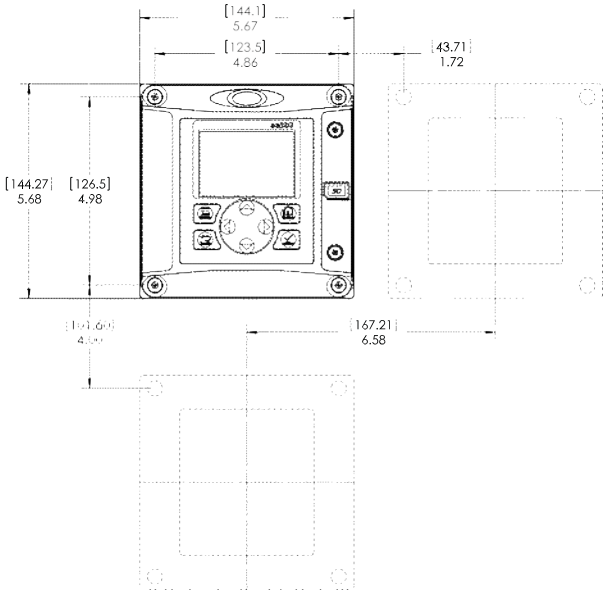
Bracket (supplied) for Surface Mounting
(Not compatible with Weather and Sun Shield
p/n 9220600 when surface mounting.)

Panel Mounting Dimensions



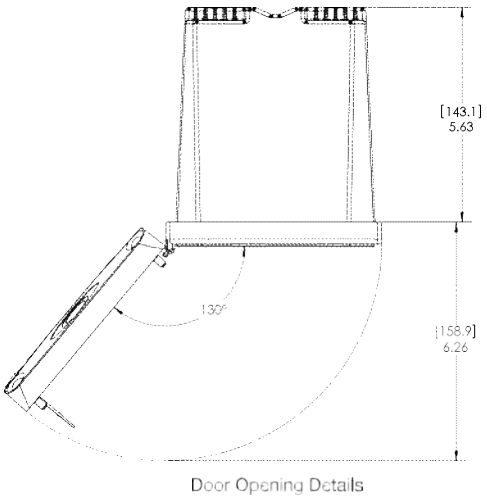


Recommended Cutout
for Panel Mounting

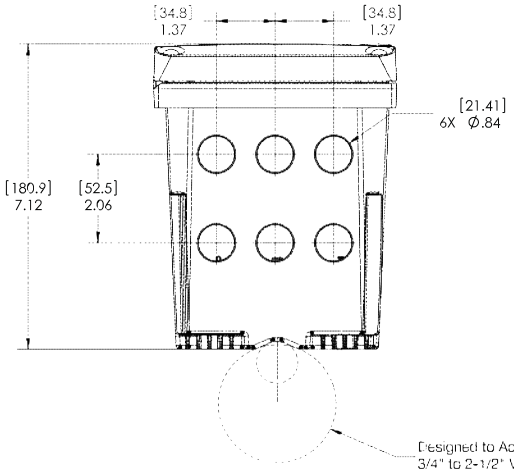


Minimum Spacing Dimensions
for Group Mounting

Top and Bottom Views

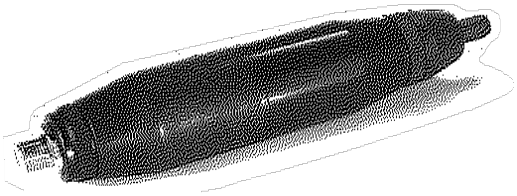


Door Opening Details

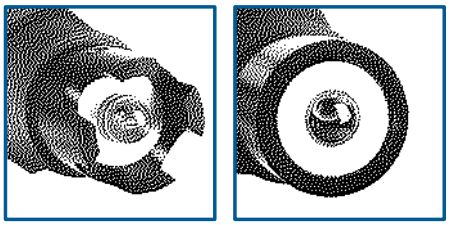


Designed to Accommodate
3/4" to 2-1/2" Vertical or Horizontal Pipe

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.*

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.

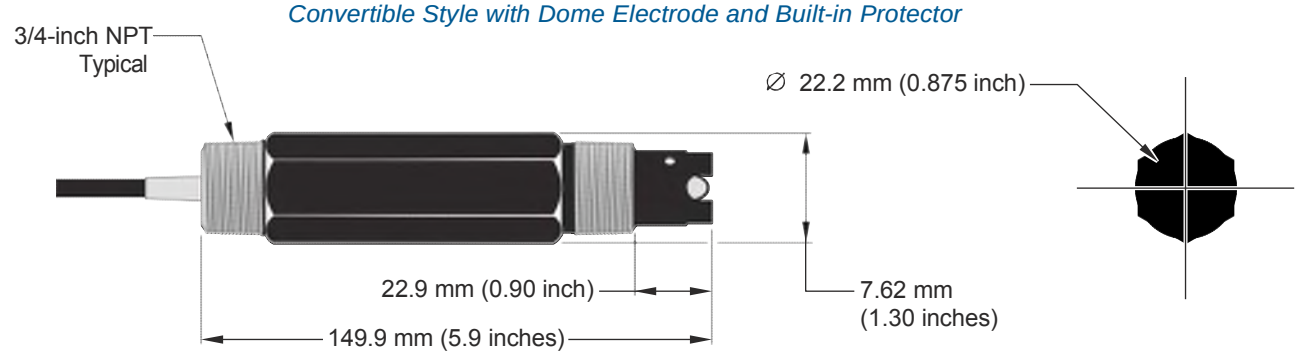
Insertion Style Sensor

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.

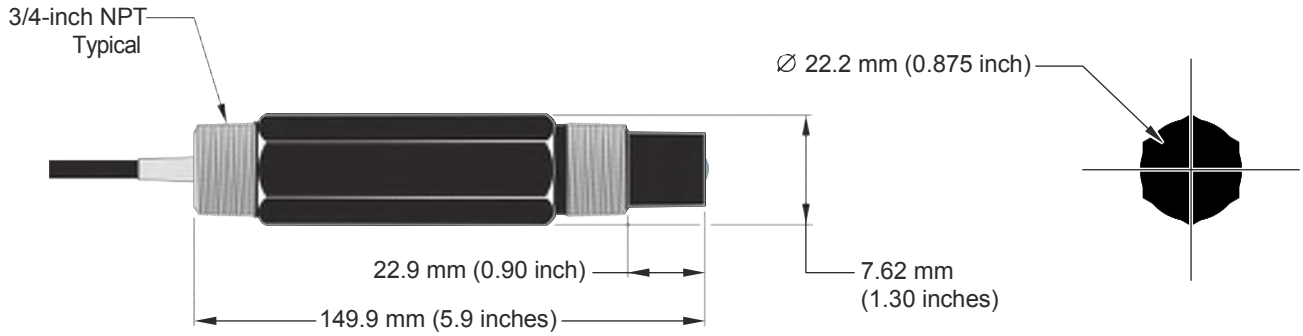
Sanitary Style Sensor

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

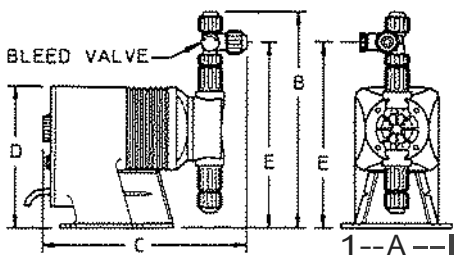
Pre-Engineered Systems

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
LB0[illegible]4	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."

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 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/m^3	(Vacated) TWA: 1 mg/m^3 TWA: 1 mg/m^3	IDLH: 15 mg/m^3 TWA: 1 mg/m^3	TWA: 1 mg/m^3

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.

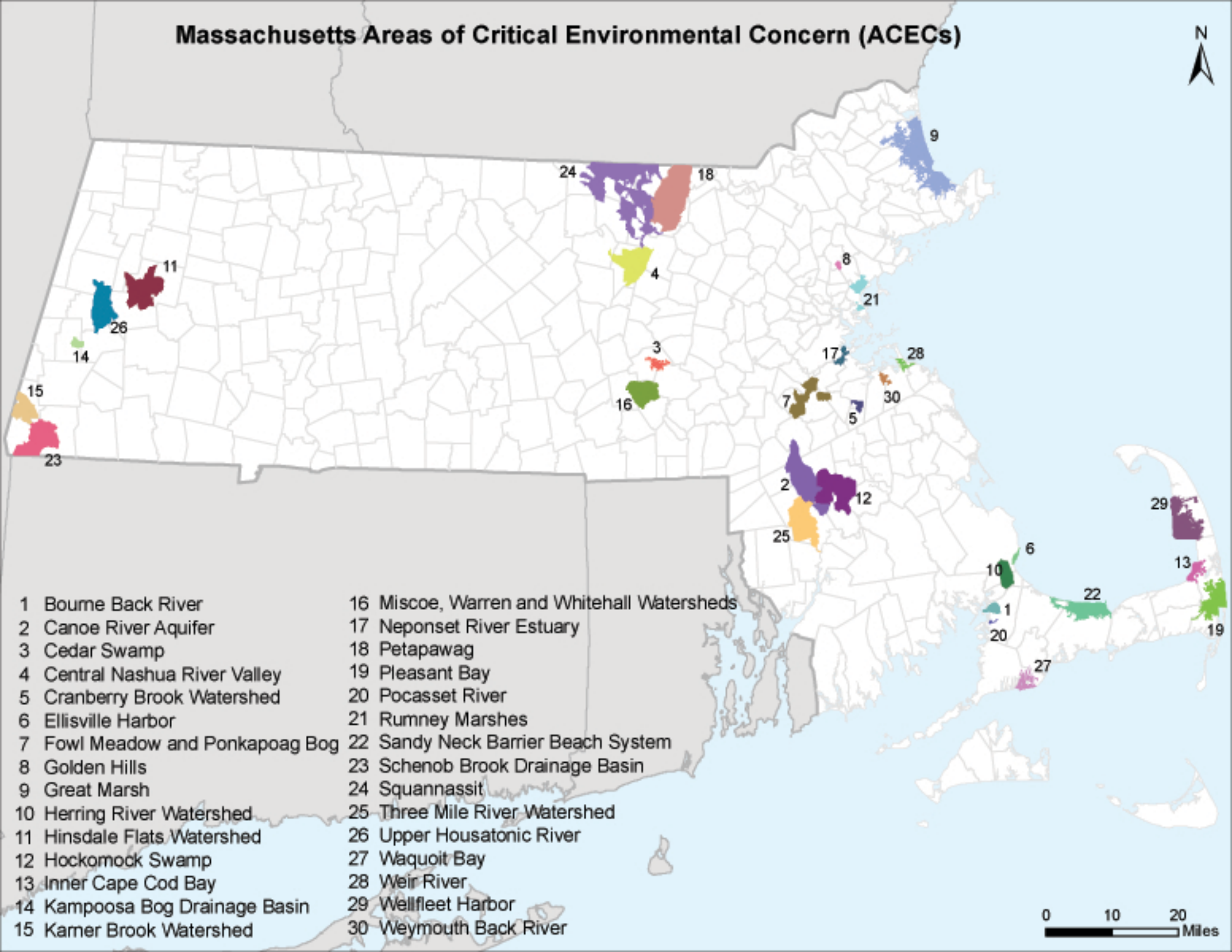
Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not 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

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

MassDEP - Bureau of Waste Site Cleanup

Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

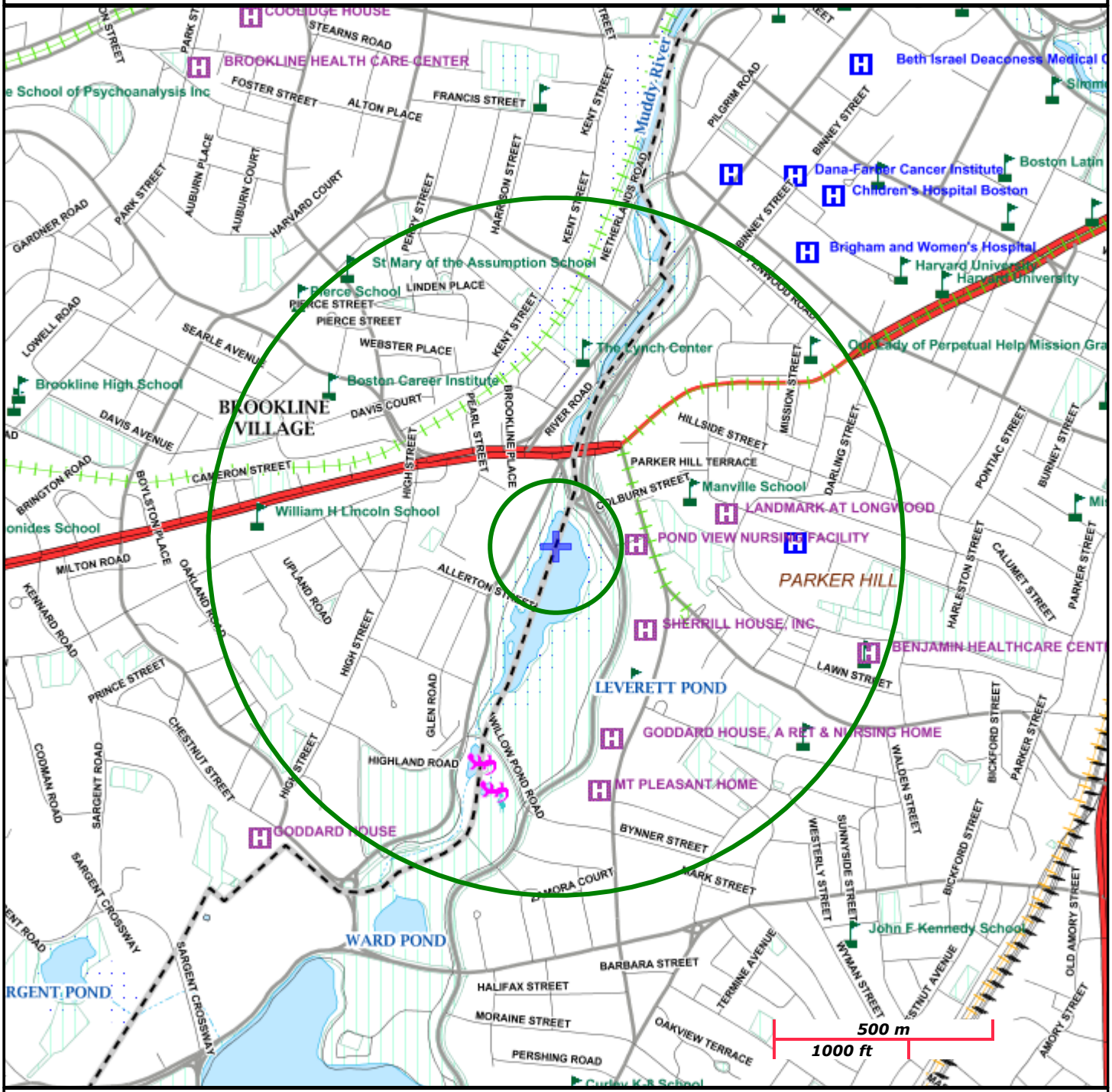
Site Information:

WASHINGTON STREET BROOKLINE, MA

NAD83 UTM Meters:
4688564mN , 325839mE (Zone: 19)
July 13, 2018

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: http://www.mass.gov/mgis/.

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.

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

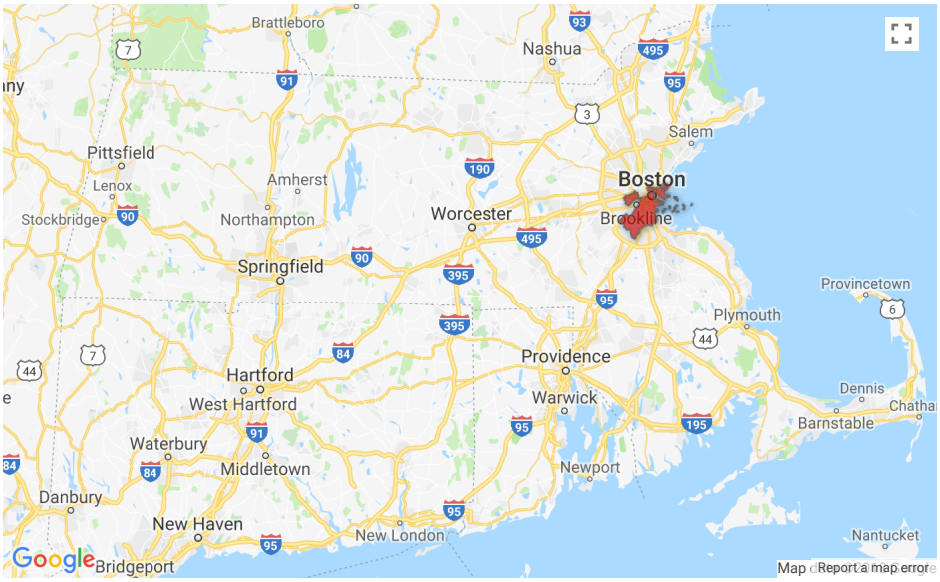
-Eastern cougar and gray wolf are considered extirpated in Massachusetts.
-Endangered gray wolves are not known to be present in Massachusetts, but dispersing individuals from source populations in Canada may occur statewide.
-Critical habitat for the Northern Red-bellied Cooter is present in Plymouth County.

