HALEY & ALDRICH, INC.
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Revised 27 June 2019
6 June 2019
File No. 41486-204

US Environmental Protection Agency
Office of Ecosystem Protection
5 Post Office Square – Suite 100 (OEP06-01)
Boston, MA 02109-3912

Attention: EPA/OEP RGP Applications Coordinator

Subject: Notice of Intent (NOI)
Temporary Construction Dewatering
Proposed Performing Arts Center
College of the Holy Cross
One College Street
Worcester, Massachusetts

Dear Ms. Little:

On behalf of our client, The College of the Holy Cross, and in accordance with the National Pollutant Discharge Elimination System (NPDES) Remediation General Permit (RGP) in Massachusetts, MAG910000, this letter submits a Notice of Intent (NOI) and the applicable documentation as required by the US Environmental Protection Agency (EPA) for temporary construction site dewatering under the RGP. Haley & Aldrich, Inc. (Haley & Aldrich) has prepared this submission to facilitate off-site discharge of temporary dewatering during construction activities at the proposed Performing Arts Center building, located in the Holy Cross campus in Worcester, Massachusetts.

Site Location and Historical Site Usage

The project site is located on the western side of The College of the Holy Cross campus in Worcester, Massachusetts (see Figure 1, Project Locus). The site is on the side of a hill and is bordered by Hogan Campus Center to the northwest, by an open grassed area to the south, by access roadways and parking to the east, and by parking fields to the west. The site is currently a paved parking field, paved roadways, and pedestrian paths. The surface grades range from approximately El. 648 to the north to El. 669 to the south.

Owner and Operator Information

Owner
College of the Holy Cross
One College Street
Worcester, MA 01610
Contact: Lenny Raymond
Director of Capital Construction

Proposed Activities

The proposed construction consists of a three-story, 40,000 sq. ft. cross-shaped footprint performing arts center, which will house a stage auditorium and orchestra, studio theater, media lab, scene shop, and other amenities. The following finish floor elevations are proposed: first floor El. 650 and the basement (middle and southern portions of the cross shape) El. 635.6. The approximate limits of the proposed performing arts center are shown on Figure 2, Boring Location Plan.

Dewatering System and Off-Site Discharge

During the development 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 July 2019 and are anticipated to be required for up to 3 months. On average, we estimate effluent discharge rates of about 50 gallons per minute (gpm), with occasional peak flows of approximately 150 gpm during significant precipitation events. Temporary construction dewatering is anticipated to be conducted from sumps located in excavations or from dewatering wells installed at the Site.

Temporary construction dewatering includes piping and discharge to storm drains located on or near the Site that ultimately discharge to the Mill Brook, located east of the Site. The proposed discharge route and outfall are shown on Figure 4, Proposed Discharge Route.

An effluent treatment system will be designed by the Contractor to meet the 2017 NPDES RGP Discharge Effluent Criteria. Prior to discharge, collected water will be routed through a sedimentation tank and a bag filter (and other treatment components, if needed) to remove suspended solids and undissolved chemical constituents, as shown on Figure 3, Proposed Treatment System Schematic.

Groundwater Quality Data

To assess groundwater quality to support this NOI, a groundwater sample was obtained from observation well HA16-B9-OW (see Figure 2) in May 2019. The collected sample was submitted to Alpha Analytical Laboratory (Alpha) of Westborough, MA, for chemical analysis of 2017 NPDES Remediation General Permit parameters including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polyaromatic hydrocarbons (PAHs), total metals, total petroleum hydrocarbons (TPH), pesticides, polychlorinated biphenyls (PCBs), total suspended solids (TSS), chloride, total cyanide, total phenolics, and total residual chlorine.

Refer to Table I for a summary of groundwater analytical data. The recent groundwater analyses detected concentrations of total copper, total suspended solids, and pH above the 2017 NPDES RGP Project-Specific Effluent Limits. No compounds were detected above the applicable MCP reportable concentrations (RCGW-2). The construction dewatering effluent at the Site will be managed under a Remediation General Permit. The location of the observation well HA16-B9-OW is shown on Figure 2.

Receiving Water Quality Information and Dilution Factor

On 3 May 2019, Haley & Aldrich collected a receiving water sample from the Mill Brook. The Mill Brook has been identified as the surface water to which dewatering effluent from the Site will eventually discharge. The surface water sample was collected and submitted to Alpha for chemical analysis of total metals and ammonia. Field parameters, including pH and temperature, were measured from surface water sample at the time of sampling. The results of water quality testing are summarized in Table I.

The pH and temperature readings collected in the field were used to calculate the Site Water Quality Based Effluent Limitations (WQBELs). 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 23 May 2019. The effluent limitations calculated from the WQBEL spreadsheet are included for reference in Table I.

Effluent Criteria Determination

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 was tabulated in the attached Table I. As requested by EPA, the Microsoft Excel spreadsheet for the WQBEL calculation will be submitted to the EPA via email, for their review upon submission of this NOI.

Endangered Species Action Eligibility Determination

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 C. Based on the results of the determination, the project and action area are considered to meet FWS Criterion B. One listed species has been established to be present within the project action area, the Northern Long-eared Bat. Discharges and related activities are not likely to adversely affected this listed species.

Historic Property Review

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), the area of the existing parking lot (location of proposed work) and the adjacent Hogan Campus Center building are not listed as historic properties, although there are many buildings on the Holy Cross campus which are. Proposed discharges

and discharge-related activities are not considered to have the potential to cause effects on the historic properties. The discharge is considered to meet Criterion B. Documentation is included in Appendix B.

Ethanol Discussion

The Site history does not suggest that ethanol was stored at the Site, or that a petroleum product containing ethanol was released at the Site, therefore analysis for ethanol was not conducted. Ethanol has been increasingly used in fuels since 2006 (according to the 2016 NOI Fact Sheet), and according to Site history, there are no known fuel-related storage or handling activities conducted at the site.

Appendices

The completed "Suggested Notice of Intent" (NOI) form as provided in the RGP is enclosed in Appendix A. The Site owner is the College of the Holy Cross, who will act as Owner and Operator. Haley & Aldrich is monitoring the dewatering activities on behalf of Holy Cross in accordance with the requirements for this NOI submission.

Appendices B and C include the National Register of Historic Places and Endangered Species Act Documentation, respectively. Copies of the groundwater testing laboratory data reports are provided in Appendix D. Since the Site Contractor's dewatering submittal is not yet available, Appendix E provides details of typical the dewatering system components used to remove suspended solids and undissolved chemical constituents. 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.

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.

Kenneth N. Alepidis, P.G.
Senior Technical Specialist - Geology

Douglas M. Lindsay, P.G., LSP
Senior Project Manager

Attachments:

Table I – Summary of Groundwater Quality Data
Figure 1 – Site Locus

Figure 2 – Site and Groundwater Monitoring Well Location Plan
Figure 3 – Proposed Discharge Route
Appendix A – Notice of Intent (NOI) for Remediation General Permit (RGP)
Appendix B – National Register of Historic Places and Massachusetts Historical Commission Documentation
Appendix C – Endangered Species Act Documentation
Appendix D – Laboratory Data Reports
Appendix E – Contractor Dewatering Cut Sheets and SDSs

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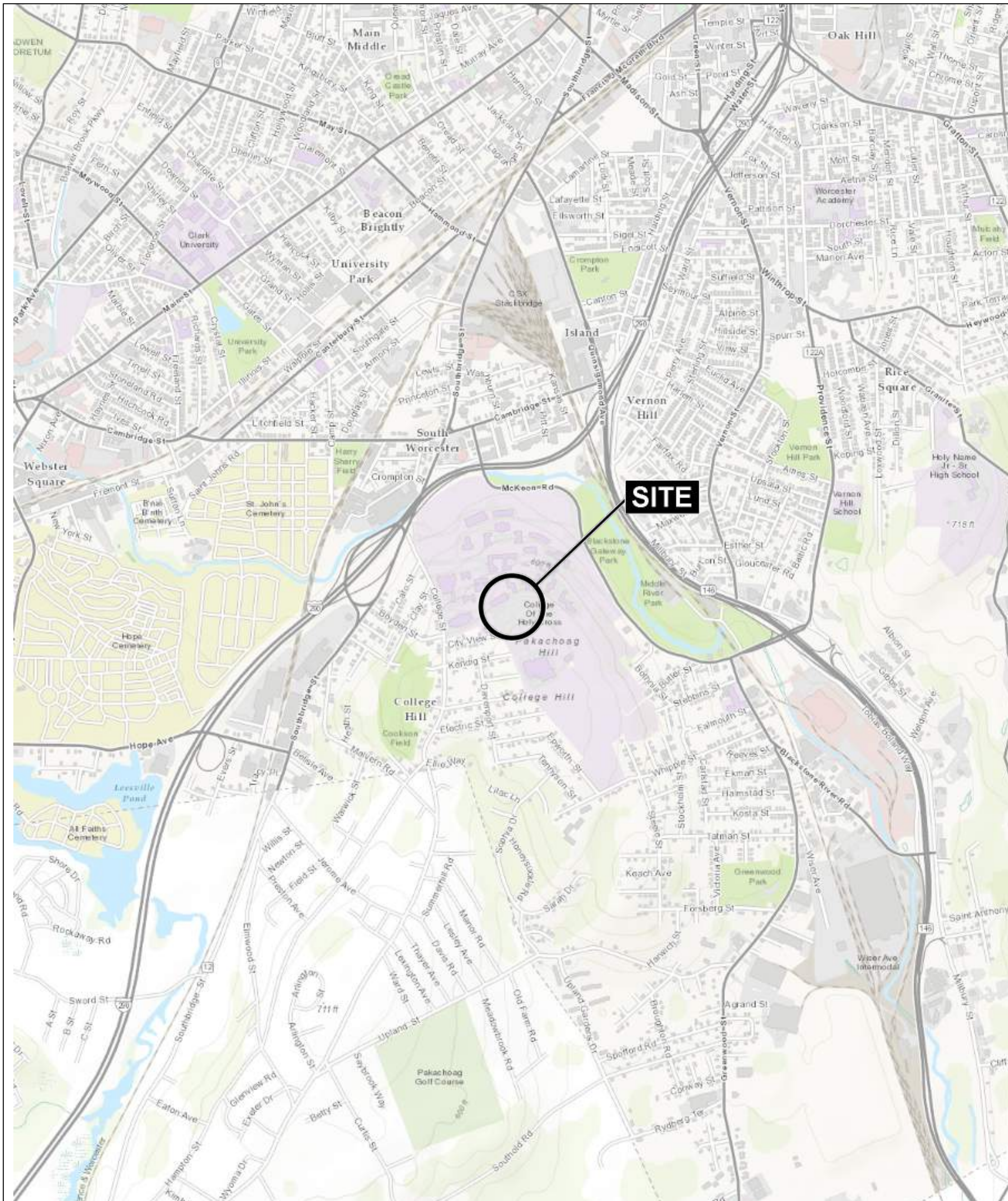
TABLE I
SUMMARY OF WATER QUALITY DATA
PROPOSED PERFORMING ARTS CENTER
WORCERSTER, MA
FILE NO. 41486-204