Updated 02/05/2016

The Natural Heritage & Endangered Species Program maintains a list of all documented MESA-listed species observations in the Commonwealth. Please select a town if you would like to see a table showing which listed species have been observed in that town. The selected town will also be highlighted on the map. Alternatively you can specify either the Common Name or Scientific Name of a species to see it's distribution on the map and table showing the towns it has been observed in. Clicking on a column header in the table will sort the column. Clicking again on the same column heading will reverse the sort order.

The Town List and Species Viewer will be updated at regular intervals as new data is accepted and entered into the NHESP database.

Town: BOSTON or Species (Common Name): or Species (Scientific Name):



Show 50 entries Search:

Town	Taxonomic Group	Scientific Name	Common Name	MESA Status	Most Recent
BOSTON	Butterfly/Moth	Abagrotis nefascia	Coastal Heathland Cutworm	SC	2001
BOSTON	Vascular Plant	Ageratina aromatica	Lesser Snakeroot	E	1896
BOSTON	Amphibian	Ambystoma laterale	Blue-spotted Salamander	SC	2015
BOSTON	Bird	Ammodramus savannarum	Grasshopper Sparrow	T	1993
BOSTON	Butterfly/Moth	Apodrepanulatrix liberaria	New Jersey Tea Inchworm	E	Historic
BOSTON	Vascular Plant	Aristida purpurascens	Purple Needlegrass	T	Historic
BOSTON	Vascular Plant	Aristida tuberculosa	Seabeach Needlegrass	T	1877
BOSTON	Vascular Plant	Asclepias verticillata	Linear-leaved Milkweed	T	1878
BOSTON	Bird	Bartramia longicauda	Upland Sandpiper	E	2015
BOSTON	Vascular Plant	Boechera missouriensis	Green Rock-cress	T	1930
BOSTON	Vascular Plant	Carex striata	Walter's Sedge	E	Historic
BOSTON	Bird	Charadrius melodus	Piping Plover	T	2016
BOSTON	Beetle	Cicindela duodecimguttata	Twelve-spotted Tiger Beetle	SC	1910
BOSTON	Beetle	Cicindela purpurea	Cow Path Tiger Beetle	SC	1928
BOSTON	Beetle	Cicindela rufiventris hentzii	Eastern Red-bellied Tiger Beetle	T	1927
BOSTON	Vascular Plant	Desmodium cuspidatum	Large-bracted Tick-trefoil	T	1896
BOSTON	Vascular Plant	Eriophorum gracile	Slender Cottongrass	T	1885
BOSTON	Bird	Falco peregrinus	Peregrine Falcon	T	2017
BOSTON	Fish	Gasterosteus aculeatus	Threespine Stickleback	T	2014
BOSTON	Bird	Gavia immer	Common Loon	SC	1824
BOSTON	Vascular Plant	Houstonia longifolia	Long-leaved Bluet	E	1918
BOSTON	Vascular Plant	Liatris scariosa var. novae-angliae	New England Blazing Star	SC	1933
BOSTON	Mussel	Ligumia nasuta	Eastern Pondmussel	SC	1841
BOSTON	Vascular Plant	Linum medium var. texanum	Rigid Flax	T	1909
BOSTON	Vascular Plant	Lycopus rubellus	Gypsywort	E	1896
BOSTON	Vascular Plant	Malaxis unifolia	Green Adder's Mouth	T	1883
BOSTON	Butterfly/Moth	Metarranthis apiciaria	Barrens Metarranthis	E	1934
BOSTON	Vascular Plant	Myriophyllum alterniflorum	Alternate-flowered Water-milfoil	E	Historic
BOSTON	Vascular Plant	Ophioglossum pusillum	Adder's-tongue Fern	T	1884
BOSTON	Vascular Plant	Platanthera flava var. herbiola	Pale Green Orchis	T	1908
BOSTON	Bird	Pooecetes gramineus	Vesper Sparrow	T	1985
BOSTON	Butterfly/Moth	Pyrrhia aurantiago	Orange Sallow Moth	SC	1988
BOSTON	Vascular Plant	Ranunculus micranthus	Tiny-flowered Buttercup	E	1891
BOSTON	Vascular Plant	Rumex pallidus	Seabeach Dock	T	1984
BOSTON	Vascular Plant	Sanicula odorata	Long-styled Sanicle	T	Historic
BOSTON	Amphibian	Scaphiopus holbrookii	Eastern Spadefoot	T	1932
BOSTON	Vascular Plant	Scirpus longii	Long's Bulrush	T	1907
BOSTON	Vascular Plant	Setaria parviflora	Bristly Foxtail	SC	2001
BOSTON	Dragonfly/Damselfly	Somatochlora linearis	Mocha Emerald	SC	2009

Town	Taxonomic Group	Scientific Name	Common Name	MESA Status	Most Recent
BOSTON	Bird	Sterna hirundo	Common Tern	SC	2015
BOSTON	Bird	Sternula antillarum	Least Tern	SC	2015
BOSTON	Vascular Plant	Suaeda calceoliformis	American Sea-blite	SC	1909
BOSTON	Reptile	Terrapene carolina	Eastern Box Turtle	SC	1939
BOSTON	Bird	Tyto alba	Barn Owl	SC	1989
BOSTON	Bird	Vermivora chrysoptera	Golden-winged Warbler	E	Historic
BOSTON	Vascular Plant	Viola brittoniana	Britton's Violet	T	1909

Showing 1 to 46 of 46 entries

First Previous 1 Next Last

Show Additional Info

The Natural Heritage & Endangered Species Program maintains a list of all documented MESA-listed species observations in the Commonwealth. Please select a town if you would like to see a table showing which listed species have been observed in that town. The selected town will also be highlighted on the map. Alternatively you can specify either the Common Name or Scientific Name of a species to see it's distribution on the map and table showing the towns it has been observed in. Clicking on a column header in the table will sort the column. Clicking again on the same column heading will reverse the sort order.

The Town List and Species Viewer will be updated at regular intervals as new data is accepted and entered into the NHESP database.

Town: BROOKLINE or Species (Common Name): or Species (Scientific Name):

Google Map data ©2018 Google Report a map error

Showing 1 to 8 of 8 entries Search:

First Previous 1 Next Last

Town	Taxonomic Group	Scientific Name	Common Name	MESA Status	Most Recent Obs
BROOKLINE	Beetle	Cicindela purpurea	Cow Path Tiger Beetle	SC	Historic
BROOKLINE	Beetle	Cicindela rufiventris hentzii	Eastern Red-bellied Tiger Beetle	T	Historic
BROOKLINE	Vascular Plant	Houstonia longifolia	Long-leaved Bluet	E	1897
BROOKLINE	Vascular Plant	Linum medium var. texanum	Rigid Flax	T	1903
BROOKLINE	Vascular Plant	Lipocarpha micrantha	Dwarf Bulrush	T	1902
BROOKLINE	Vascular Plant	Platanthera flava var. herbiola	Pale Green Orchis	T	1912

Town	Taxonomic Group	Scientific Name	Common Name	MESA Status	Most Recent Obs
BROOKLINE	Bird	Vermivora chrysoptera	Golden-winged Warbler	E	1932
BROOKLINE	Vascular Plant	Viola brittoniana	Britton's Violet	T	1913

Show 10 ▼ entries

Show Additional Info

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.

Location

Norfolk and Suffolk counties, 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.
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.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Northern Long-eared Bat Myotis septentrionalis Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9045

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

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 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
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 — Breeds Apr 20 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Long-eared Owl asio otus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3631

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.

Ruddy Turnstone Arenaria interpres morinella — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

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

Saltmarsh Sparrow Ammodramus caudacutus — Breeds May 15 to Sep 5
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.

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

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

Whimbrel Numenius phaeopus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9483

Willet Tringa semipalmata — Breeds Apr 20 to Aug 5
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.

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.

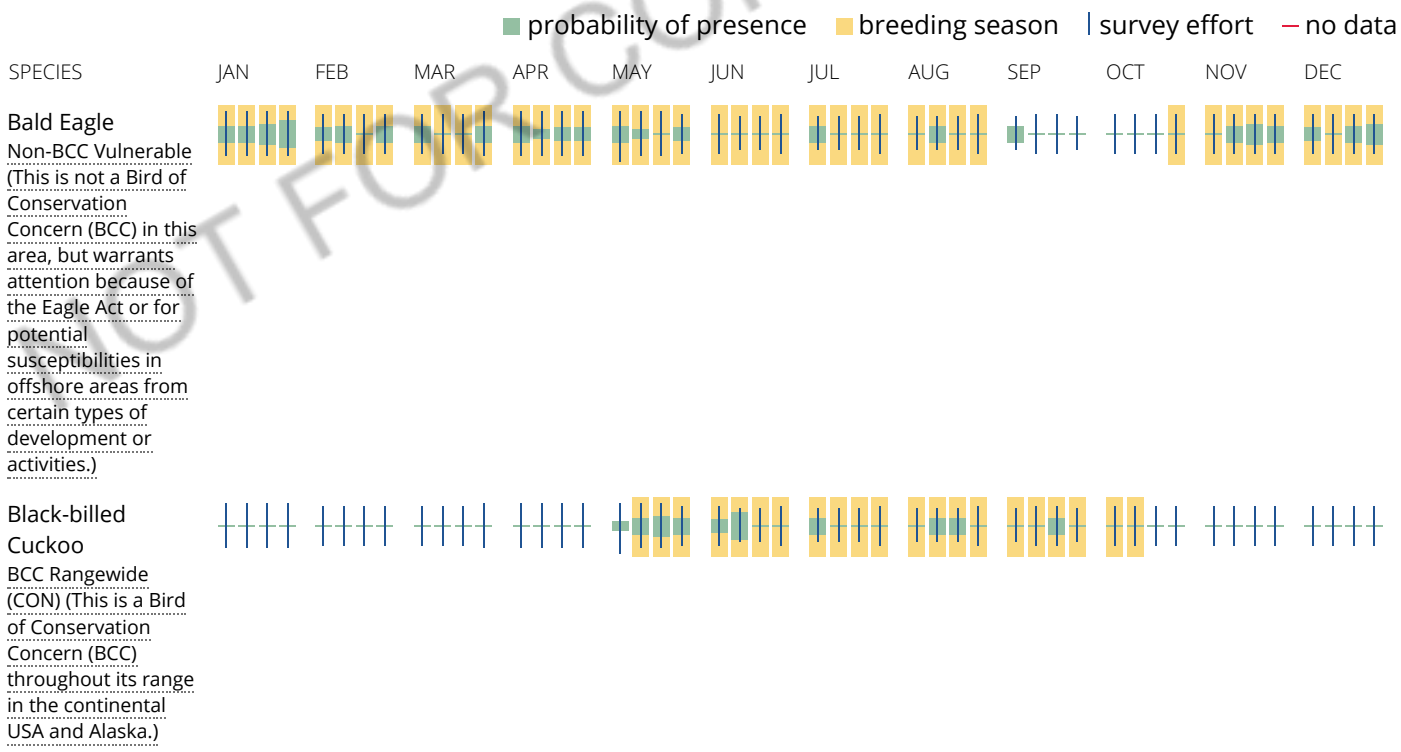
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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.

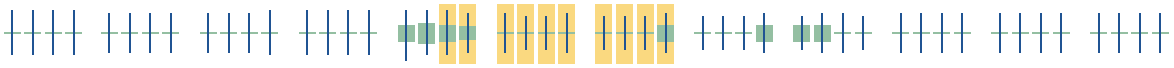
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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

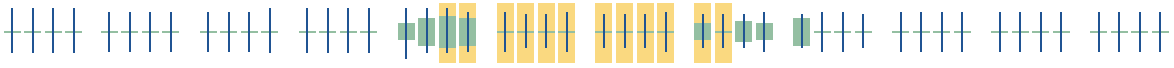
Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



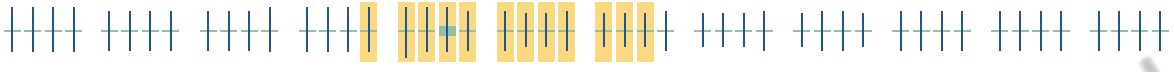
Bobolink
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Canada Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

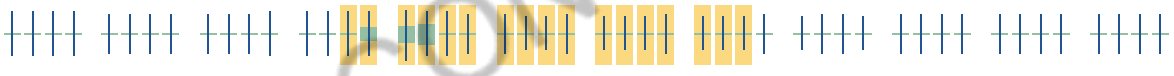


Cerulean Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Evening Grosbeak
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Kentucky Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Lesser Yellowlegs
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Long-eared Owl
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Prairie Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Prothonotary Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Red-headed Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

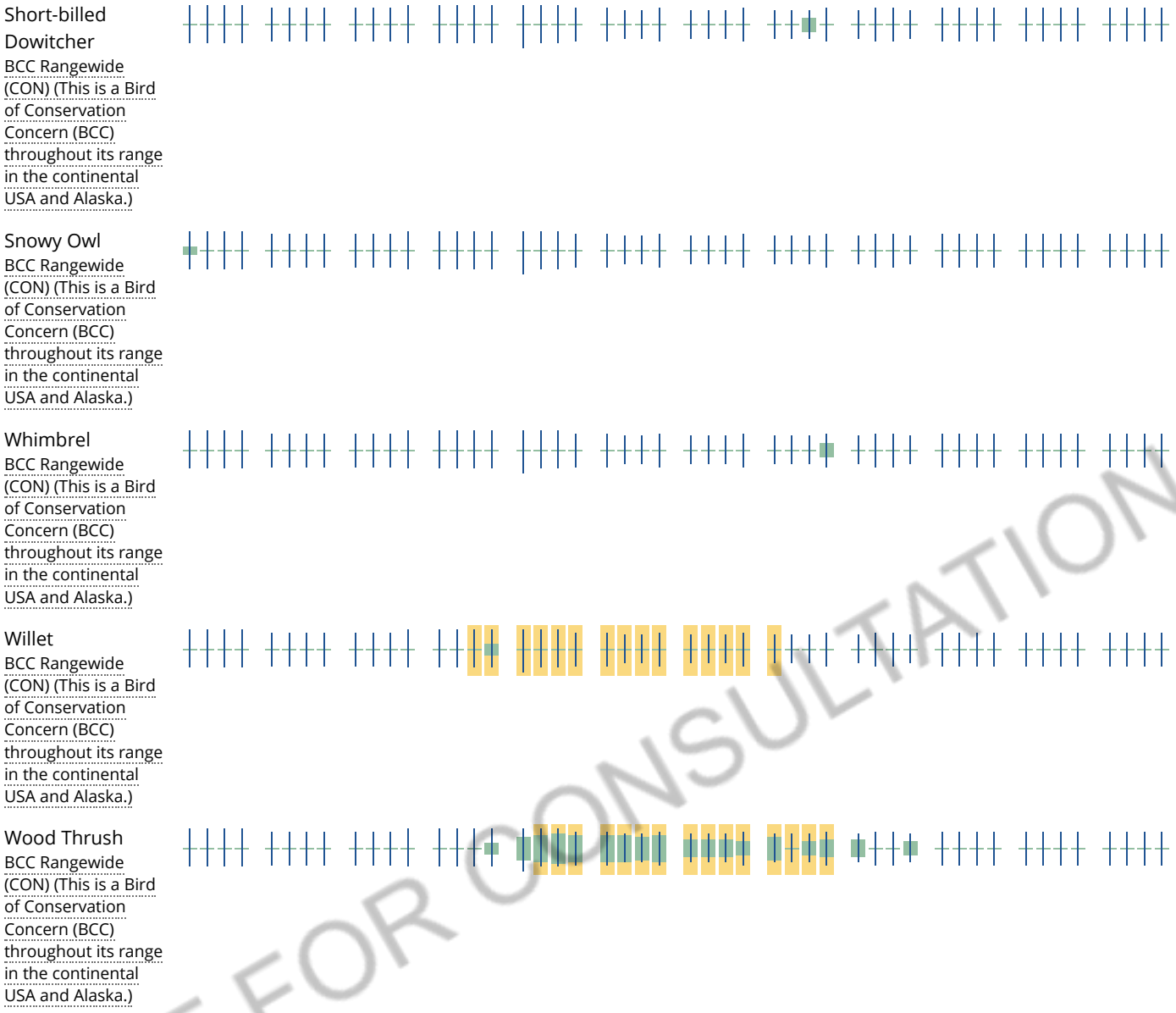
Red-throated Loon
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Ruddy Turnstone
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Rusty Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Saltmarsh Sparrow
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Semipalmated Sandpiper
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



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 and/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.