Location Sample Name Sample Date Lab Sample ID	MCP 2014 RCGW-2 Reportable Concentrations	NPDES RGP Project Specific Criteria	Site Source Water Sample HA16-B9-OW-1245 5/3/2019 L1918597-01	Receiving Water Sample SW-1-1645 5/3/2019 L1918597-02
Volatile Organic Compounds (mg/L)				
1,1,1-Trichloroethane	0.2	0.2	ND(0.002)	-
1,1,2-Trichloroethane	0.005	0.005	ND(0.0015)	-
1,1-Dichloroethane	0.07	0.07	ND(0.0015)	-
1,2-Dibromoethane	0.00002	0.00005	ND(0.001)	-
1,2-Dichlorobenzene	0.6	0.6	ND(0.005)	-
1,2-Dichloroethane	0.005	0.005	ND(0.0015)	-
1,3-Dichlorobenzene	0.1	0.32	ND(0.005)	-
1,4-Dichlorobenzene	0.005	0.005	ND(0.005)	-
Acetone	6.3	7.97	ND(0.01)	-
Benzene	0.005	0.005+	ND(0.001)	-
Carbon tetrachloride	0.002	0.0044	ND(0.001)	-
Ethylbenzene	0.7	+	ND(0.001)	-
Methyl tert butyl ether	0.07	0.07	ND(0.01)	-
Methylene chloride	0.005	0.0046	ND(0.001)	-
Tert-Butyl Alcohol	NA	0.12	ND(0.1)	-
Tertiary-Amyl Methyl Ether	NA	0.09	ND(0.02)	-
Tetrachloroethene	0.005	0.005	ND(0.001)	-
Toluene	1	+	ND(0.001)	-
Trichloroethene	0.005	0.005	ND(0.001)	-
Vinyl chloride	0.002	0.002	ND(0.001)	-
Xylenes, Total	3	+	ND(0.001)	-
cis-1,2-Dichloroethene	0.02	0.07	ND(0.001)	-
o-Xylene	3	+	ND(0.001)	-
p/m-Xylene	3	+	ND(0.002)	-
1,4-Dioxane	0.0003	0.2	ND(0.05)	-
Total VOCs by GC/MS	NA	NA	ND	-
Total BTEX	NA	0.1	ND	-
Semi-Volatile Organic Compounds (mg/L)				
Bis(2-ethylhexyl)phthalate	0.006	0.101++	ND(0.0022)	-
Butyl benzyl phthalate	1	++	ND(0.005)	-
Di-n-butylphthalate	0.5	++	ND(0.005)	-
Di-n-octylphthalate	10	++	ND(0.005)	-
Diethyl phthalate	2	++	ND(0.005)	-
Dimethyl phthalate	0.3	++	ND(0.005)	-
Acenaphthene	0.02	**	ND(0.0001)	-
Acenaphthylene	0.03	**	ND(0.0001)	-
Anthracene	0.03	**	ND(0.0001)	-
Benzo(a)anthracene	0.001	0.001*	ND(0.0001)	-
Benzo(a)pyrene	0.0002	0.001*	ND(0.0001)	-
Benzo(b)fluoranthene	0.001	0.001*	ND(0.0001)	-
Benzo(ghi)perylene	0.02	**	ND(0.0001)	-
Benzo(k)fluoranthene	0.001	0.001*	ND(0.0001)	-
Chrysene	0.002	0.001*	ND(0.0001)	-
Dibenzo(a,h)anthracene	0.0005	0.001*	ND(0.0001)	-
Fluoranthene	0.09	**	ND(0.0001)	-
Fluorene	0.03	**	ND(0.0001)	-
Indeno(1,2,3-cd)pyrene	0.0005	0.001*	ND(0.0001)	-
Naphthalene	0.14	0.02	ND(0.0001)	-
Pentachlorophenol	0.001	0.001*	ND(0.001)	-
Phenanthrene	0.04	**	ND(0.0001)	-
Pyrene	0.02	**	ND(0.0001)	-
Total Phthalates	NA	0.19++	ND	-
Total Group I PAHs	NA	0.001*	ND	-
Total Group II PAHs	NA	0.1*	ND	-
Total Petroleum Hydrocarbons (mg/L)				
TPH, SGT-HEM	5	5	ND(4)	-
Total Metals (mg/L)				
Antimony, Total	8	0.206	ND(0.004)	ND(0.004)
Arsenic, Total	0.9	0.104	0.0028	0.00299
Cadmium, Total	0.004	0.0102	0.00185	ND(0.0002)
Chromium, Total	0.3	0.323	0.00227	0.00143
Copper, Total	100	0.0138	**0.01978**	0.1012
Iron, Total	NA	5	0.98	0.414
Lead, Total	0.01	0.16	ND(0.001)	0.1066
Mercury, Total	0.02	0.000739	ND(0.0002)	ND(0.0002)
Nickel, Total	0.2	1.45	0.0396	0.00342
Selenium, Total	0.1	0.2358	0.01754	ND(0.005)
Silver, Total	0.007	0.0351	0.00859	ND(0.0004)
Zinc, Total	0.9	0.42	0.04269	0.02654
PCBs (mg/L)				
Total PCBs	0.005	***	ND	-
Other (mg/L)				
Chlorine, Total Residual	NA	0.106	ND(0.02)	-
Chromium, Hexavalent	0.3	0.323	ND(0.01)	-
Chromium, Trivalent	0.6	0.323	ND(0.01)	-
Cyanide, Total	0.03	0.0138	ND(0.005)	-
Nitrogen, Ammonia	NA	Report	0.11	0.166
Phenolics, Total	NA	1.08	ND(0.03)	-
Temperature (^{o}C)	NA	NA	12.6	12.2
pH	NA	6.5 - 8.5	**5.64**	7.24
Solids, Total Suspended	NA	30	**32**	-
Chloride	NA	Report	5060	-
Hardness	NA	NA	298	142

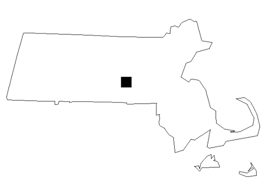
ABBREVIATIONS:
- : Not analyzed
mg/L: milligram per liter
NA: Not Applicable
ND (2.5): Result not detected above reporting limit (shown in parentheses)

NOTES:
1. Analytes detected in at least one sample are reported herein. For a complete list of analytes see the laboratory data sheets.
3. +: Indicates effluent limit is limited as total BTEX of 0.1 mg/l.
4. *: Indicates effluent limit is limited as total Group I PAHs of 0.001 mg/l.
5. **: Indicates effluent limit is limited as total Group II PAHs of 0.1 mg/l.
6. ***: Indicates compliance limits are equal to the minimum level (ML) of the test method
7. pH and Temperature are collected in the field.



MAP SOURCE: ESRI

SITE COORDINATES: 42°14'14"N, 71°48'27"W



HALEY ALDRICH

PROPOSED PERFORMING ARTS CENTER
THE COLLEGE OF THE HOLY CROSS
WORCESTER, MASSACHUSETTS

PROJECT LOCUS

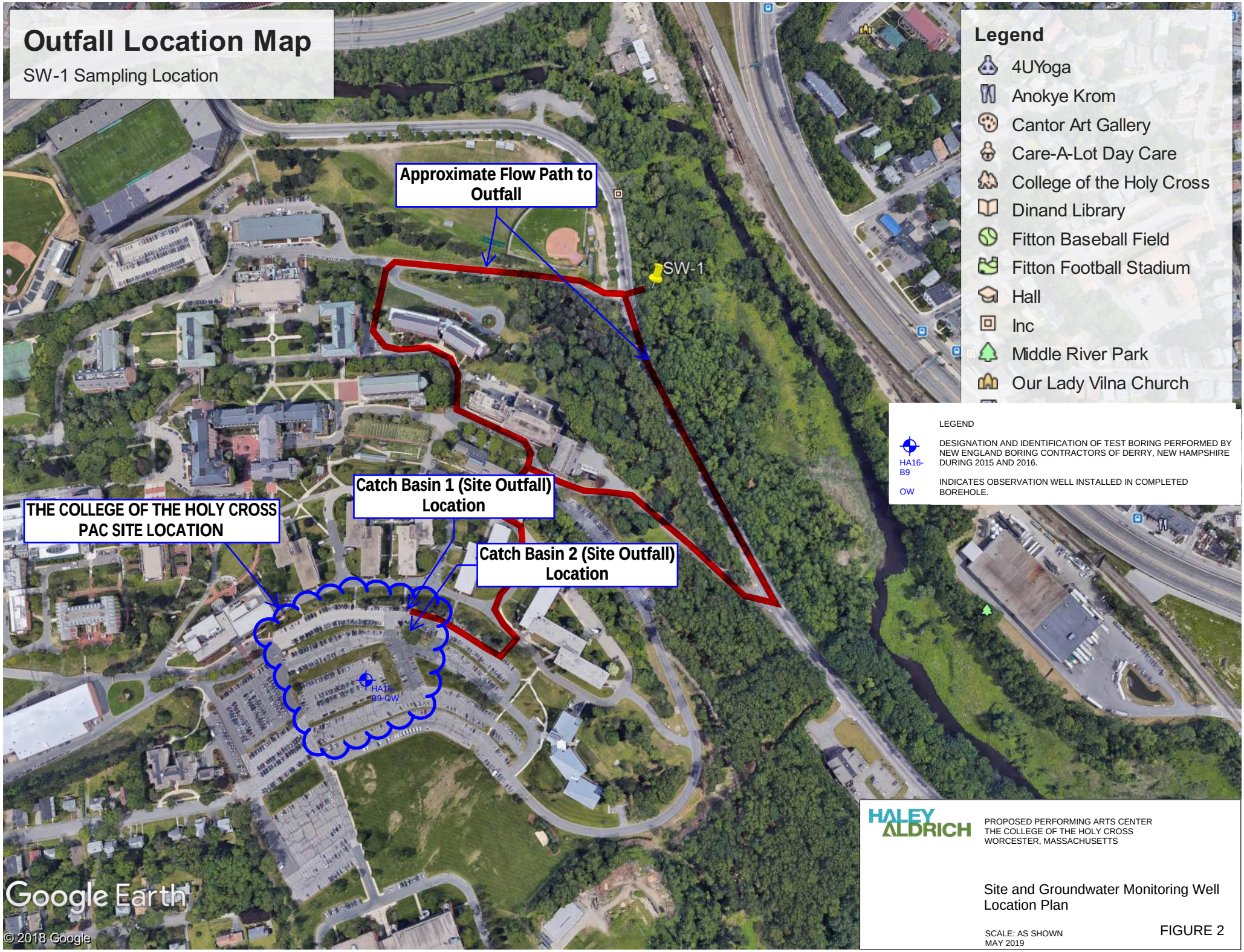
APPROXIMATE SCALE: 1 IN = 2000 FT
JUNE 2019

FIGURE 1

41486-000_1_LOCUS.PDF

Outfall Location Map

SW-1 Sampling Location



Legend

- 4UYoga
- Anokye Krom
- Cantor Art Gallery
- Care-A-Lot Day Care
- College of the Holy Cross
- Dinand Library
- Fitton Baseball Field
- Fitton Football Stadium
- Hall
- Inc
- Middle River Park
- Our Lady Vilna Church

LEGEND

HA16-B9 — DESIGNATION AND IDENTIFICATION OF TEST BORING PERFORMED BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMPSHIRE DURING 2015 AND 2016.