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 E-bird Explore Data 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

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.

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.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER POND

PUBHh

RIVERINE

R4SBC

R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

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.

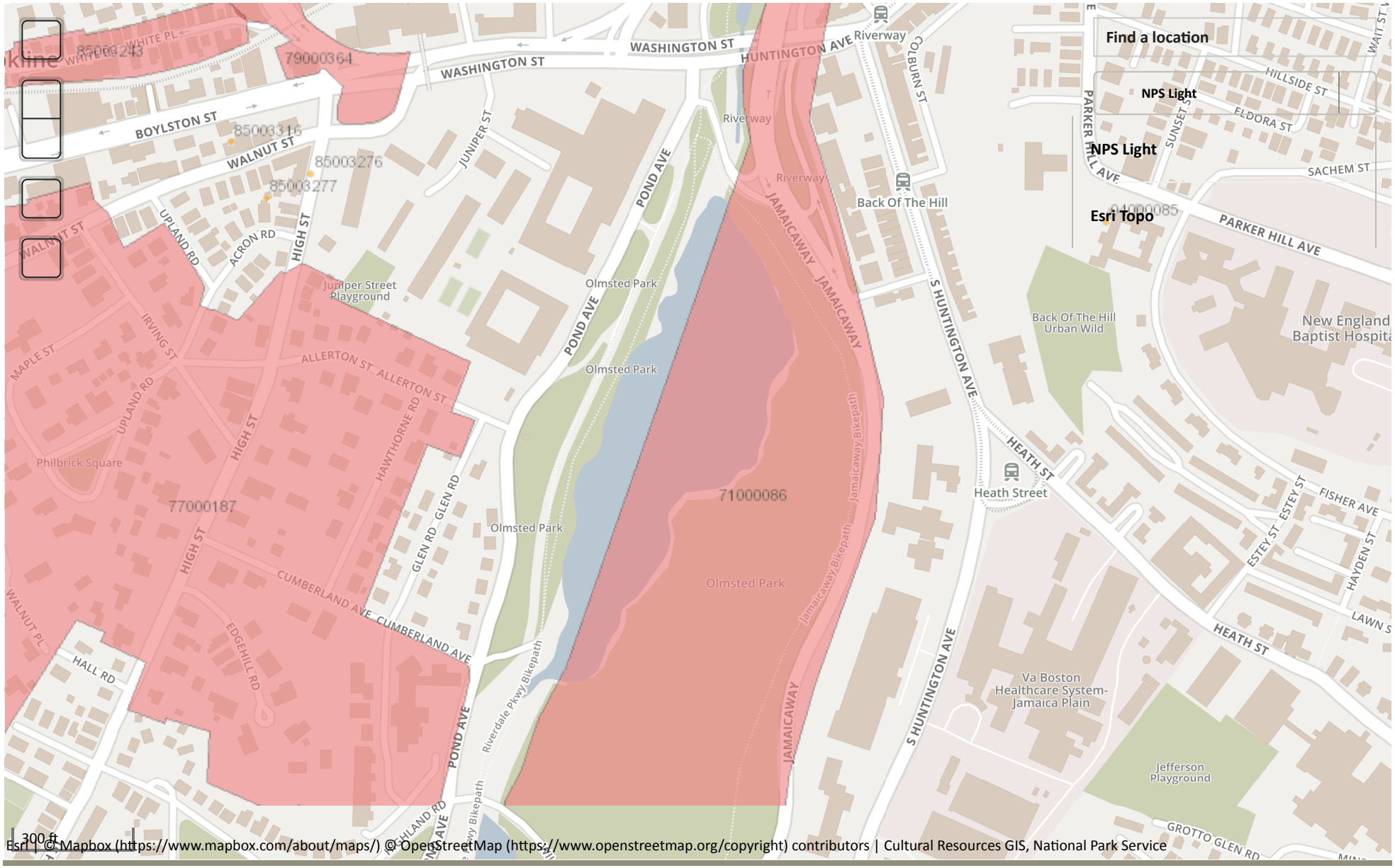
APPENDIX E

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. …



Massachusetts Cultural Resource Information System

MACRIS

MACRIS Search Results

Search Criteria: Town(s): Brookline; Street Name: Pond Ave; Resource Type(s): Area, Building, Object, Structure, Burial Ground;

Inv. No.	Property Name	Street	Town	Year
BKL.901	Leverett Pond	Huntington Ave	Brookline	1881
BKL.2244		203 Pond Ave	Brookline	1924
BKL.2245		209 Pond Ave	Brookline	1925
BKL.2246		215 Pond Ave	Brookline	1926
BKL.2247		219 Pond Ave	Brookline	1925
BKL.2248		225 Pond Ave	Brookline	1940
BKL.2249		231 Pond Ave	Brookline	1928

Massachusetts Cultural Resource Information System

Scanned Record Cover Page

Inventory No:	BKL.901
Historic Name:	Leverett Pond
Common Name:	
Address:	Huntington Ave Pond Ave
City/Town:	Brookline
Village/Neighborhood:	
Local No:	O.P. 3
Year Constructed:	1881
Architect(s):	Olmsted, Frederick Law
Architectural Style(s):	
Use(s):	Park
Significance:	Landscape Architecture; Recreation
Area(s):	BKL.X: Olmsted Park System
Designation(s):	Nat'l Register District (12/08/1971)
Building Materials(s):	

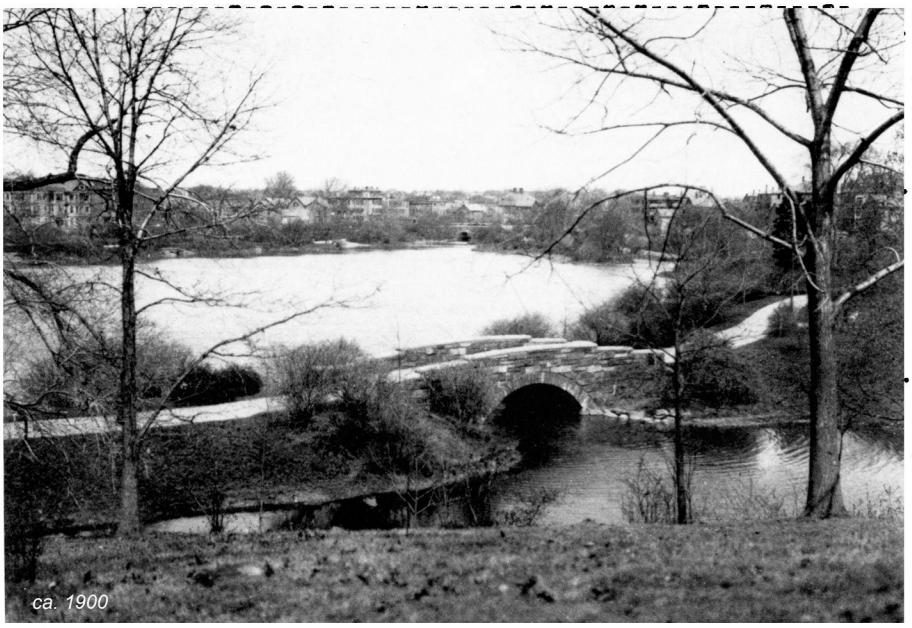
Commonwealth of Massachusetts
Massachusetts Historical Commission
220 Morrissey Boulevard, Boston, Massachusetts 02125
www.sec.state.ma.us/mhc

NRDIS 12/08/1971 [BOS.IO / BKL.X]

FORM H - PARKS AND LANDSCAPE FEATURES

Area	Form No.
O.P.	3

MASSACHUSETTS HISTORICAL COMMISSION
294 Washington Street, Boston, Ma. 02108



Town **Brookline & Boston**

Address **Pond & Huntington Ave.s,**

Name **Leverett Pond (Olmsted Park)& (Muddy River Improvement)**

Ownership:

X Public

____ Private

Present owner **Brookline, Boston & MDC**
Brookline Town Office
333 Washington St.
Brookline, MA

Type:

X Park

____ Green

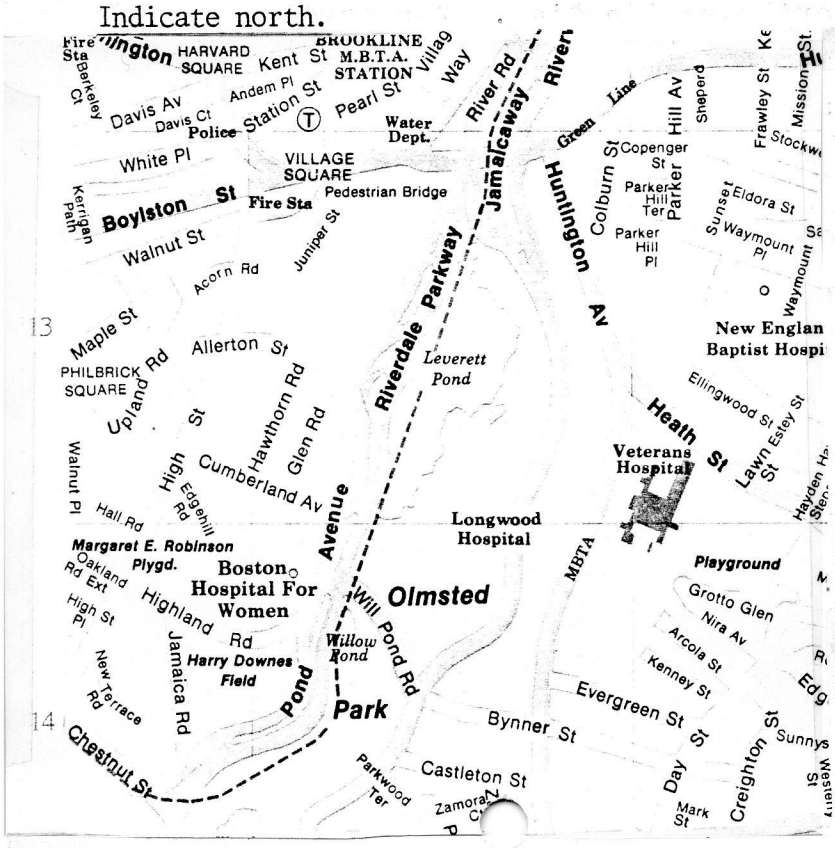
____ Training Field

____ Boulevard or Parkway

____ Other

SKETCH MAP

Draw map showing property's location in relationship to nearest cross streets and other buildings or geographical features. Indicate north.



4. Description:

Date **1881**

Size (approx. acreage) **12.8 acres**

Architect (if known) **F.L. Olmsted**

Location of Plans (if known) **Job # 964,927 & 930/FLONHS -99Warren St., Brookline**

Setting **primarily residential/urban**

Current Condition **improving/$100,000 in revitalization funds/fair-good**

Recorded by **Becca Palder**

Organization **MAOP**

Date **Aug. 1983**

VISUAL ASSESSMENT Describe topography and layout. Note components such as structures (bandstands, gazebos, sheds) monuments & fountains; landscaping features (formal plantings, bodies of water).

NATURAL FEATURES: Compare current appearance with original, if possible.

The pond is 1500ft. x 500ft. & has a half-mile shoreline. The major inlet to Leverett Pond originates from Jamaica Pond, a kettle pond fed by a natural spring. From Jamaica Pond the brook is culverted from Ward Pond to Willow Pond & emerges into Leverett Pond. The water flows into Muddy River at the (N) end of the pond, into the Back Bay Fens, & finally into the Charles River basin. Leverett Pond is therefore an important link in the continuing function of the river-floodplain & wetland ystem of the Boston-Brookline area.

ARCH. ELEMENTS:

The Cumberland Avenue Bridge (1893) & the Leverett Pond footbridge (1894) designed by Shepley, Rutan & Coolidge, from designs furnished by the Olmsted office. To the (SE) on the Boston side, are two baseball diamonds & an MDC skating rink.

HISTORICAL SIGNIFICANCE Discuss types of use, major period of use, evaluate importance within town.

Leverett Pond is a major component of Frederick Law Olmsted's plan for the Boston Park System. It is thus a vital link in the chain of open spaces & waterways planned by Olmsted as a cohesive work of art. It is characteristic of Olmsted's naturalistic approach to park design.

The pond occupies a significant link in the Muddy River wetland system & the Charles River watershed.

Leverett Pond serves as a significant focal point for Brookline meetings & gatherings. The pond & surrounding parklands now called Leverett Park are situated in a densely populated district called Brookline Village. Olmsted Park (renamed in 1900) includes Jamaica Pond, Leverette Pond, Ward's Pond, & Willow Pond.

Landuse adjacent to the park is primarily residential. The northwest border of Leverette Pond is residential. At the (N) end of Pond Avenue is Brook House, an apartment complex. Until recently, the Parkway Division of the Lying-In Hospital, to the (W), provided an institutional land use. The grounds of this bldg. were designed by Frederick Law Olmsted in 1892. It has been proposed for condominium development.

Leverett Pond is primarily used for picnicking, sunbathing, & wildlife observation.

Olmsted's original design for Leverette Pond is still essentially intact, although the condition of the park has deteriorated. Many trees & shrubs planted by Olmsted on the Brookline side have inevitably been lost, although a few majestic maples, beeches & oaks survive. The oak forest on the Boston side contains much of the original planting. Invasive plants such as bittersweet & brambles have taken over, preventing fruiting & choking out other plants.

The pond is polluted & needs to be dredged. Since the pond is at the foot of the drumlin, the runoff from the streets is significant. The pond banks are eroded & the turf is torn up by parked cars. An intrinsic part of Olmsted's design was to divert attention away from the park's boundries. Today's traffic on the parkway has the opposite effect. A recent restoration study has been made by Radcliffe Seminars Landscape Design Program.

Massachusetts Cultural Resource Information System

MACRIS

MACRIS Search Results

Search Criteria: Town(s): Boston; Street Name: Jamaicaway; Resource Type(s): Area, Building, Object, Burial Ground, Structure;

Inv. No.	Property Name	Street	Town	Year
BOS.9300	Jamaicaway Bridge over Huntington Avenue	Jamaicaway	Boston	1936
BOS.9310	Olmsted Park - Retaining Walls along Jamaicaway	Jamaicaway	Boston	1894
BOS.9338	Jamaica Pond	Jamaicaway	Boston	r 1780
BOS.9339	Jamaica Pond Pavilon	Jamaicaway	Boston	c 1910
BOS.10020	Perkins, Edward Newton House	Jamaicaway	Boston	1870
BOS.10021	Jamaica Pond Boathouse	Jamaicaway	Boston	1913
BOS.10022	Curley, James Michael House	350 Jamaicaway	Boston	1915
BOS.9308	Ward's Pond Stone Steps	Ward's Pond	Boston	1894

Massachusetts Cultural Resource Information System
MACRIS

MHC Home | MACRIS Home

For more information about this page and how to use it, click here.

Inventory No:	BOS.IO NR
Historic Name:	Olmsted Park System
Common Name:	Emerald Necklace around Boston
Address:	
City/Town:	Boston
Village/Neighborhood:	Back Bay West; Dorchester; Fenway - Kenmore; Jamaica Plain; Parker Hill - Mission Hill; Roxbury
Local No:	
Year Constructed:	
Architect(s):	Olmsted, Frederick Law
Architectural Style(s):	
Use(s):	Other Recreational; Park
Significance:	Community Planning; Landscape Architecture; Recreation
Area(s):	
Designation(s):	Nat'l Register District (12/08/1971)
Building Material(s):	

New Search Previous

MHC Home | MACRIS Home

Massachusetts Cultural Resource Information System
MACRIS

MHC Home | MACRIS Home

For more information about this page and how to use it, click here.

Inventory No: BOS.9310
Historic Name: Olmsted Park - Retaining Walls along Jamaicaway
Common Name:
Address: Jamaicaway
City/Town: Boston
Village/Neighborhood: Parker Hill - Mission Hill; Top and Back of the Hill; Centre - Heath Streets
Local No: IO;JE
Year Constructed: 1894
Architect(s): Olmsted
Architectural Style(s):
Use(s): Other Engineering; Other Road Related
Significance: Engineering; Landscape Architecture; Transportation
Area(s): NR BOS.IO: Olmsted Park System
BOS.JE: Emerald Necklace Parks
Designation(s): Nat'l Register District (12/08/1971); Local Landmark (12/18/1989)
Building Material(s):

New Search Previous

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Inventory No:	BOS.JE
Historic Name:	Emerald Necklace Parks
Common Name:	
Address:	
City/Town:	Boston
Village/Neighborhood:	Fenway - Longwood; Jamaica Plain; Parker Hill - Mission Hill; Fenway
Local No:	
Year Constructed:	
Architect(s):	Olmsted, Frederick Law
Architectural Style(s):	
Use(s):	Other Recreational; Other Transportation; Park
Significance:	Architecture; Community Planning; Conservation; Engineering; Landscape Architecture; Recreation; Social History; Transportation
Area(s):	
Designation(s):	Nat'l Register District (12/08/1971); Local Landmark (12/18/1989)
Building Material(s):	

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APPENDIX F

Laboratory Data Reports

ANALYTICAL REPORT

Lab Number:	L1812596
Client:	Haley & Aldrich, Inc. 465 Medford Street, Suite 2200 Charlestown, MA 02129-1400
ATTN:	Cole Worthy
Phone:	(617) 886-7341
Project Name:	BOSTON COLLEGE CENTRAL HEAT
Project Number:	128271-018
Report Date:	04/23/18

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1812596
Report Date: 04/23/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1812596-01	HA-B1(OW)_04112018	WATER	CHESTNUT HILL, MA	04/11/18 13:35	04/11/18

Project Name:	BOSTON COLLEGE CENTRAL HEAT	**Lab Number:**	L1812596
Project Number:	128271-018	**Report Date:**	04/23/18

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. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated 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.

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 table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

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 Client Service Representative 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 Client Services at 800-624-9220 with any questions.

Project Name:	BOSTON COLLEGE CENTRAL HEAT	**Lab Number:**	L1812596
Project Number:	128271-018	**Report Date:**	04/23/18

Case Narrative (continued)

Report Submission

April 23, 2018: This final report includes the results of all requested analyses. In addition, the sample location has been corrected.

April 18, 2018: This is a preliminary report.

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.

Microextractables

The WG1105886-3 MS recovery, performed on L1812596-01 (HA-B1(OW)_04112018), is outside the acceptance criteria for 1,2-dibromoethane (76%).

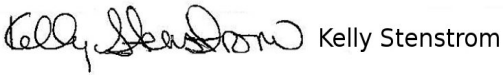
Semivolatile Organics

The WG1106018-2/-3 LCS/LCSD recoveries, associated with L1812596-01 (HA-B1(OW)_04112018), are below the acceptance criteria for benzidine (3%/5%) and pyridine (LCS 9%); however, they have been identified as "difficult" analytes. The results of the associated samples are reported.

Total Metals

The WG1105795-4 Laboratory Duplicate RPD for iron (28%), performed on L1812596-01 (HA-B1(OW)_04112018), is outside the acceptance criteria. The elevated RPD has been attributed to the non-homogeneous nature of the native sample.

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: 04/23/18

ORGANICS

VOLATILES

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01
Client ID: HA-B1(OW)_04112018
Sample Location: CHESTNUT HILL, MA

Date Collected: 04/11/18 13:35
Date Received: 04/11/18
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8260C
Analytical Date: 04/16/18 08:07
Analyst: MM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/l	3.0	--	1
1,1-Dichloroethane	ND		ug/l	0.75	--	1
Chloroform	ND		ug/l	0.75	--	1
Carbon tetrachloride	ND		ug/l	0.50	--	1
1,2-Dichloropropane	ND		ug/l	1.8	--	1
Dibromochloromethane	ND		ug/l	0.50	--	1
1,1,2-Trichloroethane	ND		ug/l	0.75	--	1
Tetrachloroethene	ND		ug/l	0.50	--	1
Chlorobenzene	ND		ug/l	0.50	--	1
Trichlorofluoromethane	ND		ug/l	2.5	--	1
1,2-Dichloroethane	ND		ug/l	0.50	--	1
1,1,1-Trichloroethane	ND		ug/l	0.50	--	1
Bromodichloromethane	ND		ug/l	0.50	--	1
trans-1,3-Dichloropropene	ND		ug/l	0.50	--	1
cis-1,3-Dichloropropene	ND		ug/l	0.50	--	1
1,3-Dichloropropene, Total	ND		ug/l	0.50	--	1
1,1-Dichloropropene	ND		ug/l	2.5	--	1
Bromoform	ND		ug/l	2.0	--	1
1,1,2,2-Tetrachloroethane	ND		ug/l	0.50	--	1
Benzene	ND		ug/l	0.50	--	1
Toluene	ND		ug/l	0.75	--	1
Ethylbenzene	ND		ug/l	0.50	--	1
Chloromethane	ND		ug/l	2.5	--	1
Bromomethane	ND		ug/l	1.0	--	1
Vinyl chloride	ND		ug/l	1.0	--	1
Chloroethane	ND		ug/l	1.0	--	1
1,1-Dichloroethene	ND		ug/l	0.50	--	1
trans-1,2-Dichloroethene	ND		ug/l	0.75	--	1

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01 Date Collected: 04/11/18 13:35

Client ID: HA-B1(OW)_04112018 Date Received: 04/11/18

Sample Location: CHESTNUT HILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
1,2-Dichloroethene, Total	ND		ug/l	0.50	--	1
Trichloroethene	ND		ug/l	0.50	--	1
1,2-Dichlorobenzene	ND		ug/l	2.5	--	1
1,3-Dichlorobenzene	ND		ug/l	2.5	--	1
1,4-Dichlorobenzene	ND		ug/l	2.5	--	1
Methyl tert butyl ether	ND		ug/l	1.0	--	1
p/m-Xylene	ND		ug/l	1.0	--	1
o-Xylene	ND		ug/l	1.0	--	1
Xylenes, Total	ND		ug/l	1.0	--	1
cis-1,2-Dichloroethene	ND		ug/l	0.50	--	1
Dibromomethane	ND		ug/l	5.0	--	1
1,4-Dichlorobutane	ND		ug/l	5.0	--	1
1,2,3-Trichloropropane	ND		ug/l	5.0	--	1
Styrene	ND		ug/l	1.0	--	1
Dichlorodifluoromethane	ND		ug/l	5.0	--	1
Acetone	ND		ug/l	5.0	--	1
Carbon disulfide	ND		ug/l	5.0	--	1
2-Butanone	ND		ug/l	5.0	--	1
Vinyl acetate	ND		ug/l	5.0	--	1
4-Methyl-2-pentanone	ND		ug/l	5.0	--	1
2-Hexanone	ND		ug/l	5.0	--	1
Ethyl methacrylate	ND		ug/l	5.0	--	1
Acrylonitrile	ND		ug/l	5.0	--	1
Bromochloromethane	ND		ug/l	2.5	--	1
Tetrahydrofuran	ND		ug/l	5.0	--	1
2,2-Dichloropropane	ND		ug/l	2.5	--	1
1,2-Dibromoethane	ND		ug/l	2.0	--	1
1,3-Dichloropropane	ND		ug/l	2.5	--	1
1,1,1,2-Tetrachloroethane	ND		ug/l	0.50	--	1
Bromobenzene	ND		ug/l	2.5	--	1
n-Butylbenzene	ND		ug/l	0.50	--	1
sec-Butylbenzene	ND		ug/l	0.50	--	1
tert-Butylbenzene	ND		ug/l	2.5	--	1
o-Chlorotoluene	ND		ug/l	2.5	--	1
p-Chlorotoluene	ND		ug/l	2.5	--	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.5	--	1
Hexachlorobutadiene	ND		ug/l	0.50	--	1

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01 Date Collected: 04/11/18 13:35

Client ID: HA-B1(OW)_04112018 Date Received: 04/11/18

Sample Location: CHESTNUT HILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Isopropylbenzene	ND		ug/l	0.50	--	1
p-Isopropyltoluene	ND		ug/l	0.50	--	1
Naphthalene	ND		ug/l	2.5	--	1
n-Propylbenzene	ND		ug/l	0.50	--	1
1,2,3-Trichlorobenzene	ND		ug/l	2.5	--	1
1,2,4-Trichlorobenzene	ND		ug/l	2.5	--	1
1,3,5-Trimethylbenzene	ND		ug/l	2.5	--	1
1,2,4-Trimethylbenzene	ND		ug/l	2.5	--	1
trans-1,4-Dichloro-2-butene	ND		ug/l	2.5	--	1
Ethyl ether	ND		ug/l	2.5	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	105		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	102		70-130
Dibromofluoromethane	103		70-130

Project Name: BOSTON COLLEGE CENTRAL HEAT
Lab Number: L1812596
Project Number: 128271-018
Report Date: 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01
Client ID: HA-B1(OW)_04112018
Sample Location: CHESTNUT HILL, MA

Date Collected: 04/11/18 13:35
Date Received: 04/11/18
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8260C-SIM(M)
Analytical Date: 04/16/18 08:07
Analyst: MM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS-SIM - Westborough Lab						
1,4-Dioxane	ND		ug/l	3.0	--	1

Project Name: BOSTON COLLEGE CENTRAL HEAT
Lab Number: L1812596
Project Number: 128271-018
Report Date: 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01
Client ID: HA-B1(OW)_04112018
Sample Location: CHESTNUT HILL, MA

Date Collected: 04/11/18 13:35
Date Received: 04/11/18
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 14,504.1
Analytical Date: 04/12/18 12:47
Analyst: AWS

Extraction Method: EPA 504.1
Extraction Date: 04/12/18 11:13

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Column
Microextractables by GC - Westborough Lab							
1,2-Dibromoethane	ND		ug/l	0.010	--	1	A
1,2-Dibromo-3-chloropropane	ND		ug/l	0.010	--	1	A

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 14,504.1
Analytical Date: 04/12/18 12:14
Analyst: AWS

Extraction Method: EPA 504.1
Extraction Date: 04/12/18 11:13

Parameter	Result	Qualifier	Units	RL	MDL	
Microextractables by GC - Westborough Lab for sample(s): 01 Batch: WG1105886-1						
1,2-Dibromoethane	ND		ug/l	0.010	--	A
1,2-Dibromo-3-chloropropane	ND		ug/l	0.010	--	A

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C-SIM(M)
Analytical Date: 04/16/18 06:03
Analyst: MM

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS-SIM - Westborough Lab for sample(s): 01 Batch: WG1106782-5					
1,4-Dioxane	ND		ug/l	3.0	--

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 04/16/18 06:03
Analyst: MM

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1106788-5					
Methylene chloride	ND		ug/l	3.0	--
1,1-Dichloroethane	ND		ug/l	0.75	--
Chloroform	ND		ug/l	0.75	--
Carbon tetrachloride	ND		ug/l	0.50	--
1,2-Dichloropropane	ND		ug/l	1.8	--
Dibromochloromethane	ND		ug/l	0.50	--
1,1,2-Trichloroethane	ND		ug/l	0.75	--
2-Chloroethylvinyl ether	ND		ug/l	10	--
Tetrachloroethene	ND		ug/l	0.50	--
Chlorobenzene	ND		ug/l	0.50	--
Trichlorofluoromethane	ND		ug/l	2.5	--
1,2-Dichloroethane	ND		ug/l	0.50	--
1,1,1-Trichloroethane	ND		ug/l	0.50	--
Bromodichloromethane	ND		ug/l	0.50	--
trans-1,3-Dichloropropene	ND		ug/l	0.50	--
cis-1,3-Dichloropropene	ND		ug/l	0.50	--
1,3-Dichloropropene, Total	ND		ug/l	0.50	--
1,1-Dichloropropene	ND		ug/l	2.5	--
Bromoform	ND		ug/l	2.0	--
1,1,2,2-Tetrachloroethane	ND		ug/l	0.50	--
Benzene	ND		ug/l	0.50	--
Toluene	ND		ug/l	0.75	--
Ethylbenzene	ND		ug/l	0.50	--
Chloromethane	ND		ug/l	2.5	--
Bromomethane	ND		ug/l	1.0	--
Vinyl chloride	ND		ug/l	1.0	--
Chloroethane	ND		ug/l	1.0	--
1,1-Dichloroethene	ND		ug/l	0.50	--
trans-1,2-Dichloroethene	ND		ug/l	0.75	--

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 04/16/18 06:03
Analyst: MM

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1106788-5					
1,2-Dichloroethene, Total	ND		ug/l	0.50	--
Trichloroethene	ND		ug/l	0.50	--
1,2-Dichlorobenzene	ND		ug/l	2.5	--
1,3-Dichlorobenzene	ND		ug/l	2.5	--
1,4-Dichlorobenzene	ND		ug/l	2.5	--
Methyl tert butyl ether	ND		ug/l	1.0	--
p/m-Xylene	ND		ug/l	1.0	--
o-Xylene	ND		ug/l	1.0	--
Xylenes, Total	ND		ug/l	1.0	--
cis-1,2-Dichloroethene	ND		ug/l	0.50	--
Dibromomethane	ND		ug/l	5.0	--
1,4-Dichlorobutane	ND		ug/l	5.0	--
Iodomethane	ND		ug/l	5.0	--
1,2,3-Trichloropropane	ND		ug/l	5.0	--
Styrene	ND		ug/l	1.0	--
Dichlorodifluoromethane	ND		ug/l	5.0	--
Acetone	ND		ug/l	5.0	--
Carbon disulfide	ND		ug/l	5.0	--
2-Butanone	ND		ug/l	5.0	--
Vinyl acetate	ND		ug/l	5.0	--
4-Methyl-2-pentanone	ND		ug/l	5.0	--
2-Hexanone	ND		ug/l	5.0	--
Ethyl methacrylate	ND		ug/l	5.0	--
Acrylonitrile	ND		ug/l	5.0	--
Bromochloromethane	ND		ug/l	2.5	--
Tetrahydrofuran	ND		ug/l	5.0	--
2,2-Dichloropropane	ND		ug/l	2.5	--
1,2-Dibromoethane	ND		ug/l	2.0	--
1,3-Dichloropropane	ND		ug/l	2.5	--

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 04/16/18 06:03
Analyst: MM

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1106788-5					
1,1,1,2-Tetrachloroethane	ND		ug/l	0.50	--
Bromobenzene	ND		ug/l	2.5	--
n-Butylbenzene	ND		ug/l	0.50	--
sec-Butylbenzene	ND		ug/l	0.50	--
tert-Butylbenzene	ND		ug/l	2.5	--
o-Chlorotoluene	ND		ug/l	2.5	--
p-Chlorotoluene	ND		ug/l	2.5	--
1,2-Dibromo-3-chloropropane	ND		ug/l	2.5	--
Hexachlorobutadiene	ND		ug/l	0.50	--
Isopropylbenzene	ND		ug/l	0.50	--
p-Isopropyltoluene	ND		ug/l	0.50	--
Naphthalene	ND		ug/l	2.5	--
n-Propylbenzene	ND		ug/l	0.50	--
1,2,3-Trichlorobenzene	ND		ug/l	2.5	--
1,2,4-Trichlorobenzene	ND		ug/l	2.5	--
1,3,5-Trimethylbenzene	ND		ug/l	2.5	--
1,3,5-Trichlorobenzene	ND		ug/l	2.0	--
1,2,4-Trimethylbenzene	ND		ug/l	2.5	--
trans-1,4-Dichloro-2-butene	ND		ug/l	2.5	--
Halothane	ND		ug/l	2.5	--
Ethyl ether	ND		ug/l	2.5	--
Methyl Acetate	ND		ug/l	10	--
Ethyl Acetate	ND		ug/l	10	--
Isopropyl Ether	ND		ug/l	2.0	--
Cyclohexane	ND		ug/l	10	--
Tert-Butyl Alcohol	ND		ug/l	10	--
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	--
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	--
1,4-Dioxane	ND		ug/l	250	--