OW — INDICATES OBSERVATION WELL INSTALLED IN COMPLETED BOREHOLE.

HALEY ALDRICH

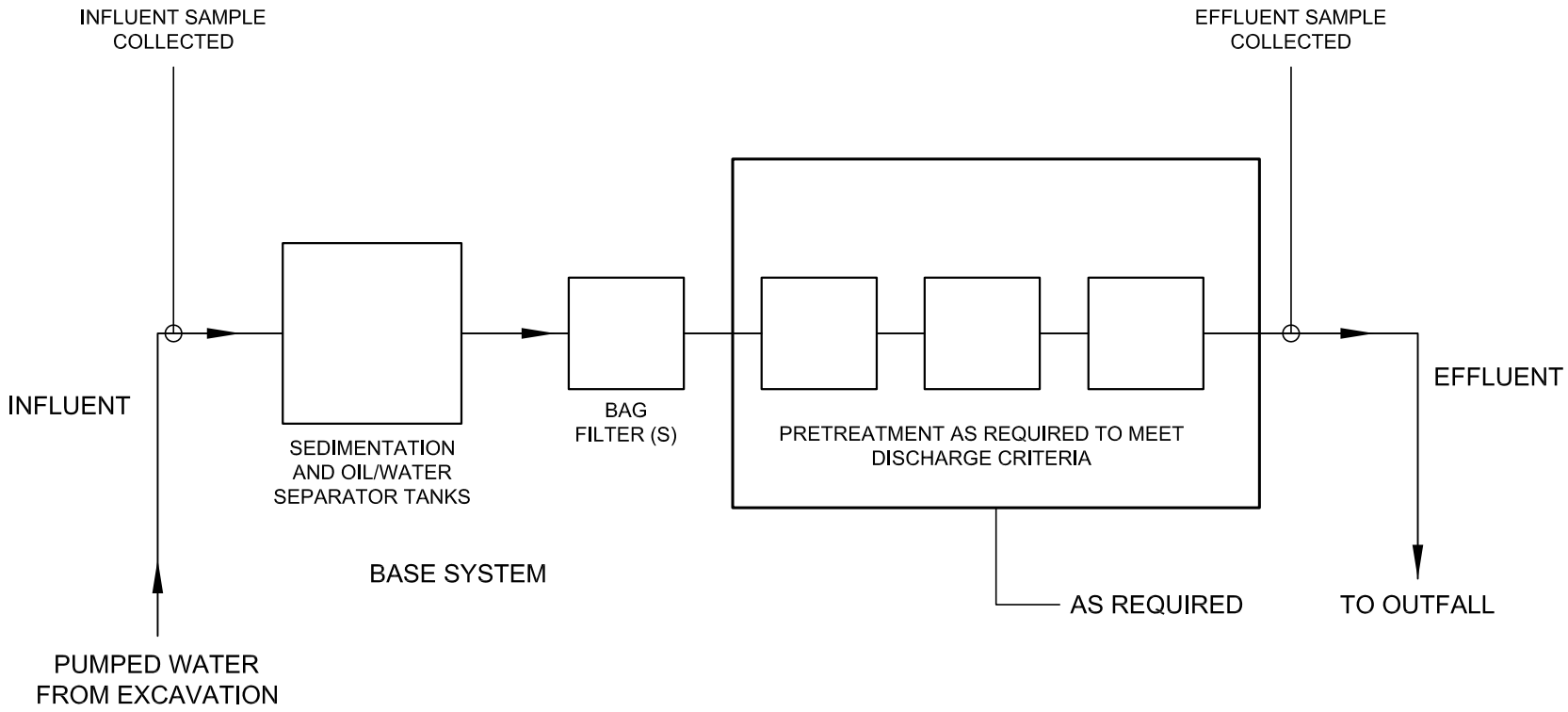
PROPOSED PERFORMING ARTS CENTER
THE COLLEGE OF THE HOLY CROSS
WORCESTER, MASSACHUSETTS

Site and Groundwater Monitoring Well Location Plan

SCALE: AS SHOWN
MAY 2019

FIGURE 2

G:\38625\NPDES\FIGURES\COPY-A142.DWG



LEGEND:

DIRECTION OF FLOW

NOTE:

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

HALEY ALDRICH

PROPOSED PERFORMAING ARTS CENTER
THE COLEGE OF THE HOLY CROSS
WORCESTER, MASSACHUSETTS

PROPOSED TREATMENT SYSTEM SCHEMATIC

SCALE: NONE
JUNE 2019

FIGURE 3

APPENDIX A

Notice of Intent (NOI)
for Remediation General Permit (RGP)

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

A. General site information:

<table>
<tr><td rowspan="2">1. Name of site: The College of the Holy Cross - Proposed Performing Arts Center</td><td colspan="3">Site address:
Street: 1 College Street</td></tr>
<tr><td>City: Worcester</td><td>State: MA</td><td>Zip: 01610</td></tr>
<tr><td rowspan="4">2. Site owner
The College of the Holy Cross

Owner is (check one): ☐ Federal ☐ State/Tribal ☒ Private
☐ Other; if so, specify:</td><td colspan="3">Contact Person: Lenny Raymond</td></tr>
<tr><td>Telephone: 508-793-2438</td><td colspan="2">Email: raymond@holycross.edu</td></tr>
<tr><td colspan="3">Mailing address:
Street: 1 College Street</td></tr>
<tr><td>City: Worcester</td><td>State: MA</td><td>Zip: 01610</td></tr>
<tr><td rowspan="4">3. Site operator, if different than owner</td><td colspan="3">Contact Person:</td></tr>
<tr><td>Telephone:</td><td colspan="2">Email:</td></tr>
<tr><td colspan="3">Mailing address:
Street:</td></tr>
<tr><td>City:</td><td>State:</td><td>Zip:</td></tr>
<tr><td>4. NPDES permit number assigned by EPA: N/A

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):

☐ 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):
Mill Brook / Middle River	MA51-02	B

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

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

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

3. Indicate if the receiving water(s) is listed in the State's Integrated List of Waters (i.e., CWA Section 303(d)). Include which designated uses are impaired, and any pollutants indicated. Also, indicate if a final TMDL is available for any of the indicated pollutants. For more information, contact the appropriate State as noted in Part 4.6 of the RGP. No

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.	2.9 cfs
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.	DF 9.7

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: 5/23/2019

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 detected above RGP effluent limits	
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): Outfall 001 (via 2 catch basin locations)	Outfall location(s): (Latitude, Longitude) 42.240252 -71.803591
Discharges enter the receiving water(s) via (check any that apply): ☐ Direct discharge to the receiving water ☒ Indirect discharge, if so, specify: ☐ 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 City of Worcester Sewer Department has been notified 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: N/A Has the operator attached a summary of any additional requirements the owner of this system has specified? (check one): ☒ Yes ☐ No	
Provide the expected start and end dates of discharge(s) (month/year): July 2019 - October 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="4">☐ 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		X	1	4500NH3-BH	75	110	110	Report mg/L	---
Chloride		X	1	300.0	25000	5,060,000	5,060,000	Report µg/l	---
Total Residual Chlorine	X		1	4500CL	20	ND	ND	0.2 mg/L	106 ug/L
Total Suspended Solids		X	1	2540D	5000	32,000	32,000	30 mg/L	—
Antimony Total	X		1	6020A	4	ND	ND	206 µg/L	6181
Arsenic Total		X	1	6020A	1	2.8	2.8	104 µg/L	71
Cadmium Total		X	1	6020A	0.2	1.85	1.85	10.2 µg/L	0.38
Chromium III	X		1	6020A	1	ND	ND	323 µg/L	1199
Chromium VI	X		1	3500CR	10	ND	ND	323 µg/L	110.4
Copper Total		X	1	6020A	1	19.78	19.78	242 µg/L	13.8
Iron Total		X	1	200.7	50	980	980	5,000 µg/L	6073
Lead Total	X		1	6020A	0.5	ND	ND	160 µg/L	5.7
Mercury Total	X		1	245.1	0.2	ND	ND	0.739 µg/L	8.75
Nickel Total		X	1	6020A	2	39.6	39.6	1,450 µg/L	712.8
Selenium Total		X	1	6020A	5	17.54	17.54	235.8 µg/L	43.8
Silver Total		X	1	6020A	0.4	8.59	8.59	35.1 µg/L	80.4
Zinc Total		X	1	6020A	10	42.6	42.6	420 µg/L	1476.5
Cyanide Total	X		1	4500CN	5	ND	ND	178 mg/L	50.2
B. Non-Halogenated VOCs									
Total BTEX	X		1	8260C	NA	ND	ND	100 µg/L	---
Benzene	X		1	8260C	1	ND	ND	5.0 µg/L	---
1,4 Dioxane	X		1	8260C-SIM	5	ND	ND	200 µg/L	---
Acetone	X		1	8260C	10	ND	ND	7.97 mg/L	---
Phenol	X		1	8270D	30	ND	ND	1,080 µg/L	2897

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	X		1	8260C	0.5	ND	ND	4.4 µg/L	15.5
1,2 Dichlorobenzene	X		1	8260C	2.5	ND	ND	600 µg/L	---
1,3 Dichlorobenzene	X		1	8260C	2.5	ND	ND	320 µg/L	---
1,4 Dichlorobenzene	X		1	8260C	2.5	ND	ND	5.0 µg/L	---
Total dichlorobenzene	X		1	8260C	NA	NA	NA	763 µg/L in NH	---
1,1 Dichloroethane	X		1	8260C	0.75	ND	ND	70 µg/L	---
1,2 Dichloroethane	X		1	8260C	0.5	ND	ND	5.0 µg/L	---
1,1 Dichloroethylene	X		1	8260C	0.5	ND	ND	3.2 µg/L	---
Ethylene Dibromide	X		1	8260C	2.0	ND	ND	0.05 µg/L	---
Methylene Chloride	X		1	8260C	3.0	ND	ND	4.6 µg/L	---
1,1,1 Trichloroethane	X		1	8260C	0.5	ND	ND	200 µg/L	---
1,1,2 Trichloroethane	X		1	8260C	0.75	ND	ND	5.0 µg/L	---
Trichloroethylene	X		1	8260C	0.5	ND	ND	5.0 µg/L	---
Tetrachloroethylene	X		1	8260C	0.5	ND	ND	5.0 µg/L	31.9
cis-1,2 Dichloroethylene	X		1	8260C	0.5	ND	ND	70 µg/L	---
Vinyl Chloride	X		1	8260C	1.0	ND	ND	2.0 µg/L	---
D. Non-Halogenated SVOCs									
Total Phthalates	X		1	8270D	NA	ND	ND	190 µg/L	
Diethylhexyl phthalate	X		1	8270D	3.0	ND	ND	101 µg/L	21.2
Total Group I PAHs	X		1	8270D	NA	ND	ND	1.0 µg/L	---
Benzo(a)anthracene	X		1	8270D	0.1	ND	ND	As Total PAHs	0.037
Benzo(a)pyrene	X		1	8270D	0.1	ND	ND		0.037
Benzo(b)fluoranthene	X		1	8270D	0.1	ND	ND		0.037
Benzo(k)fluoranthene	X		1	8270D	0.1	ND	ND		0.037
Chrysene	X		1	8270D	0.1	ND	ND		0.037
Dibenzo(a,h)anthracene	X		1	8270D	0.1	ND	ND		0.037
Indeno(1,2,3-cd)pyrene	X		1	8270D	0.1	ND	ND		0.037

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	X		1	8270D	NA	ND	ND	100 µg/L	---
Naphthalene	X		1	8260C	2.5	ND	ND	20 µg/L	---
E. Halogenated SVOCs									
Total PCBs	X		1	608	NA	ND	ND	0.000064 µg/L	---
Pentachlorophenol	X		1	8270D	0.8	ND	ND	1.0 µg/L	---
F. Fuels Parameters									
Total Petroleum Hydrocarbons	X		1	1664A	NA	ND	ND	5.0 mg/L	---
Ethanol								Report mg/L	---
Methyl-tert-Butyl Ether	X		1	8260C	1.0	ND	ND	70 µg/L	
tert-Butyl Alcohol	X		1	8260C	10	ND	ND	120 µg/L in MA 40 µg/L in NH	---
tert-Amyl Methyl Ether	X		1	8260C	2	ND	ND	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		X	1	200.7	0.660	298	298		
pH		X	1			5.64	5.64		
See Attached Table 1									

E. Treatment system information

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

Following will be applied IF REQUIRED per effluent monitoring sampling

☐ 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:

2. Provide a written description of all treatment system(s) or processes that will be applied to the effluent prior to discharge.

Prior to discharge, collected water will be routed through a sedimentation tank and a bag filter and other necessary treatment components (potentially: Ion exchange, GAC, oil/water seperator), to remove suspended solids and undissolved chemical constituents, as shown on Figure 3 of the NPDES permit application.

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: 150 gpm Is use of a flow meter feasible? (check one): ☒ Yes ☐ No, if so, provide justification:	
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:	

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:

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

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

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

G. Endangered Species Act eligibility determination

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

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

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

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

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

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

Find attached

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 ☒ N/A

I. Supplemental information

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

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 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: Leonard J Rapuano	Date: 6-13-2019
Print Name and Title: College of the Holy Cross	

APPENDIX B

National Register of Historic Places and
Massachusetts Historical Commission Documentation

Massachusetts Historical Commission

William Francis Galvin, Secretary of the Commonwealth

Massachusetts Cultural Resource Information System

MACRIS

Scanned forms and photos now available for selected towns!

The Massachusetts Cultural Resource Information System (MACRIS) allows you to search the Massachusetts Historical Commission database for information on historic properties and areas in the Commonwealth.

Users of the database should keep in mind that it does not include information on all historic properties and areas in Massachusetts, nor does it reflect all the information on file on historic properties and areas at the Massachusetts Historical Commission.

Click here to begin your search of the MACRIS database.

MACRIS MAPS 2.0 beta

About || Help || Disclaimer

1 College Street, Worcester, MA Search

1 College St, Worcester, Massachusetts, 01610

Bing MassDOT Street View

Available Layers

- Base Layer
- Inventory Layers
- MassGIS Layers

Legend

MHC Inventory Points

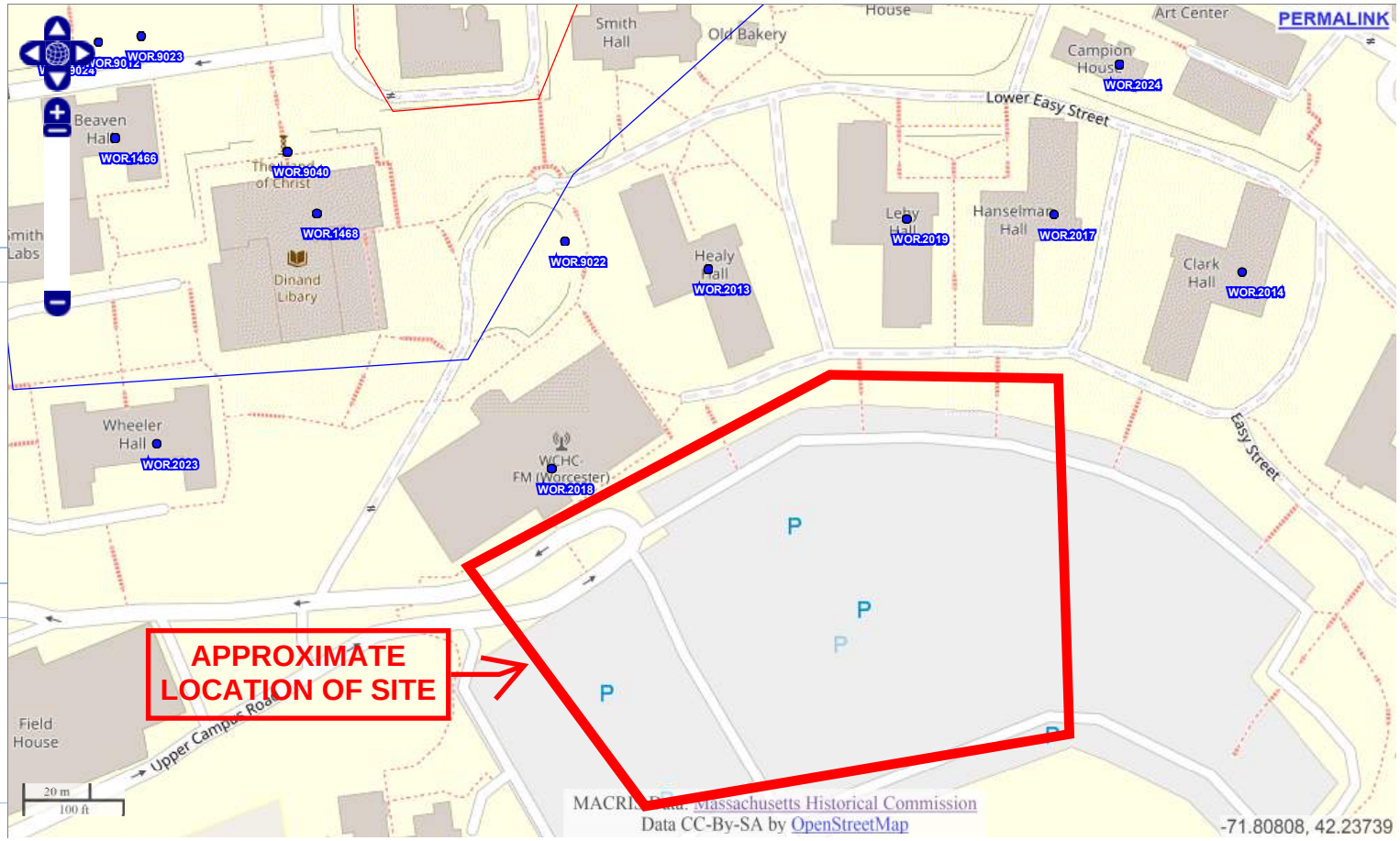
- Nat'l Register of Historic Places
- Preservation Restriction
- Local Historic District
- NRHP and LHD
- Inventoried Property

Archaeology Login

Username:

Password: Login

MACRIS Maps Last Updated 04/05/2019



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. Data last updat...

Massachusetts Cultural Resource Information System

MACRIS

MACRIS Search Results

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

Inv. No.	Property Name	Street	Town	Year
WOR.1462	Fenwick Hall - Holy Cross College	College St	Worcester	r 1840
WOR.1463	O'Kane Hall - Holy Cross College	College St	Worcester	1895
WOR.1464	Alumni Hall - Holy Cross College	College St	Worcester	1904
WOR.1465	Carlin Hall - Holy Cross College	College St	Worcester	1922
WOR.1466	Beaven Hall - Holy Cross College	College St	Worcester	c 1922
WOR.1467	Saint Joseph's Chapel - Holy Cross College	College St	Worcester	1923
WOR.1468	Dinand Library - Holy Cross College	College St	Worcester	1927
WOR.1469	Kimball Hall - Holy Cross College	College St	Worcester	1934
WOR.2013	Bishop Healy Hall - Holy Cross College	College St	Worcester	1962
WOR.2014	Clark Hall - Holy Cross College	College St	Worcester	1962
WOR.2015	Football Stadium - Holy Cross College	College St	Worcester	
WOR.2016	Haberlin Hall - Holy Cross College	College St	Worcester	1959
WOR.2017	Hanselman Hall - Holy Cross College	College St	Worcester	1954
WOR.2018	Hogan, Henry M. Campus Center - Holy Cross College	College St	Worcester	1967
WOR.2019	Lehy Hall - Holy Cross College	College St	Worcester	1954
WOR.2020	Loyola Hall - Holy Cross College	College St	Worcester	1965
WOR.2021	Mulledy Hall - Holy Cross College	College St	Worcester	1966
WOR.2022	O'Neil Memorial Hall - Holy Cross College	College St	Worcester	1951
WOR.2023	Wheeler Hall - Holy Cross College	College St	Worcester	1940
WOR.2024	Campion Hall - Holy Cross College	College St	Worcester	
WOR.9022	Isaiah Sculpture	1 College St	Worcester	1976
WOR.1441	McGauley, Michael Two-Decker	34 College St	Worcester	c 1892
WOR.1477	Williams, William A. Cottage	111 College St	Worcester	c 1860
WOR.1478	Dutton, George H. House	125 College St	Worcester	c 1888
WOR.9012	Die Nacht Sculpture	Linden Ln	Worcester	1930
WOR.9023	L'Arrivee Sculpture	Linden Ln	Worcester	1965

Inv. No.	Property Name	Street	Town	Year
WOR.9024	L'Offrande Sculpture	Linden Ln	Worcester	1936
WOR.9040	The Hand of Christ Sculpture	Linden Ln	Worcester	1966