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 04/16/18 06:03
Analyst: MM

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1106788-5					
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND		ug/l	10	--
Methyl cyclohexane	ND		ug/l	10	--
p-Diethylbenzene	ND		ug/l	2.0	--
4-Ethyltoluene	ND		ug/l	2.0	--
1,2,4,5-Tetramethylbenzene	ND		ug/l	2.0	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	104		70-130
Dibromofluoromethane	100		70-130

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits	Column
Microextractables by GC - Westborough Lab Associated sample(s): 01 Batch: WG1105886-2									
1,2-Dibromoethane	109		-		80-120	-			A
1,2-Dibromo-3-chloropropane	102		-		80-120	-			A

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

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 Batch: WG1106782-3 WG1106782-4								
1,4-Dioxane	93		93		70-130	0		25

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106788-3 WG1106788-4								
Methylene chloride	98		97		70-130	1		20
1,1-Dichloroethane	100		100		70-130	0		20
Chloroform	100		100		70-130	0		20
Carbon tetrachloride	100		100		63-132	0		20
1,2-Dichloropropane	99		97		70-130	2		20
Dibromochloromethane	97		94		63-130	3		20
1,1,2-Trichloroethane	98		96		70-130	2		20
2-Chloroethylvinyl ether	98		98		70-130	0		20
Tetrachloroethene	99		97		70-130	2		20
Chlorobenzene	98		96		75-130	2		25
Trichlorofluoromethane	100		100		62-150	0		20
1,2-Dichloroethane	98		95		70-130	3		20
1,1,1-Trichloroethane	100		100		67-130	0		20
Bromodichloromethane	100		100		67-130	0		20
trans-1,3-Dichloropropene	97		96		70-130	1		20
cis-1,3-Dichloropropene	98		97		70-130	1		20
1,1-Dichloropropene	100		100		70-130	0		20
Bromoform	92		88		54-136	4		20
1,1,2,2-Tetrachloroethane	93		92		67-130	1		20
Benzene	97		96		70-130	1		25
Toluene	100		100		70-130	0		25
Ethylbenzene	100		100		70-130	0		20
Chloromethane	110		110		64-130	0		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106788-3 WG1106788-4								
Bromomethane	110		110		39-139	0		20
Vinyl chloride	100		100		55-140	0		20
Chloroethane	110		110		55-138	0		20
1,1-Dichloroethene	87		95		61-145	9		25
trans-1,2-Dichloroethene	100		100		70-130	0		20
Trichloroethene	99		98		70-130	1		25
1,2-Dichlorobenzene	96		94		70-130	2		20
1,3-Dichlorobenzene	97		95		70-130	2		20
1,4-Dichlorobenzene	95		96		70-130	1		20
Methyl tert butyl ether	95		94		63-130	1		20
p/m-Xylene	100		100		70-130	0		20
o-Xylene	100		100		70-130	0		20
cis-1,2-Dichloroethene	100		100		70-130	0		20
Dibromomethane	100		99		70-130	1		20
1,4-Dichlorobutane	97		96		70-130	1		20
Iodomethane	89		90		70-130	1		20
1,2,3-Trichloropropane	97		93		64-130	4		20
Styrene	100		100		70-130	0		20
Dichlorodifluoromethane	100		99		36-147	1		20
Acetone	95		97		58-148	2		20
Carbon disulfide	82		99		51-130	19		20
2-Butanone	100		100		63-138	0		20
Vinyl acetate	110		110		70-130	0		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106788-3 WG1106788-4								
4-Methyl-2-pentanone	91		85		59-130	7		20
2-Hexanone	92		90		57-130	2		20
Ethyl methacrylate	97		93		70-130	4		20
Acrylonitrile	98		96		70-130	2		20
Bromochloromethane	96		100		70-130	4		20
Tetrahydrofuran	97		90		58-130	7		20
2,2-Dichloropropane	110		110		63-133	0		20
1,2-Dibromoethane	95		93		70-130	2		20
1,3-Dichloropropane	98		96		70-130	2		20
1,1,1,2-Tetrachloroethane	99		98		64-130	1		20
Bromobenzene	96		95		70-130	1		20
n-Butylbenzene	98		100		53-136	2		20
sec-Butylbenzene	100		100		70-130	0		20
tert-Butylbenzene	100		110		70-130	10		20
o-Chlorotoluene	100		100		70-130	0		20
p-Chlorotoluene	100		100		70-130	0		20
1,2-Dibromo-3-chloropropane	85		84		41-144	1		20
Hexachlorobutadiene	81		85		63-130	5		20
Isopropylbenzene	100		100		70-130	0		20
p-Isopropyltoluene	100		100		70-130	0		20
Naphthalene	88		87		70-130	1		20
n-Propylbenzene	100		100		69-130	0		20
1,2,3-Trichlorobenzene	86		87		70-130	1		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106788-3 WG1106788-4								
1,2,4-Trichlorobenzene	91		89		70-130	2		20
1,3,5-Trimethylbenzene	100		100		64-130	0		20
1,3,5-Trichlorobenzene	89		90		70-130	1		20
1,2,4-Trimethylbenzene	100		100		70-130	0		20
trans-1,4-Dichloro-2-butene	94		100		70-130	6		20
Halothane	100		100		70-130	0		20
Ethyl ether	100		100		59-134	0		20
Methyl Acetate	96		94		70-130	2		20
Ethyl Acetate	95		90		70-130	5		20
Isopropyl Ether	100		100		70-130	0		20
Cyclohexane	100		100		70-130	0		20
Tert-Butyl Alcohol	88		84		70-130	5		20
Ethyl-Tert-Butyl-Ether	97		97		70-130	0		20
Tertiary-Amyl Methyl Ether	94		93		66-130	1		20
1,4-Dioxane	96		94		56-162	2		20
1,1,2-Trichloro-1,2,2-Trifluoroethane	93		98		70-130	5		20
Methyl cyclohexane	98		100		70-130	2		20
p-Diethylbenzene	98		98		70-130	0		20
4-Ethyltoluene	100		100		70-130	0		20
1,2,4,5-Tetramethylbenzene	96		95		70-130	1		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106788-3 WG1106788-4								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	100		99		70-130
Toluene-d8	102		102		70-130
4-Bromofluorobenzene	103		101		70-130
Dibromofluoromethane	101		102		70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

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			QC Batch ID: WG1105886-3			QC Sample: L1812596-01		Client ID: HA-B1(OW)_04112018				
1,2-Dibromoethane	ND	0.249	0.190	**76**	Q	-	-		80-120	-		20	A
1,2-Dibromo-3-chloropropane	ND	0.249	0.203	82		-	-		80-120	-		20	A

SEMIVOLATILES

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01
Client ID: HA-B1(OW)_04112018
Sample Location: CHESTNUT HILL, MA

Date Collected: 04/11/18 13:35
Date Received: 04/11/18
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8270D
Analytical Date: 04/15/18 03:52
Analyst: SZ

Extraction Method: EPA 3510C
Extraction Date: 04/12/18 16:49

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Benzidine	ND		ug/l	20	--	1
1,2,4-Trichlorobenzene	ND		ug/l	5.0	--	1
Bis(2-chloroethyl)ether	ND		ug/l	2.0	--	1
1,2-Dichlorobenzene	ND		ug/l	2.0	--	1
1,3-Dichlorobenzene	ND		ug/l	2.0	--	1
1,4-Dichlorobenzene	ND		ug/l	2.0	--	1
3,3'-Dichlorobenzidine	ND		ug/l	5.0	--	1
2,4-Dinitrotoluene	ND		ug/l	5.0	--	1
2,6-Dinitrotoluene	ND		ug/l	5.0	--	1
Azobenzene	ND		ug/l	2.0	--	1
4-Chlorophenyl phenyl ether	ND		ug/l	2.0	--	1
4-Bromophenyl phenyl ether	ND		ug/l	2.0	--	1
Bis(2-chloroisopropyl)ether	ND		ug/l	2.0	--	1
Bis(2-chloroethoxy)methane	ND		ug/l	5.0	--	1
Hexachlorocyclopentadiene	ND		ug/l	20	--	1
Isophorone	ND		ug/l	5.0	--	1
Nitrobenzene	ND		ug/l	2.0	--	1
NDPA/DPA	ND		ug/l	2.0	--	1
n-Nitrosodi-n-propylamine	ND		ug/l	5.0	--	1
Bis(2-ethylhexyl)phthalate	ND		ug/l	3.0	--	1
Butyl benzyl phthalate	ND		ug/l	5.0	--	1
Di-n-butylphthalate	ND		ug/l	5.0	--	1
Di-n-octylphthalate	ND		ug/l	5.0	--	1
Diethyl phthalate	ND		ug/l	5.0	--	1
Dimethyl phthalate	ND		ug/l	5.0	--	1
Biphenyl	ND		ug/l	2.0	--	1
Aniline	ND		ug/l	2.0	--	1
4-Chloroaniline	ND		ug/l	5.0	--	1

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01 Date Collected: 04/11/18 13:35
Client ID: HA-B1(OW)_04112018 Date Received: 04/11/18
Sample Location: CHESTNUT HILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
2-Nitroaniline	ND		ug/l	5.0	--	1
3-Nitroaniline	ND		ug/l	5.0	--	1
4-Nitroaniline	ND		ug/l	5.0	--	1
Dibenzofuran	ND		ug/l	2.0	--	1
n-Nitrosodimethylamine	ND		ug/l	2.0	--	1
2,4,6-Trichlorophenol	ND		ug/l	5.0	--	1
p-Chloro-m-cresol	ND		ug/l	2.0	--	1
2-Chlorophenol	ND		ug/l	2.0	--	1
2,4-Dichlorophenol	ND		ug/l	5.0	--	1
2,4-Dimethylphenol	ND		ug/l	5.0	--	1
2-Nitrophenol	ND		ug/l	10	--	1
4-Nitrophenol	ND		ug/l	10	--	1
2,4-Dinitrophenol	ND		ug/l	20	--	1
4,6-Dinitro-o-cresol	ND		ug/l	10	--	1
Phenol	ND		ug/l	5.0	--	1
2-Methylphenol	ND		ug/l	5.0	--	1
3-Methylphenol/4-Methylphenol	ND		ug/l	5.0	--	1
2,4,5-Trichlorophenol	ND		ug/l	5.0	--	1
Benzoic Acid	ND		ug/l	50	--	1
Benzyl Alcohol	ND		ug/l	2.0	--	1
Carbazole	ND		ug/l	2.0	--	1
Pyridine	ND		ug/l	3.5	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	53		21-120
Phenol-d6	39		10-120
Nitrobenzene-d5	68		23-120
2-Fluorobiphenyl	81		15-120
2,4,6-Tribromophenol	95		10-120
4-Terphenyl-d14	100		41-149

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01
Client ID: HA-B1(OW)_04112018
Sample Location: CHESTNUT HILL, MA

Date Collected: 04/11/18 13:35
Date Received: 04/11/18
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 1,8270D-SIM
Analytical Date: 04/15/18 10:50
Analyst: KL

Extraction Method: EPA 3510C
Extraction Date: 04/12/18 16:55

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS-SIM - Westborough Lab						
Acenaphthene	ND		ug/l	0.10	--	1
2-Chloronaphthalene	ND		ug/l	0.20	--	1
Fluoranthene	ND		ug/l	0.10	--	1
Hexachlorobutadiene	ND		ug/l	0.50	--	1
Naphthalene	ND		ug/l	0.10	--	1
Benzo(a)anthracene	ND		ug/l	0.10	--	1
Benzo(a)pyrene	ND		ug/l	0.10	--	1
Benzo(b)fluoranthene	ND		ug/l	0.10	--	1
Benzo(k)fluoranthene	ND		ug/l	0.10	--	1
Chrysene	ND		ug/l	0.10	--	1
Acenaphthylene	ND		ug/l	0.10	--	1
Anthracene	ND		ug/l	0.10	--	1
Benzo(ghi)perylene	ND		ug/l	0.10	--	1
Fluorene	ND		ug/l	0.10	--	1
Phenanthrene	ND		ug/l	0.10	--	1
Dibenzo(a,h)anthracene	ND		ug/l	0.10	--	1
Indeno(1,2,3-cd)pyrene	ND		ug/l	0.10	--	1
Pyrene	ND		ug/l	0.10	--	1
1-Methylnaphthalene	ND		ug/l	0.10	--	1
2-Methylnaphthalene	ND		ug/l	0.10	--	1
Pentachlorophenol	ND		ug/l	0.80	--	1
Hexachlorobenzene	ND		ug/l	0.80	--	1
Hexachloroethane	ND		ug/l	0.80	--	1

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01 Date Collected: 04/11/18 13:35

Client ID: HA-B1(OW)_04112018 Date Received: 04/11/18

Sample Location: CHESTNUT HILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS-SIM - Westborough Lab						

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	38		21-120
Phenol-d6	31		10-120
Nitrobenzene-d5	54		23-120
2-Fluorobiphenyl	52		15-120
2,4,6-Tribromophenol	88		10-120
4-Terphenyl-d14	71		41-149

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 04/14/18 23:52
Analyst: SZ

Extraction Method: EPA 3510C
Extraction Date: 04/12/18 16:49

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1106018-1					
Acenaphthene	ND		ug/l	2.0	--
Benzidine	ND		ug/l	20	--
1,2,4-Trichlorobenzene	ND		ug/l	5.0	--
Hexachlorobenzene	ND		ug/l	2.0	--
Bis(2-chloroethyl)ether	ND		ug/l	2.0	--
2-Chloronaphthalene	ND		ug/l	2.0	--
1,2-Dichlorobenzene	ND		ug/l	2.0	--
1,3-Dichlorobenzene	ND		ug/l	2.0	--
1,4-Dichlorobenzene	ND		ug/l	2.0	--
3,3'-Dichlorobenzidine	ND		ug/l	5.0	--
2,4-Dinitrotoluene	ND		ug/l	5.0	--
2,6-Dinitrotoluene	ND		ug/l	5.0	--
Azobenzene	ND		ug/l	2.0	--
Fluoranthene	ND		ug/l	2.0	--
4-Chlorophenyl phenyl ether	ND		ug/l	2.0	--
4-Bromophenyl phenyl ether	ND		ug/l	2.0	--
Bis(2-chloroisopropyl)ether	ND		ug/l	2.0	--
Bis(2-chloroethoxy)methane	ND		ug/l	5.0	--
Hexachlorobutadiene	ND		ug/l	2.0	--
Hexachlorocyclopentadiene	ND		ug/l	20	--
Hexachloroethane	ND		ug/l	2.0	--
Isophorone	ND		ug/l	5.0	--
Naphthalene	ND		ug/l	2.0	--
Nitrobenzene	ND		ug/l	2.0	--
NDPA/DPA	ND		ug/l	2.0	--
n-Nitrosodi-n-propylamine	ND		ug/l	5.0	--
Bis(2-ethylhexyl)phthalate	ND		ug/l	3.0	--
Butyl benzyl phthalate	ND		ug/l	5.0	--
Di-n-butylphthalate	ND		ug/l	5.0	--

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 04/14/18 23:52
Analyst: SZ

Extraction Method: EPA 3510C
Extraction Date: 04/12/18 16:49

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1106018-1					
Di-n-octylphthalate	ND		ug/l	5.0	--
Diethyl phthalate	ND		ug/l	5.0	--
Dimethyl phthalate	ND		ug/l	5.0	--
Benzo(a)anthracene	ND		ug/l	2.0	--
Benzo(a)pyrene	ND		ug/l	2.0	--
Benzo(b)fluoranthene	ND		ug/l	2.0	--
Benzo(k)fluoranthene	ND		ug/l	2.0	--
Chrysene	ND		ug/l	2.0	--
Acenaphthylene	ND		ug/l	2.0	--
Anthracene	ND		ug/l	2.0	--
Benzo(ghi)perylene	ND		ug/l	2.0	--
Fluorene	ND		ug/l	2.0	--
Phenanthrene	ND		ug/l	2.0	--
Dibenzo(a,h)anthracene	ND		ug/l	2.0	--
Indeno(1,2,3-cd)pyrene	ND		ug/l	2.0	--
Pyrene	ND		ug/l	2.0	--
Biphenyl	ND		ug/l	2.0	--
Aniline	ND		ug/l	2.0	--
4-Chloroaniline	ND		ug/l	5.0	--
1-Methylnaphthalene	ND		ug/l	2.0	--
2-Nitroaniline	ND		ug/l	5.0	--
3-Nitroaniline	ND		ug/l	5.0	--
4-Nitroaniline	ND		ug/l	5.0	--
Dibenzofuran	ND		ug/l	2.0	--
2-Methylnaphthalene	ND		ug/l	2.0	--
n-Nitrosodimethylamine	ND		ug/l	2.0	--
2,4,6-Trichlorophenol	ND		ug/l	5.0	--
p-Chloro-m-cresol	ND		ug/l	2.0	--
2-Chlorophenol	ND		ug/l	2.0	--

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 04/14/18 23:52
Analyst: SZ

Extraction Method: EPA 3510C
Extraction Date: 04/12/18 16:49

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1106018-1					
2,4-Dichlorophenol	ND		ug/l	5.0	--
2,4-Dimethylphenol	ND		ug/l	5.0	--
2-Nitrophenol	ND		ug/l	10	--
4-Nitrophenol	ND		ug/l	10	--
2,4-Dinitrophenol	ND		ug/l	20	--
4,6-Dinitro-o-cresol	ND		ug/l	10	--
Pentachlorophenol	ND		ug/l	10	--
Phenol	ND		ug/l	5.0	--
2-Methylphenol	ND		ug/l	5.0	--
3-Methylphenol/4-Methylphenol	ND		ug/l	5.0	--
2,4,5-Trichlorophenol	ND		ug/l	5.0	--
Benzoic Acid	ND		ug/l	50	--
Benzyl Alcohol	ND		ug/l	2.0	--
Carbazole	ND		ug/l	2.0	--
Pyridine	ND		ug/l	3.5	--
Tentatively Identified Compounds					
No Tentatively Identified Compounds	ND		ug/l		

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 04/14/18 23:52
Analyst: SZ

Extraction Method: EPA 3510C
Extraction Date: 04/12/18 16:49

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1106018-1					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	57		21-120
Phenol-d6	39		10-120
Nitrobenzene-d5	73		23-120
2-Fluorobiphenyl	81		15-120
2,4,6-Tribromophenol	97		10-120
4-Terphenyl-d14	96		41-149

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D-SIM
Analytical Date: 04/15/18 09:04
Analyst: KL

Extraction Method: EPA 3510C
Extraction Date: 04/12/18 16:55

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS-SIM - Westborough Lab for sample(s): 01 Batch: WG1106021-1					
Acenaphthene	ND		ug/l	0.10	--
2-Chloronaphthalene	ND		ug/l	0.20	--
Fluoranthene	ND		ug/l	0.10	--
Hexachlorobutadiene	ND		ug/l	0.50	--
Naphthalene	ND		ug/l	0.10	--
Benzo(a)anthracene	ND		ug/l	0.10	--
Benzo(a)pyrene	ND		ug/l	0.10	--
Benzo(b)fluoranthene	ND		ug/l	0.10	--
Benzo(k)fluoranthene	ND		ug/l	0.10	--
Chrysene	ND		ug/l	0.10	--
Acenaphthylene	ND		ug/l	0.10	--
Anthracene	ND		ug/l	0.10	--
Benzo(ghi)perylene	ND		ug/l	0.10	--
Fluorene	ND		ug/l	0.10	--
Phenanthrene	ND		ug/l	0.10	--
Dibenzo(a,h)anthracene	ND		ug/l	0.10	--
Indeno(1,2,3-cd)pyrene	ND		ug/l	0.10	--
Pyrene	ND		ug/l	0.10	--
1-Methylnaphthalene	ND		ug/l	0.10	--
2-Methylnaphthalene	ND		ug/l	0.10	--
Pentachlorophenol	ND		ug/l	0.80	--
Hexachlorobenzene	ND		ug/l	0.80	--
Hexachloroethane	ND		ug/l	0.80	--

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D-SIM
Analytical Date: 04/15/18 09:04
Analyst: KL

Extraction Method: EPA 3510C
Extraction Date: 04/12/18 16:55

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS-SIM - Westborough Lab for sample(s): 01 Batch: WG1106021-1					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	38		21-120
Phenol-d6	29		10-120
Nitrobenzene-d5	55		23-120
2-Fluorobiphenyl	51		15-120
2,4,6-Tribromophenol	84		10-120
4-Terphenyl-d14	66		41-149

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106018-2 WG1106018-3								
Acenaphthene	95		98		37-111	3		30
Benzidine	**3**	Q	**5**	Q	10-75	**68**	Q	30
1,2,4-Trichlorobenzene	84		82		39-98	2		30
Hexachlorobenzene	103		105		40-140	2		30
Bis(2-chloroethyl)ether	81		80		40-140	1		30
2-Chloronaphthalene	98		100		40-140	2		30
1,2-Dichlorobenzene	78		75		40-140	4		30
1,3-Dichlorobenzene	76		69		40-140	10		30
1,4-Dichlorobenzene	75		68		36-97	10		30
3,3'-Dichlorobenzidine	75		81		40-140	8		30
2,4-Dinitrotoluene	110		111		48-143	1		30
2,6-Dinitrotoluene	107		108		40-140	1		30
Azobenzene	109		109		40-140	0		30
Fluoranthene	103		108		40-140	5		30
4-Chlorophenyl phenyl ether	99		103		40-140	4		30
4-Bromophenyl phenyl ether	103		105		40-140	2		30
Bis(2-chloroisopropyl)ether	65		68		40-140	5		30
Bis(2-chloroethoxy)methane	90		90		40-140	0		30
Hexachlorobutadiene	88		83		40-140	6		30
Hexachlorocyclopentadiene	70		69		40-140	1		30
Hexachloroethane	81		70		40-140	15		30
Isophorone	94		96		40-140	2		30
Naphthalene	88		89		40-140	1		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106018-2 WG1106018-3								
Nitrobenzene	92		96		40-140	4		30
NDPA/DPA	104		106		40-140	2		30
n-Nitrosodi-n-propylamine	92		95		29-132	3		30
Bis(2-ethylhexyl)phthalate	127		133		40-140	5		30
Butyl benzyl phthalate	112		117		40-140	4		30
Di-n-butylphthalate	115		120		40-140	4		30
Di-n-octylphthalate	124		134		40-140	8		30
Diethyl phthalate	110		114		40-140	4		30
Dimethyl phthalate	107		110		40-140	3		30
Benzo(a)anthracene	102		109		40-140	7		30
Benzo(a)pyrene	102		112		40-140	9		30
Benzo(b)fluoranthene	103		108		40-140	5		30
Benzo(k)fluoranthene	104		113		40-140	8		30
Chrysene	104		110		40-140	6		30
Acenaphthylene	106		106		45-123	0		30
Anthracene	102		107		40-140	5		30
Benzo(ghi)perylene	100		107		40-140	7		30
Fluorene	103		104		40-140	1		30
Phenanthrene	101		108		40-140	7		30
Dibenzo(a,h)anthracene	101		108		40-140	7		30
Indeno(1,2,3-cd)pyrene	101		110		40-140	9		30
Pyrene	103		107		26-127	4		30
Biphenyl	106		108		40-140	2		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106018-2 WG1106018-3								
Aniline	**22**	Q	**31**	Q	40-140	**34**	Q	30
4-Chloroaniline	59		75		40-140	24		30
1-Methylnaphthalene	102		102		41-103	0		30
2-Nitroaniline	108		111		52-143	3		30
3-Nitroaniline	71		76		25-145	7		30
4-Nitroaniline	100		101		51-143	1		30
Dibenzofuran	101		104		40-140	3		30
2-Methylnaphthalene	97		97		40-140	0		30
n-Nitrosodimethylamine	48		45		22-74	6		30
2,4,6-Trichlorophenol	105		110		30-130	5		30
p-Chloro-m-cresol	**108**	Q	**110**	Q	23-97	2		30
2-Chlorophenol	84		89		27-123	6		30
2,4-Dichlorophenol	103		107		30-130	4		30
2,4-Dimethylphenol	94		99		30-130	5		30
2-Nitrophenol	89		98		30-130	10		30
4-Nitrophenol	67		66		10-80	2		30
2,4-Dinitrophenol	91		96		20-130	5		30
4,6-Dinitro-o-cresol	114		115		20-164	1		30
Pentachlorophenol	90		88		9-103	2		30
Phenol	44		48		12-110	9		30
2-Methylphenol	78		83		30-130	6		30
3-Methylphenol/4-Methylphenol	80		86		30-130	7		30
2,4,5-Trichlorophenol	106		109		30-130	3		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1106018-2 WG1106018-3								
Benzoic Acid	26		42		10-164	**47**	Q	30
Benzyl Alcohol	79		86		26-116	8		30
Carbazole	104		110		55-144	6		30
Pyridine	**9**	Q	10		10-66	7		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Fluorophenol	55		59		21-120
Phenol-d6	43		46		10-120
Nitrobenzene-d5	75		83		23-120
2-Fluorobiphenyl	86		88		15-120
2,4,6-Tribromophenol	94		98		10-120
4-Terphenyl-d14	86		95		41-149

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

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 Batch: WG1106021-2 WG1106021-3								
Acenaphthene	64		64		40-140	0		40
2-Chloronaphthalene	55		56		40-140	2		40
Fluoranthene	70		66		40-140	6		40
Hexachlorobutadiene	50		49		40-140	2		40
Naphthalene	54		54		40-140	0		40
Benzo(a)anthracene	66		68		40-140	3		40
Benzo(a)pyrene	68		69		40-140	1		40
Benzo(b)fluoranthene	67		68		40-140	1		40
Benzo(k)fluoranthene	70		71		40-140	1		40
Chrysene	67		69		40-140	3		40
Acenaphthylene	60		62		40-140	3		40
Anthracene	65		66		40-140	2		40
Benzo(ghi)perylene	68		70		40-140	3		40
Fluorene	68		69		40-140	1		40
Phenanthrene	62		63		40-140	2		40
Dibenzo(a,h)anthracene	73		75		40-140	3		40
Indeno(1,2,3-cd)pyrene	72		73		40-140	1		40
Pyrene	64		66		40-140	3		40
1-Methylnaphthalene	55		55		40-140	0		40
2-Methylnaphthalene	55		55		40-140	0		40
Pentachlorophenol	74		76		40-140	3		40
Hexachlorobenzene	64		64		40-140	0		40
Hexachloroethane	50		49		40-140	2		40

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

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 Batch: WG1106021-2 WG1106021-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Fluorophenol	41		41		21-120
Phenol-d6	31		32		10-120
Nitrobenzene-d5	55		55		23-120
2-Fluorobiphenyl	50		49		15-120
2,4,6-Tribromophenol	76		77		10-120
4-Terphenyl-d14	61		61		41-149

PCBS

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01
Client ID: HA-B1(OW)_04112018
Sample Location: CHESTNUT HILL, MA

Date Collected: 04/11/18 13:35
Date Received: 04/11/18
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 5,608
Analytical Date: 04/16/18 08:07
Analyst: HT

Extraction Method: EPA 608
Extraction Date: 04/12/18 19:11
Cleanup Method: EPA 3665A
Cleanup Date: 04/13/18
Cleanup Method: EPA 3660B
Cleanup Date: 04/13/18

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	101		30-150	A
Decachlorobiphenyl	107		30-150	A

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 5,608
Analytical Date: 04/16/18 08:19
Analyst: HT

Extraction Method: EPA 608
Extraction Date: 04/12/18 19:11
Cleanup Method: EPA 3665A
Cleanup Date: 04/13/18
Cleanup Method: EPA 3660B
Cleanup Date: 04/13/18

Parameter	Result	Qualifier	Units	RL	MDL	Column
Polychlorinated Biphenyls by GC - Westborough Lab for sample(s): 01 Batch: WG1106056-1						
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	74		30-150	A
Decachlorobiphenyl	90		30-150	A

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits	Column
Polychlorinated Biphenyls by GC - Westborough Lab Associated sample(s): 01 Batch: WG1106056-2									
Aroclor 1016	94		-		30-150	-		30	A
Aroclor 1260	100		-		30-150	-		30	A

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	88				30-150	A
Decachlorobiphenyl	104				30-150	A

Matrix Spike Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits	Column
Polychlorinated Biphenyls by GC - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1106056-3 QC Sample: L1800004-05 Client ID: MS Sample													
Aroclor 1016	ND	3.12	2.57	82		-	-		40-126	-		30	A
Aroclor 1260	ND	3.12	2.88	92		-	-		40-127	-		30	A

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	77				30-150	A
Decachlorobiphenyl	95				30-150	A

Lab Duplicate Analysis
Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1812596
Report Date: 04/23/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits	
Polychlorinated Biphenyls by GC - Westborough Lab Sample	Associated sample(s): 01	QC Batch ID: WG1106056-4		QC Sample: L1800004-05		Client ID: DUP	
Aroclor 1016	ND	ND	ug/l	NC		30	A
Aroclor 1221	ND	ND	ug/l	NC		30	A
Aroclor 1232	ND	ND	ug/l	NC		30	A
Aroclor 1242	ND	ND	ug/l	NC		30	A
Aroclor 1248	ND	ND	ug/l	NC		30	A
Aroclor 1254	ND	ND	ug/l	NC		30	A
Aroclor 1260	ND	ND	ug/l	NC		30	A

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	82		86		30-150	A
Decachlorobiphenyl	96		103		30-150	A

METALS

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01 Date Collected: 04/11/18 13:35

Client ID: HA-B1(OW)_04112018 Date Received: 04/11/18

Sample Location: CHESTNUT HILL, 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	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Arsenic, Total	ND		mg/l	0.00100	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Chromium, Total	0.00114		mg/l	0.00100	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Copper, Total	0.00146		mg/l	0.00100	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Iron, Total	0.341		mg/l	0.050	--	1	04/12/18 08:50	04/12/18 17:27	EPA 3005A	19,200.7	AB
Lead, Total	ND		mg/l	0.00050	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Mercury, Total	ND		mg/l	0.00020	--	1	04/12/18 11:04	04/12/18 16:18	EPA 245.1	3,245.1	MG
Nickel, Total	ND		mg/l	0.00200	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Zinc, Total	ND		mg/l	0.01000	--	1	04/12/18 08:50	04/12/18 14:23	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	247		mg/l	0.660	NA	1	04/12/18 08:50	04/12/18 17:27	EPA 3005A	19,200.7	AB
General Chemistry - Mansfield Lab											
Chromium, Trivalent	ND		mg/l	0.010	--	1		04/12/18 14:23	NA	107,-	

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

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: WG1105793-1										
Antimony, Total	ND		mg/l	0.00400	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Arsenic, Total	ND		mg/l	0.00100	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Chromium, Total	ND		mg/l	0.00100	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Copper, Total	ND		mg/l	0.00100	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Lead, Total	ND		mg/l	0.00050	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Nickel, Total	ND		mg/l	0.00200	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM
Zinc, Total	ND		mg/l	0.01000	--	1	04/12/18 08:50	04/12/18 14:08	3,200.8	AM

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: WG1105795-1										
Iron, Total	ND		mg/l	0.050	--	1	04/12/18 08:50	04/12/18 16:56	19,200.7	AB

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: WG1105795-1										
Hardness	ND		mg/l	0.660	NA	1	04/12/18 08:50	04/12/18 16:56	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

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: WG1105888-1										
Mercury, Total	ND		mg/l	0.00020	--	1	04/12/18 11:04	04/12/18 16:00	3,245.1	MG

Prep Information

Digestion Method: EPA 245.1

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1812596

Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1105793-2								
Antimony, Total	109		-		85-115	-		
Arsenic, Total	112		-		85-115	-		
Cadmium, Total	112		-		85-115	-		
Chromium, Total	105		-		85-115	-		
Copper, Total	104		-		85-115	-		
Lead, Total	106		-		85-115	-		
Nickel, Total	102		-		85-115	-		
Selenium, Total	111		-		85-115	-		
Silver, Total	105		-		85-115	-		
Zinc, Total	107		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1105795-2								
Iron, Total	105		-		85-115	-		
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 Batch: WG1105795-2								
Hardness	101		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1105888-2								
Mercury, Total	98		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1812596
Report Date: 04/23/18