Ref#	Property Name	State	City	Street & Number	Listed Date
80000595	Abbott Street School	MASSACHUSETTS	Worcester	36 Abbott St.	3/5/1980
80000584	Adams, Elwood, Store	MASSACHUSETTS	Worcester	156 Main St.	3/5/1980
80000483	Adriatic Mills	MASSACHUSETTS	Worcester	3-35 Armory St.	3/5/1980
89002392	Ahern, Catherine, Three-Decker	MASSACHUSETTS	Worcester	215 Cambridge St.	2/9/1990
80000544	Alexander, Arad, House	MASSACHUSETTS	Worcester	53 Waverly St.	3/5/1980
80000579	Allen, Charles, House	MASSACHUSETTS	Worcester	65 Elm St.	3/5/1980
68000018	American Antiquarian Society	MASSACHUSETTS	Worcester	185 Salisbury St.	11/24/1968
89002355	Anderson, Ludwig, Three-Decker	MASSACHUSETTS	Worcester	4 Fairbanks St.	2/9/1990
80000598	Armsby Block	MASSACHUSETTS	Worcester	144-148 Main St.	3/5/1980
80000542	Ash Street School	MASSACHUSETTS	Worcester	Ash St.	3/5/1980
80000489	Ashworth and Jones Factory	MASSACHUSETTS	Worcester	1511 Main St.	3/5/1980
88000429	Aurora Hotel	MASSACHUSETTS	Worcester	652--660 Main St.	4/28/1988
80000611	Babcock Block	MASSACHUSETTS	Worcester	600 Main St.	3/5/1980
89002445	Baker, Peter, Three-Decker	MASSACHUSETTS	Worcester	90 Vernon St.	2/9/1990
80000614	Bancroft Hotel	MASSACHUSETTS	Worcester	50 Franklin St.	3/5/1980
80000524	Bancroft Tower	MASSACHUSETTS	Worcester	Bancroft Tower Rd.	3/5/1980
80000569	Bannister, Emory, House	MASSACHUSETTS	Worcester	3 Harvard St.	3/5/1980
80000592	Barker, Richard, Octagon House	MASSACHUSETTS	Worcester	312 Plantation St.	3/5/1980
89002429	Battelle, Marion, Three-Decker	MASSACHUSETTS	Worcester	13 Preston St.	2/9/1990
80000538	Beacon Street Firehouse	MASSACHUSETTS	Worcester	108 Beacon St.	3/5/1980
89002377	Beaver Street Historic District	MASSACHUSETTS	Worcester	31--39 Beaver St.	2/9/1990
80000560	Bentley, George, House	MASSACHUSETTS	Worcester	9 Earle St.	3/5/1980
80000497	Bliss Building	MASSACHUSETTS	Worcester	26 Old Lincoln St.	3/5/1980
89002417	Blodgett, Lydia, Three-Decker	MASSACHUSETTS	Worcester	167 Eastern Ave.	2/9/1990
80000593	Bloomingdale Firehouse	MASSACHUSETTS	Worcester	676 Franklin St.	3/5/1980
80000562	Bloomingdale School	MASSACHUSETTS	Worcester	327 Plantation St.	3/5/1980
80000590	Borden-Pond House	MASSACHUSETTS	Worcester	40 Laurel St.	3/5/1980
89002414	Bostrom, Eric, Three-Decker	MASSACHUSETTS	Worcester	152 Eastern Ave.	2/9/1990
00001394	Boulevard Diner	MASSACHUSETTS	Worcester	155 Shrewsbury St.	11/22/2000
89002360	Bousquet, Henry, Three-Decker	MASSACHUSETTS	Worcester	8/10 Fairmont Ave.	2/9/1990
80000540	Boynton and Windsor	MASSACHUSETTS	Worcester	718 and 720 Main St.	3/5/1980
80000635	Brightside Apartments	MASSACHUSETTS	Worcester	2 King St.	3/5/1980
80000516	Brooks, John, House	MASSACHUSETTS	Worcester	12 Nelson Pl.	3/5/1980
80000487	Cambridge Street Firehouse	MASSACHUSETTS	Worcester	534 Cambridge St.	3/5/1980
80000484	Cambridge Street School	MASSACHUSETTS	Worcester	510 Cambridge St.	3/5/1980
89002415	Carlson, Eric, Three-Decker	MASSACHUSETTS	Worcester	154 Eastern Ave.	2/9/1990
80000625	Castle Street Row	MASSACHUSETTS	Worcester	4-18 Castle St.	3/5/1980
01000120	Castle Street Row--Boundary Increase	MASSACHUSETTS	Worcester	20-24 Castle St.	2/16/2001
80000604	Cathedral of St. Paul	MASSACHUSETTS	Worcester	38 Chatham St.	3/5/1980
03001206	Chadwick Square Diner	MASSACHUSETTS	Worcester	95 rear Prescott St.	11/26/2003
80000518	Chadwick-Brittan House	MASSACHUSETTS	Worcester	309 Lincoln St.	3/5/1980
80000596	Chamberlain, Charles, House	MASSACHUSETTS	Worcester	373 Pleasant St.	3/5/1980
80000519	Chamberlain-Flagg House	MASSACHUSETTS	Worcester	2 Brookshire Dr.	3/5/1980
80000547	Clark University	MASSACHUSETTS	Worcester	Clark University Campus	3/5/1980
80000571	Cobb, George, House	MASSACHUSETTS	Worcester	24 William St.	3/5/1980
80000610	Colton's Block	MASSACHUSETTS	Worcester	588 Main St.	3/5/1980
80000563	Copeland, Samuel, House	MASSACHUSETTS	Worcester	31 Harvard St.	3/5/1980
00001286	Corner Lunch	MASSACHUSETTS	Worcester	133 Lamartine St.	11/15/2000
89002383	Crabtree, Thomas, Three-Decker	MASSACHUSETTS	Worcester	22 Haynes St.	2/9/1990
80000552	Crawford, Elias, House	MASSACHUSETTS	Worcester	3 Norwood St.	3/5/1980
80000541	Crompton Loom Works	MASSACHUSETTS	Worcester	132-142 Green St.	3/5/1980
89002379	Crystal Street Historic District	MASSACHUSETTS	Worcester	30--34 Crystal St.	2/9/1990
80000526	Daniels, Frederick, House	MASSACHUSETTS	Worcester	148 Lincoln St.	3/5/1980
80000546	Dartmouth Street School	MASSACHUSETTS	Worcester	13 Dartmouth St.	3/5/1980
80000578	Davis, Isaac, House	MASSACHUSETTS	Worcester	1 Oak St.	3/5/1980
80000574	Davis, Joseph, House	MASSACHUSETTS	Worcester	41 Elm St.	3/5/1980
89002398	Davis, Rodney, Three-Decker	MASSACHUSETTS	Worcester	62 Catharine St.	2/9/1990
89002386	Davis, Wesley, Three-Decker	MASSACHUSETTS	Worcester	7 Albert St.	2/9/1990
09000618	Day Building	MASSACHUSETTS	Worcester	300-310 Main St.	9/13/1978
02001471	Dean, Frank L. and Mabel H., House	MASSACHUSETTS	Worcester	10 Cedar St.	12/5/2002
89002390	Dean, Mary, Three-Decker	MASSACHUSETTS	Worcester	130 Belmont St.	2/9/1990
89002396	Delsignore, Louis, Three-Decker	MASSACHUSETTS	Worcester	12 Imperial Rd.	2/9/1990
80000580	Dewey Francis, House	MASSACHUSETTS	Worcester	71 Elm St.	3/5/1980
02000155	Dodge Block and Sawyer Building, Bancroft Trust Building	MASSACHUSETTS	Worcester	60 Franklin St.	3/15/2002
89002427	Dodge, Helen, Three-Decker	MASSACHUSETTS	Worcester	570 Pleasant St.	2/9/1990
89002406	Doran, Thomas F., Three-Decker	MASSACHUSETTS	Worcester	27 John St.	2/9/1990
80000627	Dowley-Taylor House	MASSACHUSETTS	Worcester	770 Main St.	3/5/1980
80000621	Downing Street School	MASSACHUSETTS	Worcester	92 Downing St.	3/5/1980
89002384	Drew, Elvira, Three-Decker	MASSACHUSETTS	Worcester	42 Abbott St.	2/9/1990
89002425	Duke, Philip, Three-Decker	MASSACHUSETTS	Worcester	7 Maxwell St.	2/9/1990
89002430	Dworman, David, Three-Decker	MASSACHUSETTS	Worcester	159 Providence St.	2/9/1990
80000618	East Worcester School-Norcross Factory	MASSACHUSETTS	Worcester	10 E. Worcester St.	3/5/1980
80000589	Elizabeth Street School	MASSACHUSETTS	Worcester	31 Elizabeth St.	3/5/1980
70000096	Elm Park	MASSACHUSETTS	Worcester	Elm Park	7/1/1970
89002374	Elm Street Historic District	MASSACHUSETTS	Worcester	132--148 Elm St.	2/9/1990
80000536	Emmanuel Baptist	MASSACHUSETTS	Worcester	717 Main St.	3/5/1980

Ref#	Property Name	State	City	Street & Number	Listed Date
80000601	English High School	MASSACHUSETTS	Worcester	20 Irving St.	3/5/1980
80000608	Enterprise Building	MASSACHUSETTS	Worcester	540 Main St.	3/5/1980
89002438	Erikson, Knut, Three-Decker	MASSACHUSETTS	Worcester	19 Stanton St.	2/9/1990
89002357	Euclid Avenue--Montrose Street Historic District	MASSACHUSETTS	Worcester	Along Euclid Ave. and Montrose St., between Vernon St. and Perry Ave.	2/9/1990
80000594	Fairlawn	MASSACHUSETTS	Worcester	189 May St.	3/5/1980
89002372	Fay Street Historic District	MASSACHUSETTS	Worcester	4--6 Fay St.	2/9/1990
80000631	Fitch, C.H., House	MASSACHUSETTS	Worcester	15 Oread St.	3/5/1980
80000515	Flagg, Amos, House	MASSACHUSETTS	Worcester	246 Burncoat St.	3/5/1980
80000620	Flagg, Benjamin, House	MASSACHUSETTS	Worcester	136 Plantation St.	3/5/1980
89002362	Flagg, Levi, Three-Decker	MASSACHUSETTS	Worcester	79 Florence St.	2/9/1990
89002447	Fontaine, George, Three-Decker	MASSACHUSETTS	Worcester	141 Vernon St.	2/9/1990
80000636	Forbes, William Trowbridge, House	MASSACHUSETTS	Worcester	23 Trowbridge Rd.	3/5/1980
80000529	Forest Hill Cottage	MASSACHUSETTS	Worcester	22 Windsor St.	3/5/1980
80000482	Freeland Street School	MASSACHUSETTS	Worcester	12 Freeland St.	3/5/1980
89002387	Friberg, Andrew, Three-Decker	MASSACHUSETTS	Worcester	26 Ames St.	2/9/1990
75000303	G.A.R. Hall	MASSACHUSETTS	Worcester	55 Pearl St.	3/13/1975
80000523	Gabriel, George, House	MASSACHUSETTS	Worcester	31 Lenox St.	3/5/1980
80000561	Gale, George, House	MASSACHUSETTS	Worcester	15 Elizabeth St.	3/5/1980
89002356	Giguere, Thomas, Three-Decker	MASSACHUSETTS	Worcester	18 Fairhaven Rd.	2/9/1990
00001342	Gilman Block	MASSACHUSETTS	Worcester	207-219 Main St.	11/20/2000
80000555	Goddard House	MASSACHUSETTS	Worcester	12 Catherine St.	3/5/1980
80000525	Goddard, Harry, House	MASSACHUSETTS	Worcester	190 Salisbury St.	3/5/1980
07001202	Goldberg Building	MASSACHUSETTS	Worcester	97-103 Water St.	11/19/2007
80000564	Goulding, Henry, House	MASSACHUSETTS	Worcester	26 Harvard St.	3/5/1980
80000566	Goulding, W.H., House	MASSACHUSETTS	Worcester	4 Dix St.	3/5/1980
80000545	Grafton Street School	MASSACHUSETTS	Worcester	311 Grafton St.	3/5/1980
80000522	Green Hill Park Shelter	MASSACHUSETTS	Worcester	Green Hill Parkway	3/5/1980
80000511	Greendale Branch Library	MASSACHUSETTS	Worcester	470 W. Boylston St.	3/5/1980
76000949	Greendale Village Improvement Society Building	MASSACHUSETTS	Worcester	480 W. Boylston St.	11/7/1976
89002388	Gullberg, Evert, Three-Decker	MASSACHUSETTS	Worcester	18 Ashton St.	2/9/1990
11000068	Hadley Furniture Company Building	MASSACHUSETTS	Worcester	651-659 Main St	3/1/2011
89002433	Hadley, Gilbert, Three-Decker	MASSACHUSETTS	Worcester	31 Russell St.	2/9/1990
89002423	Hall, Charles A., Three-Decker	MASSACHUSETTS	Worcester	68 Mason St.	2/9/1990
80000531	Hammond Heights	MASSACHUSETTS	Worcester	Properties along Germain, Haviland, Highland, and Westland Sts. and Institute Rd.	3/5/1980
80000632	Hammond Organ Factory	MASSACHUSETTS	Worcester	9 May St.	3/5/1980
80000543	Harding-Winter Street Manufacturing District	MASSACHUSETTS	Worcester	28-88 Winter St.	3/5/1980
80000602	Harris-Merrick House	MASSACHUSETTS	Worcester	41 Fruit St.	3/5/1980
80000572	Hastins, John, Cottage	MASSACHUSETTS	Worcester	31 William St.	3/5/1980
80000514	Higgins Armory Museum	MASSACHUSETTS	Worcester	100 Barber Ave.	3/5/1980
80000496	Higgins, Aldus Chapin, House	MASSACHUSETTS	Worcester	1 John Wing Rd.	3/5/1980
89002420	Hirst, Samuel, Three-Decker	MASSACHUSETTS	Worcester	90 Lovell St.	2/9/1990
80000582	Hobbs, Marcus, House	MASSACHUSETTS	Worcester	16 William St.	3/5/1980
80000576	Hogg, William, House	MASSACHUSETTS	Worcester	54 Elm St.	3/5/1980
80000491	Holy Cross College	MASSACHUSETTS	Worcester	Holy Cross College Campus	3/5/1980
88000721	Holy Name of Jesus Complex	MASSACHUSETTS	Worcester	Illinois St.	6/9/1988
97001560	Hope Cemetery	MASSACHUSETTS	Worcester	119 Webster St.	12/22/1997
89002371	Houghton Street Historic District	MASSACHUSETTS	Worcester	Houghton St. between Palm and Dorchester Sts.	2/9/1990
89002451	Hunt, Daniel, Three-Decker	MASSACHUSETTS	Worcester	9 Wyman St.	2/9/1990
89002412	Hunt, David, Three-Decker	MASSACHUSETTS	Worcester	26 Louise St.	2/9/1990
80000535	I00F Building	MASSACHUSETTS	Worcester	674 Main St.	3/5/1980
80000510	Indian Hill-North Village	MASSACHUSETTS	Worcester	properties along Ararat St. and Delaval, Heroult, Marconi, Watt, and Westinghouse Rds.	3/5/1980
89002369	Ingleside Avenue Historic District	MASSACHUSETTS	Worcester	218--220 and 226--228 Ingleside Ave.	2/9/1990
89002363	Ingraham, Harry B., Three-Decker	MASSACHUSETTS	Worcester	19 Freeland St.	2/9/1990
80000554	Institutional District	MASSACHUSETTS	Worcester	Properties on Lincoln and Wheaton Squares and on Salisbury and Tuckerman Sts.	3/5/1980
89002389	Johnson, Edwin, Three-Decker	MASSACHUSETTS	Worcester	183 Austin St.	2/9/1990
89002416	Johnson, John and Edward, Three-Decker	MASSACHUSETTS	Worcester	31 Louise St.	2/9/1990
89002408	Johnson, John, Three-Decker	MASSACHUSETTS	Worcester	140 Eastern Ave.	2/9/1990
89002437	Johnson, Paul, Three-Decker	MASSACHUSETTS	Worcester	7 Stanton St.	2/9/1990
80000533	Junction Shop and Herman Street District	MASSACHUSETTS	Worcester	Properties on Jackson, Herman, and Beacon Sts.	3/5/1980
89002411	Kaller, Erick, Three-Decker	MASSACHUSETTS	Worcester	146 Eastern Ave.	2/9/1990
89002413	Kaller, Erick, Three-Decker	MASSACHUSETTS	Worcester	148 Eastern Ave.	2/9/1990
80000575	Katz and Leavitt Apartment House	MASSACHUSETTS	Worcester	53 Elm St.	3/5/1980
80000520	Knollwood	MASSACHUSETTS	Worcester	425 Salisbury St.	3/5/1980
80000628	Knowles, Lucius, House	MASSACHUSETTS	Worcester	838 Main St.	3/5/1980
80000492	Larchmont	MASSACHUSETTS	Worcester	36 Butler St.	3/5/1980
89002443	Larson, Swan, Three-Decker	MASSACHUSETTS	Worcester	12 Summerhill Ave.	2/9/1990
80000623	Legg, John, House	MASSACHUSETTS	Worcester	5 Claremont St.	3/5/1980
89002446	Levenson, Morris, Three-Decker	MASSACHUSETTS	Worcester	38 Plantation St.	2/9/1990
74002046	Liberty Farm	MASSACHUSETTS	Worcester	116 Mower St.	9/13/1974

Ref#	Property Name	State	City	Street & Number	Listed Date
80000570	Lincoln Estate-Elm Park Historic District	MASSACHUSETTS	Worcester	Properties along Cedar, Fruit, Oak, Sever, West, and William Sts.	3/5/1980
80000573	Lincoln, Gov. Levi, House	MASSACHUSETTS	Worcester	4 Avalon Pl.	3/5/1980
80000613	Lower Pleasant Street District	MASSACHUSETTS	Worcester	418-426 Main St. and 9-49 Pleasant St.	3/5/1980
89002403	Lumb, Thomas, Three-Decker	MASSACHUSETTS	Worcester	80 Dewey St.	2/9/1990
89002448	Lumb, Thomas, Three-Decker	MASSACHUSETTS	Worcester	44 Winfield St.	2/9/1990
89002399	Lundberg, Charles, Three-Decker	MASSACHUSETTS	Worcester	67 Catharine St.	2/9/1990
89002434	Magnuson, Charles, Three-Decker	MASSACHUSETTS	Worcester	56/58 Olga Ave.	2/9/1990
84000096	Malvern Road School	MASSACHUSETTS	Worcester	Malvern Rd. and Southbridge St.	10/4/1984
80000567	Marble, Jerome, House	MASSACHUSETTS	Worcester	23 Harvard St.	3/5/1980
89002435	Mark, John, Three-Decker	MASSACHUSETTS	Worcester	24 Sigel St.	2/9/1990
80000583	Marsh, Alexander, House	MASSACHUSETTS	Worcester	57 Elm St.	3/5/1980
80000537	Masonic Temple	MASSACHUSETTS	Worcester	Ionic Ave.	3/5/1980
71000356	Massachusetts Avenue Historic District	MASSACHUSETTS	Worcester	Between Salisbury St. and Drury Lane	12/16/1971
89002380	Massad, Anthony, Three-Decker	MASSACHUSETTS	Worcester	14 Harlow St.	2/9/1990
80000622	May Street Historic District	MASSACHUSETTS	Worcester	Properties from 29 to 46 May St.	3/5/1980
89002395	McCafferty, Elizabeth, Three-Decker	MASSACHUSETTS	Worcester	45 Canterbury St.	2/9/1990
89002442	McCarron, Andrew, Three-Decker	MASSACHUSETTS	Worcester	3 Pitt St.	2/9/1990
89002366	McDermott, John B., Three-Decker	MASSACHUSETTS	Worcester	21 Freeland St.	2/9/1990
80000517	McFarland, William, House	MASSACHUSETTS	Worcester	525 Salisbury St.	3/5/1980
89002407	McGrath, Patrick, Three-Decker	MASSACHUSETTS	Worcester	50 Dorchester St.	2/9/1990
89002439	McGuinness, Patrick, Three-Decker	MASSACHUSETTS	Worcester	25 Suffield St.	2/9/1990
89002436	McPartland, Frank, Three-Decker	MASSACHUSETTS	Worcester	61 Paine St.	2/9/1990
89002428	McPartland, James, Three-Decker	MASSACHUSETTS	Worcester	17 Pond St.	2/9/1990
72000152	Mechanics Hall	MASSACHUSETTS	Worcester	321 Main St.	11/9/1972
80000577	Mechanics' Hall District	MASSACHUSETTS	Worcester	Properties between 282 and 343 Main St.	3/5/1980
80000581	Merrill Double House	MASSACHUSETTS	Worcester	18-20 West St.	3/5/1980
80000527	Miles, Charles, House	MASSACHUSETTS	Worcester	131 Lincoln St.	3/5/1980
03001178	Miss Worcester Diner	MASSACHUSETTS	Worcester	302 Southbridge St.	11/21/2003
80000616	Mission Chapel	MASSACHUSETTS	Worcester	205 Summer St.	3/5/1980
80000521	Montvale	MASSACHUSETTS	Worcester	Properties along Monadnock, Sagamore, Waconah, and Whitman Rds., and Salisbury St.	3/5/1980
80000557	Moore, Jesse, House	MASSACHUSETTS	Worcester	25 Catherine St.	3/5/1980
89002432	Munroe, Sarah, Three-Decker	MASSACHUSETTS	Worcester	11 Rodney St.	2/9/1990
89002404	Murphy, Patrick, Three-Decker	MASSACHUSETTS	Worcester	31 Jefferson St.	2/9/1990
89002391	Nelson, Christina, Three-Decker	MASSACHUSETTS	Worcester	45 Butler St.	2/9/1990
80000508	Newton, Charles, House	MASSACHUSETTS	Worcester	24 Brattle St.	3/5/1980
09000142	Newton, S.D., House	MASSACHUSETTS	Worcester	8 Sycamore St.	3/5/1980
80000624	Norcross Brothers Houses	MASSACHUSETTS	Worcester	16, 18 Claremont St.	3/5/1980
80000512	North Worcester Aid Society	MASSACHUSETTS	Worcester	58 Holden St.	3/5/1980
89002441	O'Brien, Richard, Three-Decker	MASSACHUSETTS	Worcester	43 Suffolk St.	2/9/1990
89002419	O'Connor, James, Three-Decker	MASSACHUSETTS	Worcester	23 Endicott St.	2/9/1990
89002393	O'Connor, James--John Trybowski Three-Decker	MASSACHUSETTS	Worcester	21 Canton St.	2/9/1990
80000513	Odd Fellows' Home	MASSACHUSETTS	Worcester	40 Randolph Rd.	3/5/1980
80000585	Old State Mutual Building	MASSACHUSETTS	Worcester	240 Main St.	3/5/1980
100002161	Osgood Bradley Building	MASSACHUSETTS	Worcester	18 Grafton St.	3/5/2018
80000605	Oxford-Crown Extension District	MASSACHUSETTS	Worcester	Properties along Ashland, Austin, Chatham, Congress, Crown, and Pleasant Sts.	3/5/1980
76000954	Oxford-Crown Historic District	MASSACHUSETTS	Worcester	Roughly bounded by Chatham, Congress, Crown, Pleasant, Oxford Sts. and Oxford Pl.	5/6/1976
76000948	Paine, Timothy, House	MASSACHUSETTS	Worcester	140 Lincoln St.	4/30/1976
80000607	Park Building	MASSACHUSETTS	Worcester	507 Main St.	3/5/1980
89002367	Perry Avenue Historic District	MASSACHUSETTS	Worcester	49--55 Perry Ave.	2/9/1990
89002358	Petterson, Lars--Adolph Carlson Three-Decker	MASSACHUSETTS	Worcester	76 Fairhaven Rd.	2/9/1990
89002368	Petterson, Lars--Fred Gurney Three-Decker	MASSACHUSETTS	Worcester	2 Harlow St.	2/9/1990
89002359	Petterson, Lars--Silas Archer Three-Decker	MASSACHUSETTS	Worcester	80 Fairhaven Rd.	2/9/1990
89002376	Petterson,Lars--James Reidy Three-Decker	MASSACHUSETTS	Worcester	4 Harlow St.	2/9/1990
80000551	Pilgrim Congregational Church	MASSACHUSETTS	Worcester	909 Main St.	3/5/1980
80000597	Pleasant Street Firehouse	MASSACHUSETTS	Worcester	408 Pleasant St.	3/5/1980
10001122	Poli's Palace Theater	MASSACHUSETTS	Worcester	2 Southbridge St	1/10/2011
80000558	Prentiss, Addison, House	MASSACHUSETTS	Worcester	3 Channing Way	3/5/1980
80000553	Providence Street Firehouse	MASSACHUSETTS	Worcester	98 Providence St.	3/5/1980
89002381	Providence Street Historic District	MASSACHUSETTS	Worcester	127--145 Providence St.	2/9/1990
89002444	Provost, Arthur, Three-Decker	MASSACHUSETTS	Worcester	30 Thorne St.	2/9/1990
80000565	Putnam, Otis, House	MASSACHUSETTS	Worcester	25 Harvard St.	3/5/1980
80000494	Quinsigamond Branch Library	MASSACHUSETTS	Worcester	812 Millbury St.	3/5/1980
80000495	Quinsigamond Firehouse	MASSACHUSETTS	Worcester	837 Millbury St.	3/5/1980
80000568	Raymond, Tilley, House	MASSACHUSETTS	Worcester	12 George St.	3/5/1980
89002422	Reed, Frank, Three-Decker	MASSACHUSETTS	Worcester	913/915 Main St.	2/9/1990
80000507	Rice, Ezra, House	MASSACHUSETTS	Worcester	1133 W. Boylston St.	3/5/1980
85002783	Richmond, Willard, Apartment Block	MASSACHUSETTS	Worcester	43 Austin St.	11/7/1985