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: WG1105793-3 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018												
Antimony, Total	ND	0.5	0.5633	113		-	-		70-130	-		20
Arsenic, Total	ND	0.12	0.1290	108		-	-		70-130	-		20
Cadmium, Total	ND	0.051	0.05456	107		-	-		70-130	-		20
Chromium, Total	0.00114	0.2	0.1973	98		-	-		70-130	-		20
Copper, Total	0.00146	0.25	0.2408	96		-	-		70-130	-		20
Lead, Total	ND	0.51	0.4961	97		-	-		70-130	-		20
Nickel, Total	ND	0.5	0.4781	96		-	-		70-130	-		20
Selenium, Total	ND	0.12	0.1389	116		-	-		70-130	-		20
Silver, Total	ND	0.05	0.04904	98		-	-		70-130	-		20
Zinc, Total	ND	0.5	0.5071	101		-	-		70-130	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105795-3 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018												
Iron, Total	0.341	1	1.34	100		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105795-3 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018												
Hardness	247	66.2	311	97		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105888-3 QC Sample: L1812126-14 Client ID: MS Sample												
Mercury, Total	0.00535	0.005	0.00890	71		-	-		70-130	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105888-5 QC Sample: L1812126-15 Client ID: MS Sample												
Mercury, Total	0.00534	0.005	0.00896	72		-	-		70-130	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1812596
Report Date: 04/23/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105793-4 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018						
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	0.00114	0.00111	mg/l	3		20
Copper, Total	0.00146	0.00148	mg/l	1		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	ND	ND	mg/l	NC		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105795-4 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018						
Iron, Total	0.341	0.258	mg/l	**28**	Q	20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105795-4 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018						
Hardness	247	251	mg/l	2		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105888-4 QC Sample: L1812126-14 Client ID: DUP Sample						
Mercury, Total	0.00535	0.00547	mg/l	2		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1105888-6 QC Sample: L1812126-15 Client ID: DUP Sample						
Mercury, Total	0.00534	0.00544	mg/l	2		20

INORGANICS
&
MISCELLANEOUS

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1812596
Report Date: 04/23/18

SAMPLE RESULTS

Lab ID: L1812596-01
Client ID: HA-B1(OW)_04112018
Sample Location: CHESTNUT HILL, MA
Sample Depth:
Matrix: Water

Date Collected: 04/11/18 13:35
Date Received: 04/11/18
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	9.0		mg/l	5.0	NA	1	-	04/12/18 08:30	121,2540D	JT
Cyanide, Total	ND		mg/l	0.005	--	1	04/12/18 10:55	04/12/18 15:28	121,4500CN-CE	LH
Chlorine, Total Residual	ND		mg/l	0.02	--	1	-	04/11/18 22:55	121,4500CL-D	AS
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	04/12/18 04:00	04/12/18 23:03	121,4500NH3-BH	AT
TPH, SGT-HEM	ND		mg/l	4.00	--	1	04/14/18 08:00	04/14/18 11:00	74,1664A	KZ
Phenolics, Total	ND		mg/l	0.030	--	1	04/12/18 09:18	04/12/18 14:14	4,420.1	BR
Chromium, Hexavalent	ND		mg/l	0.010	--	1	04/12/18 00:10	04/12/18 00:40	1,7196A	MA
Anions by Ion Chromatography - Westborough Lab										
Chloride	478.		mg/l	12.5	--	25	-	04/13/18 19:26	44,300.0	JR

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1812596

Project Number: 128271-018 **Report Date:** 04/23/18

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: WG1105719-1										
Chlorine, Total Residual	ND		mg/l	0.02	--	1	-	04/11/18 22:55	121,4500CL-D	AS
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1105727-1										
Chromium, Hexavalent	ND		mg/l	0.010	--	1	04/12/18 00:10	04/12/18 00:37	1,7196A	MA
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1105766-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	04/12/18 04:00	04/12/18 23:00	121,4500NH3-BH	AT
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1105773-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	04/12/18 08:30	121,2540D	JT
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1105830-1										
Phenolics, Total	ND		mg/l	0.030	--	1	04/12/18 09:18	04/12/18 13:07	4,420.1	BR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1105850-1										
Cyanide, Total	ND		mg/l	0.005	--	1	04/12/18 10:55	04/12/18 15:07	121,4500CN-CE	LH
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1106495-1										
TPH, SGT-HEM	ND		mg/l	4.00	--	1	04/14/18 08:00	04/14/18 11:00	74,1664A	KZ
Anions by Ion Chromatography - Westborough Lab for sample(s): 01 Batch: WG1106585-1										
Chloride	ND		mg/l	0.500	--	1	-	04/13/18 18:26	44,300.0	JR

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1812596
Report Date: 04/23/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1105719-2								
Chlorine, Total Residual	101		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1105727-2								
Chromium, Hexavalent	96		-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1105766-2								
Nitrogen, Ammonia	96		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1105830-2								
Phenolics, Total	92		-		70-130	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1105850-2								
Cyanide, Total	91		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1106495-2								
TPH	86		-		64-132	-		34
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 Batch: WG1106585-2								
Chloride	98		-		90-110	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1812596
Report Date: 04/23/18

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 B1(OW)_04112018	QC Batch ID: WG1105719-4		QC Sample: L1812596-01		Client ID: HA-							
Chlorine, Total Residual	ND	0.248	0.26	105		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 B1(OW)_04112018	QC Batch ID: WG1105727-4		QC Sample: L1812596-01		Client ID: HA-							
Chromium, Hexavalent	ND	0.1	0.096	96		-	-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 B1(OW)_04112018	QC Batch ID: WG1105766-4		QC Sample: L1812596-01		Client ID: HA-							
Nitrogen, Ammonia	ND	4	3.56	89		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 B1(OW)_04112018	QC Batch ID: WG1105830-4		QC Sample: L1812596-01		Client ID: HA-							
Phenolics, Total	ND	0.4	0.39	97		-	-		70-130	-		20
General Chemistry - Westborough Lab Associated sample(s): 01	QC Batch ID: WG1105850-4		QC Sample: L1812468-02		Client ID: MS Sample							
Cyanide, Total	ND	0.2	0.191	96		-	-		90-110	-		30
General Chemistry - Westborough Lab Associated sample(s): 01 B1(OW)_04112018	QC Batch ID: WG1106495-4		QC Sample: L1812596-01		Client ID: HA-							
TPH	ND	20	16.8	84		-	-		64-132	-		34
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01	QC Batch ID: WG1106585-3		QC Sample: L1812894-06		Client ID: MS Sample							
Chloride	ND	4	4.00	100		-	-		90-110	-		18

Lab Duplicate Analysis
Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1812596
Report Date: 04/23/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1105719-3 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018						
Chlorine, Total Residual	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1105727-3 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018						
Chromium, Hexavalent	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1105766-3 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018						
Nitrogen, Ammonia	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1105773-2 QC Sample: L1812422-01 Client ID: DUP Sample						
Solids, Total Suspended	200	200	mg/l	0		29
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1105830-3 QC Sample: L1812596-01 Client ID: HA-B1(OW)_04112018						
Phenolics, Total	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1105850-3 QC Sample: L1812468-01 Client ID: DUP Sample						
Cyanide, Total	ND	ND	mg/l	NC		30
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1106495-3 QC Sample: L1812766-01 Client ID: DUP Sample						
TPH	ND	ND	mg/l	NC		34
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1106585-4 QC Sample: L1812894-06 Client ID: DUP Sample						
Chloride	ND	ND	mg/l	NC		18

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1812596
Report Date: 04/23/18

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(*)
L1812596-01A	Vial HCl preserved	A	NA		2.6	Y	Absent		8260-SIM(14),8260(14)
L1812596-01B	Vial HCl preserved	A	NA		2.6	Y	Absent		8260-SIM(14),8260(14)
L1812596-01C	Vial HCl preserved	A	NA		2.6	Y	Absent		8260-SIM(14),8260(14)
L1812596-01D	Vial Na2S2O3 preserved	A	NA		2.6	Y	Absent		504(14)
L1812596-01E	Vial Na2S2O3 preserved	A	NA		2.6	Y	Absent		504(14)
L1812596-01F	Vial HCl preserved	A	NA		2.6	Y	Absent		SUB-ETHANOL(14)
L1812596-01G	Vial HCl preserved	A	NA		2.6	Y	Absent		SUB-ETHANOL(14)
L1812596-01H	Vial HCl preserved	A	NA		2.6	Y	Absent		SUB-ETHANOL(14)
L1812596-01I	Plastic 250ml HNO3 preserved	A	<2	<2	2.6	Y	Absent		CD-2008T(180),NI-2008T(180),ZN-2008T(180),CU-2008T(180),FE-UI(180),HARDU(180),AG-2008T(180),AS-2008T(180),HG-U(28),SE-2008T(180),CR-2008T(180),PB-2008T(180),SB-2008T(180)
L1812596-01J	Plastic 250ml NaOH preserved	A	>12	>12	2.6	Y	Absent		TCN-4500(14)
L1812596-01K	Plastic 500ml H2SO4 preserved	A	<2	<2	2.6	Y	Absent		NH3-4500(28)
L1812596-01L	Plastic 950ml unpreserved	A	7	7	2.6	Y	Absent		CL-300(28),HEXCR-7196(1),TRC-4500(1)
L1812596-01M	Plastic 950ml unpreserved	A	7	7	2.6	Y	Absent		TSS-2540(7)
L1812596-01N	Amber 1000ml HCl preserved	A	NA		2.6	Y	Absent		TPH-1664(28)
L1812596-01O	Amber 1000ml HCl preserved	A	NA		2.6	Y	Absent		TPH-1664(28)
L1812596-01P	Amber 950ml H2SO4 preserved	A	<2	<2	2.6	Y	Absent		TPHENOL-420(28)
L1812596-01Q	Amber 1000ml Na2S2O3	A	7	7	2.6	Y	Absent		PCB-608(7)
L1812596-01R	Amber 1000ml Na2S2O3	A	7	7	2.6	Y	Absent		PCB-608(7)
L1812596-01S	Amber 1000ml unpreserved	A	7	7	2.6	Y	Absent		8270TCL(7),8270TCL-SIM(7)
L1812596-01T	Amber 1000ml unpreserved	A	7	7	2.6	Y	Absent		8270TCL(7),8270TCL-SIM(7)

*Values in parentheses indicate holding time in days

Project Name:	BOSTON COLLEGE CENTRAL HEAT	**Lab Number:**	L1812596
Project Number:	128271-018	**Report Date:**	04/23/18

GLOSSARY

Acronyms

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).
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.
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.
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.
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.
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.

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.

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.

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 Condensation Product".
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

Report Format: Data Usability Report

Project Name:	BOSTON COLLEGE CENTRAL HEAT	**Lab Number:**	L1812596
Project Number:	128271-018	**Report Date:**	04/23/18

Data Qualifiers

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.

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.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where 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.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

Project Name:	BOSTON COLLEGE CENTRAL HEAT	**Lab Number:**	L1812596
Project Number:	128271-018	**Report Date:**	04/23/18

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

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.

5 Methods for the Organic Chemical Analysis of Municipal and Industrial Wastewater. Appendix A, Part 136, 40 CFR (Code of Federal Regulations).

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.

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: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; 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.
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, SM4500CI-D, SM2320B, SM2540C, SM4500H-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**, EPA 351.1, 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 624: Volatile Halocarbons & Aromatics,
EPA 608: 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: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Be, Cd, Cr, Cu, 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, Pb, Mn, Ni, Se, Ag, 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: 508-823-3288

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: 4/11/18

ALPHA Job #: L1812596

Project Information
- Project Name: Boston College Central Heating Plant
- Project Location: Chestnut Hill, MA
- Project #: 128271-018
- (Use Project name as Project #)
- Project Manager: C. Worthy
- ALPHAQuote #:

Turn-Around Time
- Standard ☑ — Due Date:
- Rush (if pre approved) ☐ — # of Days: 5 Day

Deliverables
- ☑ Email ☐ Fax
- ☐ EQuIS (1 File) ☑ EQuIS (4 File)
- ☐ Other:

Regulatory Requirements (Program/Criteria)
MA NPDES RGP

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:

H&A Information
- H&A Client: Boston College
- H&A Address 465 Medford St, Boston, MA 02129-1400
- H&A Phone: 617-886-7400
- H&A Fax:
- H&A Email: Cworthy, Siberg

These samples have been previously analyzed by Alpha ☐

Other project specific requirements/comments:

14. Total Ag, An, As, Cd, Cr, Cu, Ni, Pb, Sb, Se, Zn, Hg, Fe.
SEE NPDES PERMIT INFO FOR FULL LIST OF ANALYTES
Analyze using the EPA 2017 RGP Approved Testing Methods

ANALYSIS

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	1. TSS	2. Total Residual Chlorine	3. Total Cyanide	4. Ammonia (NH3-4500)	5. Chloride	6. VOCs - Halogenated & Non-Halogenated	7. SVOCs - Halogenated & Non-Halogenated	8. Fuel Parameters	9. Total Metals (See note)	10. Total PCBs	11. TPH	12. Hex Cr - SIM 3500	13. Hardness	Total Bottles
12596-01	[redacted]HA-B1(ow)041118	4/11/18	1335	AQ	MJD	X	X	X	X	X	X	X	X	X	X	X	X	X	pH and temp collected in field

Sample Filtration
☐ Done
☐ Lab to do

Preservation
☐ Lab to do

(Please Specify below)

Sample Specific Comments

Container Type	P	V	P	P	V	V	A	A	P	P	A	P							
Preservative	A		E	D		B	A	D	C	H	B	A							

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

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	4/11/18	[signature]	4/11/18 1630
[signature]	4/11/18 1630	[signature] AAL	4/11/18 1630
[signature] HAL	4/11/18 1800	[signature] Bonnelle Mertz	4/11/18 18:00

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)

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-150202-1
Client Project/Site: L1812596

For:
Alpha Analytical Inc
145 Flanders Road
Westborough, Massachusetts 01581-1019

Attn: Melissa Gulli

Authorized for release by:
4/20/2018 12:29:59 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

Table of Contents

Sample Summary

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-150202-1	HA-B1(OW)_04112018	Water	04/11/18 13:35	04/17/18 09:15

Case Narrative

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

Job ID: 490-150202-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-150202-1

Comments
No additional comments.

Receipt
The sample was received on 4/17/2018 9:15 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 6.0º C.

GC Semi VOA
Method 1671A: The matrix spike / matrix spike duplicate (MS/MSD) precision for analytical batch 490-509221 was outside control limits. Sample matrix interference and/or non-homogeneity are suspected.