Ref#	Property Name	State	City	Street & Number	Listed Date
89002431	Ridyard, Albert, Three-Decker	MASSACHUSETTS	Worcester	5 Mount Pleasant St.	2/9/1990
89002402	Ridyard, B. E., Three-Decker	MASSACHUSETTS	Worcester	29 Dewey St.	2/9/1990
89002405	Riordan, John, Three-Decker	MASSACHUSETTS	Worcester	8 Dix St.	2/9/1990
89002397	Roynane, Catharine, Three-Decker	MASSACHUSETTS	Worcester	18 Ingalls St.	2/9/1990
80000556	Ruggles, Draper, House	MASSACHUSETTS	Worcester	21 Catherine St.	3/5/1980
85002782	Russell, The	MASSACHUSETTS	Worcester	49 Austin St.	11/7/1985
80000587	Salisbury Factory Building	MASSACHUSETTS	Worcester	25 Union St.	3/5/1980
80000588	Salisbury Factory Building	MASSACHUSETTS	Worcester	49-51 Union St.	3/5/1980
75000837	Salisbury House	MASSACHUSETTS	Worcester	61 Harvard St.	6/10/1975
75000838	Salisbury Mansion and Store	MASSACHUSETTS	Worcester	30, 40 Highland St.	5/30/1975
80000634	Schofield, James, House	MASSACHUSETTS	Worcester	3 Mt. Pleasant St.	3/5/1980
90000729	Shaarai Torah Synagogue	MASSACHUSETTS	Worcester	32 Providence St.	5/7/1990
80000626	Shattuck, Moody, House	MASSACHUSETTS	Worcester	768 Main St.	3/5/1980
89002400	Shea, Bridget, Three-Decker	MASSACHUSETTS	Worcester	21 Jefferson St.	2/9/1990
89002440	Simpson, Clara, Three-Decker	MASSACHUSETTS	Worcester	69 Piedmont St.	2/9/1990
80000609	Slater Building	MASSACHUSETTS	Worcester	390 Main St.	3/5/1980
89002409	Smith, Ellen M., Three-Decker	MASSACHUSETTS	Worcester	22 Kilby St.	2/9/1990
80000629	Smith, Elliot, House	MASSACHUSETTS	Worcester	839 Main St.	3/5/1980
80000509	Smith-Thaxter-Merrifield House	MASSACHUSETTS	Worcester	158 Holden St.	3/5/1980
80000528	Soho Cottage	MASSACHUSETTS	Worcester	21 Windsor St.	3/5/1980
80000550	South Unitarian	MASSACHUSETTS	Worcester	888 Main St.	3/5/1980
80000486	South Worcester Branch Library	MASSACHUSETTS	Worcester	705 Southbridge St.	3/5/1980
80000534	Southbridge-Sargent Manufacturing District	MASSACHUSETTS	Worcester	Southbridge, Sargent, and Gold Sts.	3/5/1980
80000619	St. John`s Catholic Church	MASSACHUSETTS	Worcester	40 Temple St.	3/5/1980
80000481	St. Marks	MASSACHUSETTS	Worcester	Freeland St.	3/5/1980
80000485	St. Matthews	MASSACHUSETTS	Worcester	693 Southbridge St.	3/5/1980
80000548	St. Peters Catholic Church	MASSACHUSETTS	Worcester	935 Main St.	3/5/1980
80000633	Stark, Edward, House	MASSACHUSETTS	Worcester	21 Oread St.	3/5/1980
80000479	Stearns Tavern	MASSACHUSETTS	Worcester	651 Park Ave.	3/5/1980
80000615	Stevens' Building	MASSACHUSETTS	Worcester	24-44 Southbridge St.	3/5/1980
80000532	Stevens, Daniel, House	MASSACHUSETTS	Worcester	7 Sycamore St.	3/5/1980
89002449	Stoliker, Edna, Three-Decker	MASSACHUSETTS	Worcester	41 Plantation St.	2/9/1990
89002450	Stone, Edward, Three-Decker	MASSACHUSETTS	Worcester	8 Wyman St.	2/9/1990
80000591	Sturtevant, Leonard, House	MASSACHUSETTS	Worcester	84 Mulberry St.	3/5/1980
80000559	Swift, D. Wheeler, House	MASSACHUSETTS	Worcester	22 Oak Ave.	3/5/1980
11000019	Thule--Plummer Buildings	MASSACHUSETTS	Worcester	180 and 184 Main St	2/18/2011
80000600	Tower, Horatio, House	MASSACHUSETTS	Worcester	71 Pleasant St.	3/5/1980
89002394	Troupes, John, Three-Decker	MASSACHUSETTS	Worcester	25 Canton St.	2/9/1990
11000161	U.S. Post Office and Courthouse	MASSACHUSETTS	Worcester	595 Main St	4/8/2011
80000599	Union Congregational Church	MASSACHUSETTS	Worcester	5 Chestnut St.	3/5/1980
80000617	Union Station	MASSACHUSETTS	Worcester	Washington Sq.	3/5/1980
80000493	Upsala Street School	MASSACHUSETTS	Worcester	36 Upsala St.	3/5/1980
89002331	Vendome, The, and the St. Ives	MASSACHUSETTS	Worcester	17--19 and 21--23 Chandler St.	2/9/1990
89002361	View Street Historic District	MASSACHUSETTS	Worcester	7--17 and 8--16 View Street	2/9/1990
80000586	Waldo Street Police Station	MASSACHUSETTS	Worcester	Waldo St.	3/5/1980
80000488	Ward Street School-Millbury Street	MASSACHUSETTS	Worcester	389 Millbury St.	3/5/1980
80000439	Washburn and Moen North Works District	MASSACHUSETTS	Worcester	Properties on Grove St.	3/5/1980
80000606	WCIS Bank	MASSACHUSETTS	Worcester	365 Main St.	3/5/1980
80000480	Webster Street Firehouse	MASSACHUSETTS	Worcester	40 Webster St.	3/5/1980
80000539	Wellington Street Apartment House District	MASSACHUSETTS	Worcester	Properties along Jacques Ave., and Wellington and Irving Sts.	3/5/1980
89002426	Wescott, John, Three-Decker	MASSACHUSETTS	Worcester	454 Pleasant St.	2/9/1990
80000603	Wesson, Franklin, House	MASSACHUSETTS	Worcester	8 Claremont St.	3/5/1980
77000653	Whitcomb House	MASSACHUSETTS	Worcester	51 Harvard St.	11/9/1977
80000499	Whitcomb Mansion	MASSACHUSETTS	Worcester	51 Harvard St.	3/5/1980
80000490	Whittall Mills	MASSACHUSETTS	Worcester	properties off Brussels St.	3/5/1980
89002365	Woodford Street Historic District	MASSACHUSETTS	Worcester	35--39 and 38--40 Woodford St.	2/9/1990
80000630	Woodland Street Firehouse	MASSACHUSETTS	Worcester	36 Woodland St.	3/5/1980
80000549	Woodland Street Historic District	MASSACHUSETTS	Worcester	Properties along Hawthorne, Loudon, Norwood, and Woodland Sts.	3/5/1980
80000478	Worcester Academy	MASSACHUSETTS	Worcester	Worcester Academy Campus	3/5/1980
80000530	Worcester Asylum and related buildings	MASSACHUSETTS	Worcester	305 Belmont St.	3/5/1980
00001343	Worcester Bleach and Dye Works	MASSACHUSETTS	Worcester	60 Fremont St.	11/8/2000
78001405	Worcester City Hall and Common	MASSACHUSETTS	Worcester	455 Main St.	3/29/1978
84000097	Worcester Corset Company Factory	MASSACHUSETTS	Worcester	30 Wyman St.	10/4/1984
78000472	Worcester Five Cents Savings Bank	MASSACHUSETTS	Worcester	316 Main St.	9/13/1978
80000612	Worcester Market Building	MASSACHUSETTS	Worcester	831 Main St.	3/5/1980
100001262	Worcester State Hospital Farmhouse	MASSACHUSETTS	Worcester	361 Plantation St.	7/3/2017
89002401	Zemaitis, Anthony, Three-Decker	MASSACHUSETTS	Worcester	35 Dartmouth St.	2/9/1990

APPENDIX C

Endangered Species Act Documentation

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

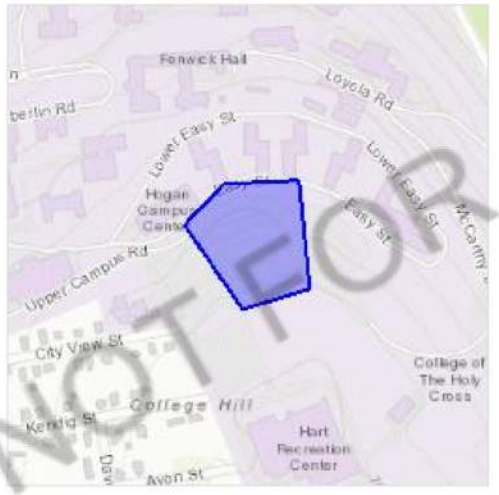
IPaC resource list

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

Worcester County, Massachusetts



Local office

New England Ecological Services Field Office

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

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

http://www.fws.gov/newengland

Endangered species

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

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

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

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

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

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

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

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
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
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere

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.