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

Definitions/Glossary

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

Qualifiers

GC VOA

Qualifier	Qualifier Description
F2	MS/MSD RPD exceeds control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

Client Sample ID: HA-B1(OW)_04112018
Date Collected: 04/11/18 13:35
Date Received: 04/17/18 09:15

Lab Sample ID: 490-150202-1
Matrix: Water

Method: 1671A - Ethanol (GC/FID)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethanol	ND	F2	2000	500	ug/L			04/18/18 18:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Isopropyl acetate (Surr)	*98*		*70 - 130*		*04/18/18 18:05*	*1*

QC Sample Results

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

Method: 1671A - Ethanol (GC/FID)

Lab Sample ID: MB 490-509221/14
Matrix: Water
Analysis Batch: 509221

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethanol	ND		2000	500	ug/L			04/18/18 16:24	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Isopropyl acetate (Surr)	*110*		*70 - 130*		*04/18/18 16:24*	*1*

Lab Sample ID: LCS 490-509221/15
Matrix: Water
Analysis Batch: 509221

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Ethanol			50200	56610		ug/L		113	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Isopropyl acetate (Surr)	*118*		*70 - 130*

Lab Sample ID: 490-150202-1 MS
Matrix: Water
Analysis Batch: 509221

Client Sample ID: HA-B1(OW)_04112018
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Ethanol	ND	F2	50200	45980		ug/L		92	70 - 130		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Isopropyl acetate (Surr)	*112*		*70 - 130*

Lab Sample ID: 490-150202-1 MSD
Matrix: Water
Analysis Batch: 509221

Client Sample ID: HA-B1(OW)_04112018
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ethanol	ND	F2	50200	58800	F2	ug/L		117	70 - 130	24	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Isopropyl acetate (Surr)	*97*		*70 - 130*

QC Association Summary

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

GC VOA

Analysis Batch: 509221

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-150202-1	HA-B1(OW)_04112018	Total/NA	Water	1671A	
MB 490-509221/14	Method Blank	Total/NA	Water	1671A	
LCS 490-509221/15	Lab Control Sample	Total/NA	Water	1671A	
490-150202-1 MS	HA-B1(OW)_04112018	Total/NA	Water	1671A	
490-150202-1 MSD	HA-B1(OW)_04112018	Total/NA	Water	1671A	

Lab Chronicle

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

Client Sample ID: HA-B1(OW)_04112018
Date Collected: 04/11/18 13:35
Date Received: 04/17/18 09:15

Lab Sample ID: 490-150202-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	1671A		1			509221	04/18/18 18:05	AAB	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

Method	Method Description	Protocol	Laboratory
1671A	Ethanol (GC/FID)	EPA	TAL NSH

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Accreditation/Certification Summary

Client: Alpha Analytical Inc
Project/Site: L1812596

TestAmerica Job ID: 490-150202-1

Laboratory: TestAmerica Nashville

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

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	2938	10-31-18

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

Analysis Method	Prep Method	Matrix	Analyte
1671A		Water	Ethanol

Maine	State Program	1	TN00032	11-03-19

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

Analysis Method	Prep Method	Matrix	Analyte
1671A		Water	Ethanol

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

490-150202 Chain of Custody

COOLER RECEIPT FORM

Cooler Received/Opened On 04-17-2018 @ 09:15 KD 04-19-2018

Time Samples Removed From Cooler 18:03 Time Samples Placed In Storage 18:12 (2 Hour Window)

1. Tracking # 1ZE3845461 9728 6378 (last 4 digits, FedEx) Courier: UPS next day Air

IR Gun ID 31470366 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 6.0 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES NO NA

If yes, how many and where: 0

5. Were the seals intact, signed, and dated correctly? YES NO NA

6. Were custody papers inside cooler? YES NO NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES NO NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES NO NA

12. Did all container labels and tags agree with custody papers? YES NO NA

13a. Were VOA vials received? YES NO NA

b. Was there any observable headspace present in any VOA vial? YES NO NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES NO NA If multiple coolers, sequence # _____

I certify that I unloaded the cooler and answered questions 7-14 (intial) KD

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO NA

b. Did the bottle labels indicate that the correct preservatives were used YES NO NA

16. Was residual chlorine present? YES NO NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) KD

17. Were custody papers properly filled out (ink, signed, etc)? YES NO NA

18. Did you sign the custody papers in the appropriate place? YES NO NA

19. Were correct containers used for the analysis requested? YES NO NA

20. Was sufficient amount of sample sent in each container? YES NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) KD

I certify that I attached a label with the unique LIMS number to each container (intial) KD

21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES NO #_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

Subcontract Chain of Custody

Test America (Nashville)
2960 Foster Creighton Drive
Nashville, TN 37204

Alpha Job Number
L1812596

Client Information	Project Information	Regulatory Requirements/Report Limits
Client: Alpha Analytical Labs Address: Eight Walkup Drive Westborough, MA 01581-1019 Phone: 508.439.5186 Email: kraymond@alphalab.com	Project Location: MA Project Manager: Karyn Raymond **Turnaround & Deliverables Information** Due Date: Deliverables:	State/Federal Program: Regulatory Criteria: RCS-1-14;S1/G1-14

Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L1812596

Report to include Method Blank, LCS/LCSD:

Additional Comments: Send all results/reports to subreports@alphalab.com Ethanol 1671

Lab ID	Client ID	Collection Date/Time	Sample Matrix	Analysis	Batch QC
	HA-B1(OW)_04112018	04-11-18 13:35	WATER	Ethanol by EPA 1671 Revision A	

Loc: 490
150202

Relinquished By:	Date/Time:	Received By:	Date/Time:
[signature] SAC	4/16/18	[signature] TA-NAS	04-17-2018 09:15

Form No: AL_subcoc

6.0

ANALYTICAL REPORT

Lab Number:	L1819674
Client:	Haley & Aldrich, Inc. 465 Medford Street, Suite 2200 Charlestown, MA 02129-1400
ATTN:	Heather Scranton
Phone:	(617) 886-7400
Project Name:	BOSTON COLLEGE CENTRAL HEAT
Project Number:	128271-018
Report Date:	06/04/18

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).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1819674
Report Date: 06/04/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1819674-01	2018 LEVERETT POND	WATER	CHESTNUT HILL, MA	05/29/18 10:30	05/29/18

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1819674
Project Number: 128271-018 **Report Date:** 06/04/18

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. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated 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.

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 table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

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 Client Service Representative 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 Client Services at 800-624-9220 with any questions.

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:  Amita Naik

Title: Technical Director/Representative Date: 06/04/18

METALS

Project Name: BOSTON COLLEGE CENTRAL HEAT
Lab Number: L1819674
Project Number: 128271-018
Report Date: 06/04/18

SAMPLE RESULTS

Lab ID: L1819674-01
Client ID: 2018 LEVERETT POND
Sample Location: CHESTNUT HILL, MA
Date Collected: 05/29/18 10:30
Date Received: 05/29/18
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	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Arsenic, Total	ND		mg/l	0.00100	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Chromium, Total	ND		mg/l	0.00100	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Copper, Total	0.00192		mg/l	0.00100	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Iron, Total	0.658		mg/l	0.050	--	1	06/01/18 09:17	06/02/18 08:34	EPA 3005A	19,200.7	PE
Lead, Total	0.00159		mg/l	0.00100	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Mercury, Total	ND		mg/l	0.00020	--	1	05/30/18 11:04	05/30/18 20:32	EPA 245.1	3,245.1	EA
Nickel, Total	ND		mg/l	0.00200	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Zinc, Total	ND		mg/l	0.01000	--	1	06/01/18 09:17	06/01/18 14:42	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	180		mg/l	0.660	NA	1	06/01/18 09:17	06/02/18 08:34	EPA 3005A	19,200.7	PE
General Chemistry - Mansfield Lab											
Chromium, Trivalent	ND		mg/l	0.010	--	1		06/01/18 14:42	NA	107,-	

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1819674

Project Number: 128271-018 **Report Date:** 06/04/18

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: WG1120603-1										
Mercury, Total	ND		mg/l	0.0002	--	1	05/30/18 11:04	05/30/18 19:27	3,245.1	EA

Prep Information

Digestion Method: EPA 245.1

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01 Batch: WG1121430-1										
Iron, Total	ND		mg/l	0.050	--	1	06/01/18 09:17	06/02/18 07:08	19,200.7	PE

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: WG1121430-1										
Hardness	ND		mg/l	0.660	NA	1	06/01/18 09:17	06/02/18 07:08	19,200.7	PE

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: WG1121434-1										
Antimony, Total	ND		mg/l	0.00400	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM
Arsenic, Total	ND		mg/l	0.00100	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM
Chromium, Total	ND		mg/l	0.00100	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM
Copper, Total	ND		mg/l	0.00100	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM
Lead, Total	ND		mg/l	0.00100	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM

Project Name: BOSTON COLLEGE CENTRAL HEAT **Lab Number:** L1819674

Project Number: 128271-018 **Report Date:** 06/04/18

Method Blank Analysis
Batch Quality Control

Nickel, Total	ND	mg/l	0.00200	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM
Selenium, Total	ND	mg/l	0.00500	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM
Silver, Total	ND	mg/l	0.00040	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM
Zinc, Total	ND	mg/l	0.01000	--	1	06/01/18 09:17	06/01/18 14:10	3,200.8	AM

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1819674

Report Date: 06/04/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1120603-2								
Mercury, Total	91		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1121430-2								
Iron, Total	112		-		85-115	-		
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 Batch: WG1121430-2								
Hardness	110		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1121434-2								
Antimony, Total	107		-		85-115	-		
Arsenic, Total	110		-		85-115	-		
Cadmium, Total	112		-		85-115	-		
Chromium, Total	99		-		85-115	-		
Copper, Total	101		-		85-115	-		
Lead, Total	104		-		85-115	-		
Nickel, Total	106		-		85-115	-		
Selenium, Total	111		-		85-115	-		
Silver, Total	101		-		85-115	-		
Zinc, Total	112		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1819674
Report Date: 06/04/18

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: WG1120603-3 QC Sample: L1819581-01 Client ID: MS Sample												
Mercury, Total	ND	0.005	0.0030	**60**	Q	-	-		70-130	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1120603-5 QC Sample: L1819581-02 Client ID: MS Sample												
Mercury, Total	ND	0.005	0.0014	**28**	Q	-	-		70-130	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1121430-3 QC Sample: L1819206-01 Client ID: MS Sample												
Iron, Total	0.601	1	1.46	86		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1121430-3 QC Sample: L1819206-01 Client ID: MS Sample												
Hardness	90.4	66.2	158	102		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1121430-7 QC Sample: L1819673-01 Client ID: MS Sample												
Iron, Total	0.125	1	0.894	77		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1121430-7 QC Sample: L1819673-01 Client ID: MS Sample												
Hardness	172	66.2	227	83		-	-		75-125	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1819674
Report Date: 06/04/18

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: WG1121434-3 QC Sample: L1819673-01 Client ID: MS Sample										
Antimony, Total	ND	0.5	0.4212	84		-	-	70-130	-	20
Arsenic, Total	0.00323	0.12	0.1356	110		-	-	70-130	-	20
Cadmium, Total	ND	0.051	0.03928	77		-	-	70-130	-	20
Chromium, Total	ND	0.2	0.1390	70		-	-	70-130	-	20
Copper, Total	0.00374	0.25	0.1705	**67**	Q	-	-	70-130	-	20
Lead, Total	ND	0.51	0.5135	101		-	-	70-130	-	20
Nickel, Total	ND	0.5	0.3563	71		-	-	70-130	-	20
Selenium, Total	ND	0.12	0.1319	110		-	-	70-130	-	20
Silver, Total	ND	0.05	0.03428	**68**	Q	-	-	70-130	-	20
Zinc, Total	ND	0.5	0.3934	79		-	-	70-130	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1819674
Report Date: 06/04/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1120603-4 QC Sample: L1819581-01 Client ID: DUP Sample						
Mercury, Total	ND	ND	mg/l	NC		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1120603-6 QC Sample: L1819581-02 Client ID: DUP Sample						
Mercury, Total	ND	ND	mg/l	NC		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1121430-8 QC Sample: L1819673-01 Client ID: DUP Sample						
Iron, Total	0.125	0.115	mg/l	8		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1121434-4 QC Sample: L1819673-01 Client ID: DUP Sample						
Antimony, Total	ND	ND	mg/l	NC		20
Arsenic, Total	0.00323	0.00317	mg/l	2		20
Cadmium, Total	ND	ND	mg/l	NC		20
Chromium, Total	ND	ND	mg/l	NC		20
Copper, Total	0.00374	0.00343	mg/l	9		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	ND	ND	mg/l	NC		20

INORGANICS
&
MISCELLANEOUS

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1819674
Report Date: 06/04/18

SAMPLE RESULTS

Lab ID: L1819674-01
Client ID: 2018 LEVERETT POND
Sample Location: CHESTNUT HILL, MA
Sample Depth:
Matrix: Water

Date Collected: 05/29/18 10:30
Date Received: 05/29/18
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
pH (H)	7.2		SU	-	NA	1	-	05/29/18 21:03	121,4500H+-B	AS
Nitrogen, Ammonia	0.118		mg/l	0.075	--	1	05/30/18 05:00	05/30/18 22:41	121,4500NH3-BH	AT
Chromium, Hexavalent	ND		mg/l	0.010	--	1	05/30/18 01:00	05/30/18 03:56	1,7196A	MA

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018
Lab Number: L1819674
Report Date: 06/04/18

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: WG1120442-1										
Chromium, Hexavalent	ND		mg/l	0.010	--	1	05/30/18 01:00	05/30/18 03:22	1,7196A	MA
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1120451-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	05/30/18 05:00	05/30/18 22:26	121,4500NH3-BH	AT

Lab Control Sample Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1819674

Report Date: 06/04/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1120384-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1120442-2								
Chromium, Hexavalent	96		-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1120451-2								
Nitrogen, Ammonia	98		-		80-120	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1819674
Report Date: 06/04/18

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: WG1120442-4 QC Sample: L1819674-01 Client ID: 2018 LEVERETT POND												
Chromium, Hexavalent	ND	0.1	0.095	95		-	-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1120451-4 QC Sample: L1819629-01 Client ID: MS Sample												
Nitrogen, Ammonia	3.23	4	7.02	95		-	-		80-120	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: BOSTON COLLEGE CENTRAL HEAT

Project Number: 128271-018

Lab Number: L1819674

Report Date: 06/04/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1120384-2 QC Sample: L1819637-01 Client ID: DUP Sample						
pH	7.2	7.1	SU	1		5
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1120442-3 QC Sample: L1819674-01 Client ID: 2018 LEVERETT POND						
Chromium, Hexavalent	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1120451-3 QC Sample: L1819629-01 Client ID: DUP Sample						
Nitrogen, Ammonia	3.23	3.48	mg/l	7		20

Project Name: BOSTON COLLEGE CENTRAL HEAT
Project Number: 128271-018

Lab Number: L1819674
Report Date: 06/04/18

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(*)
L1819674-01A	Plastic 250ml unpreserved	A	7	7	4.7	Y	Absent		HEXCR-7196(1),PH-4500(.01)
L1819674-01B	Plastic 250ml HNO3 preserved	A	<2	<2	4.7	Y	Absent		CD-2008T(180),NI-2008T(180),ZN-2008T(180),CU-2008T(180),FE-UI(180),HARDU(180),AG-2008T(180),AS-2008T(180),HG-U(28),SE-2008T(180),CR-2008T(180),PB-2008T(180),SB-2008T(180)
L1819674-01C	Plastic 500ml H2SO4 preserved	A	<2	<2	4.7	Y	Absent		NH3-4500(28)

*Values in parentheses indicate holding time in days

Project Name:	BOSTON COLLEGE CENTRAL HEAT	**Lab Number:**	L1819674
Project Number:	128271-018	**Report Date:**	06/04/18

GLOSSARY

Acronyms

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).
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.
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.
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.
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.
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.

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.

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.

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 Condensation Product".
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

Report Format: Data Usability Report

Project Name:	BOSTON COLLEGE CENTRAL HEAT	**Lab Number:**	L1819674
Project Number:	128271-018	**Report Date:**	06/04/18

Data Qualifiers

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.

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.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where 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.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

Project Name:	BOSTON COLLEGE CENTRAL HEAT	**Lab Number:**	L1819674
Project Number:	128271-018	**Report Date:**	06/04/18

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

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.

107 Alpha Analytical - In-house calculation method.

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: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; 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.
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, SM4500CI-D, SM2320B, SM2540C, SM4500H-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**, EPA 351.1, 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 624: Volatile Halocarbons & Aromatics,
EPA 608: 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: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Be, Cd, Cr, Cu, 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, Pb, Mn, Ni, Se, Ag, 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 of

Date Rec'd in Lab: 5/29/18

ALPHA Job #: L1819674

H&A Information
- H&A Client: Boston College
- H&A Address: 465 Medford Street, #220
- Boston, MA 02129
- H&A Phone: 617-886-7400
- H&A Fax:
- H&A Email: kscalise, cworthy, kalepidis

Project Information
- Project Name: Boston College Central Heating Plant
- Project Location: Chestnut Hill, MA
- Project #: 128271-018
- (Use Project name as Project #) ☐
- Project Manager: H. Scranton
- ALPHAQuote #:

Turn-Around Time
- Standard ☑ Due Date:
- Rush (only if pre approved) ☐ # of Days: 5 Day

Deliverables
- ☑ Email ☐ Fax
- ☐ EQuIS (1 File) ☑ EQuIS (4 File)
- ☐ Other:

Billing Information
- ☐ Same as Client Info
- PO #

Regulatory Requirements (Program/Criteria)
MA NPDES 2017 RGP

Note: Select State from menu & identify criteria.

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:

Please specify Metals or TAL.

ANALYSIS

Sample Filtration
- ☐ Done
- ☐ Lab to do

Preservation
- ☐ Lab to do

(Please Specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	1. Total NPDES Metals	2. Total Hardness	3. NH3	Total Chromium VI	5. pH				Sample Specific Comments	Total Bottles
19674-01	2018 Leverett Pond	5/29/18	10:30	aq		x	x	x	x	x				Temperature:	3
Container Type						p	p	p	p	p					
Preservative															

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

Relinquished By:	Date/Time	Received By:	Date/Time
Scott Ward	5/29/18 15:30	M. Cliff	5/29/18 16:30
M. Cliff	5/29/18 16:30	Sandeman AAL	5/29/18 1630
Sandeman AAL	5/29/18 1825	Danielle Mello	5/29/18 18:25

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)