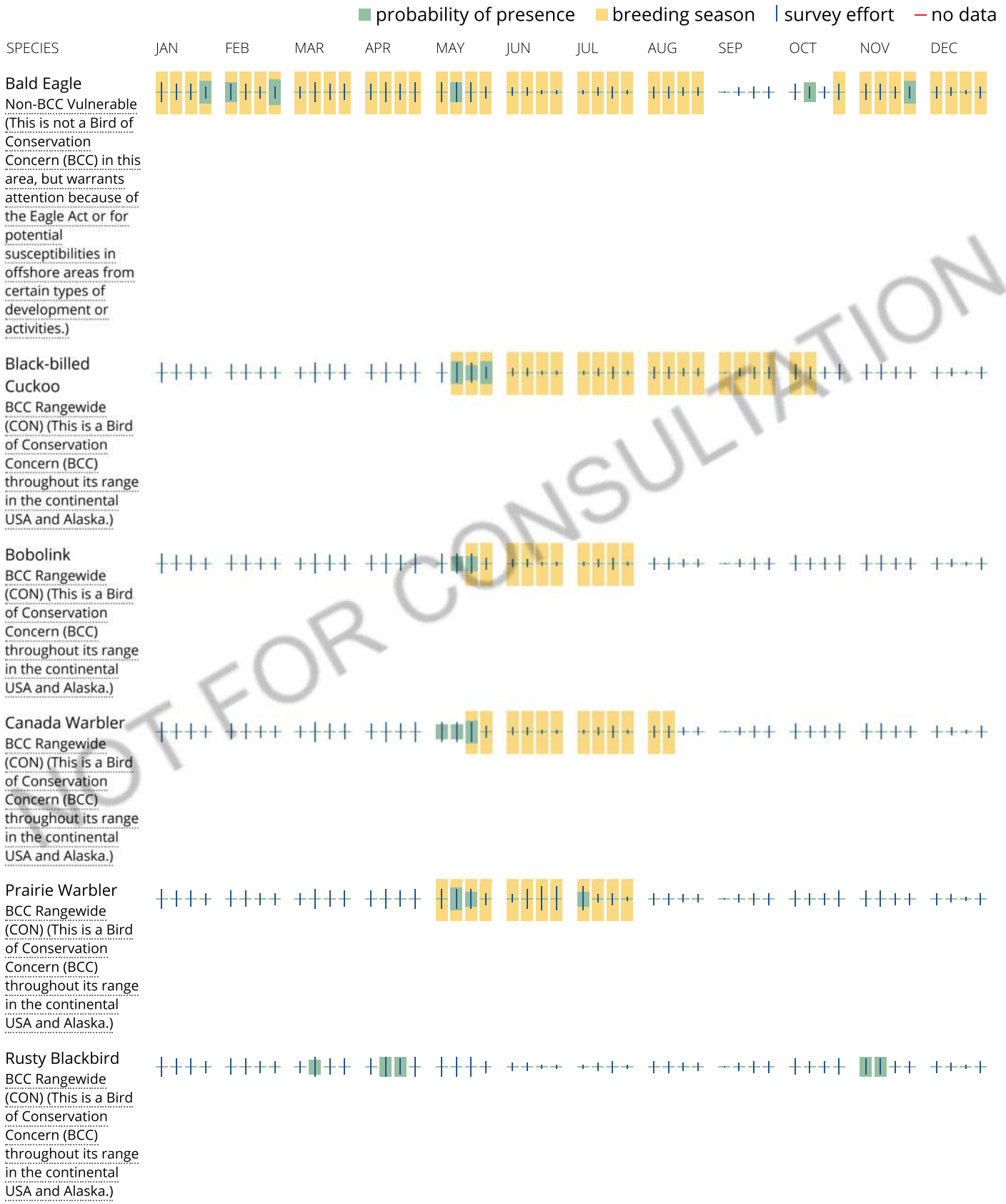
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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.



Wood Thrush
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 AKN Phenology Tool.

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

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

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

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

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

What are the levels of concern for migratory birds?

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

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

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

Details about birds that are potentially affected by offshore projects

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.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

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

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

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

Data exclusions

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

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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

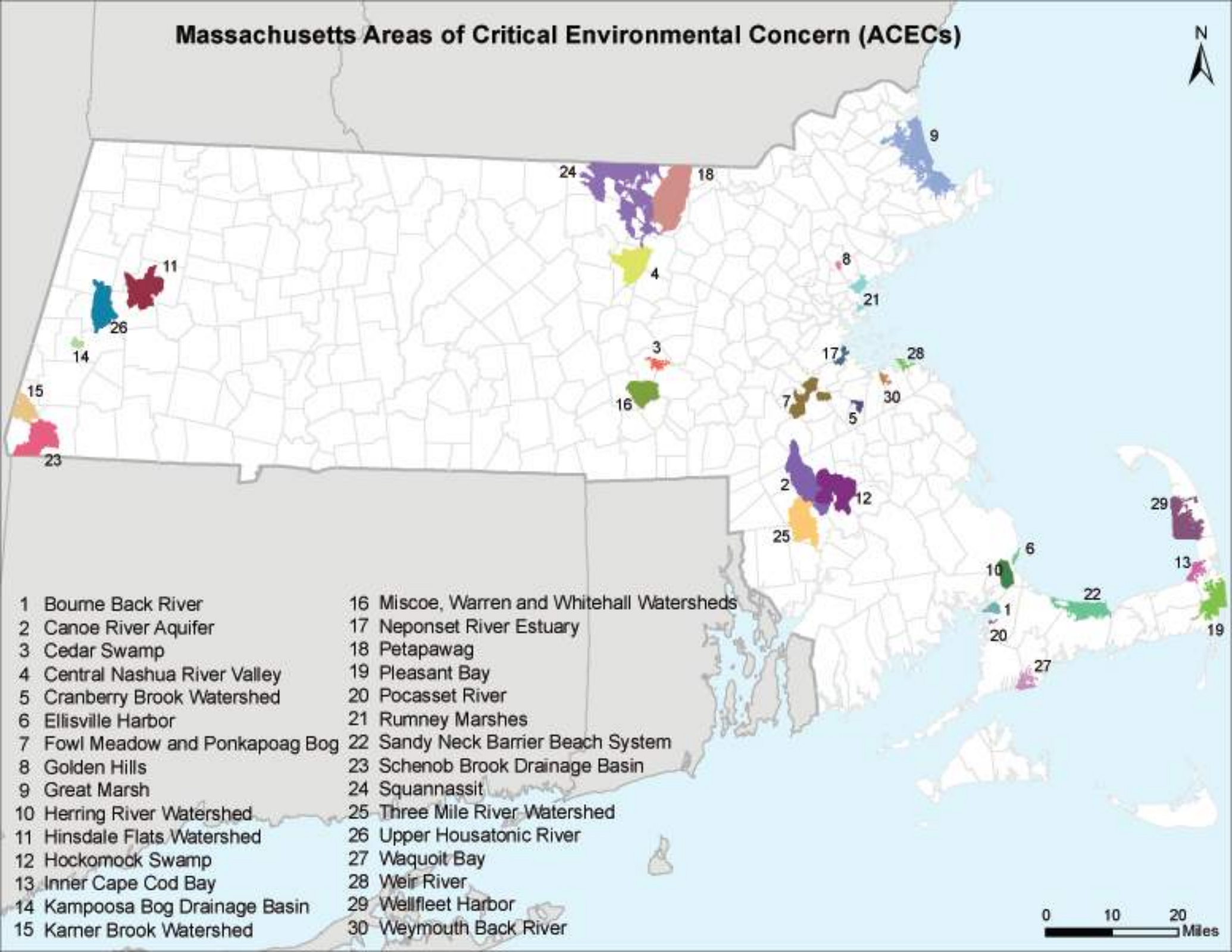
COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Plymouth	Piping Plover	Threatened	Coastal Beaches	Scituate, Marshfield, Duxbury, Plymouth, Wareham and Mattapoisett
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Kingston, Middleborough, Carver, Plymouth, Bourne, Wareham, 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

Massachusetts Areas of Critical Environmental Concern (ACECs)



MASSACHUSETTS AREAS OF CRITICAL ENVIRONMENTAL CONCERN
November 2010

Total Approximate Acreage: 268,000 acres
Approximate acreage and designation date follow ACEC names below.

Bourne Back River
(1,850 acres, 1989) Bourne

Canoe River Aquifer and Associated Areas (17,200 acres, 1991) Easton, Foxborough, Mansfield, Norton, Sharon, and Taunton

Cedar Swamp
(1,650 acres, 1975) Hopkinton and Westborough

Central Nashua River Valley
(12,900 acres, 1996) Bolton, Harvard, Lancaster, and Leominster

Cranberry Brook Watershed
(1,050 acres, 1983) Braintree and Holbrook

Ellisville Harbor
(600 acres, 1980) Plymouth

Fowl Meadow and Ponkapoag Bog
(8,350 acres, 1992) Boston, Canton, Dedham, Milton, Norwood, Randolph, Sharon, and Westwood

Golden Hills
(500 acres, 1987) Melrose, Saugus, and Wakefield

Great Marsh (originally designated as Parker River/Essex Bay)
(25,500 acres, 1979) Essex, Gloucester, Ipswich, Newbury, and Rowley

Herring River Watershed
(4,450 acres, 1991) Bourne and Plymouth

Hinsdale Flats Watershed
(14,500 acres, 1992) Dalton, Hinsdale, Peru, and Washington

Hockomock Swamp
(16,950 acres, 1990) Bridgewater, Easton, Norton, Raynham, Taunton, and West Bridgewater

Inner Cape Cod Bay
(2,600 acres, 1985) Brewster, Eastham, and Orleans

Kampoosa Bog Drainage Basin
(1,350 acres, 1995) Lee and Stockbridge

Karner Brook Watershed
(7,000 acres, 1992) Egremont and Mount Washington

Miscoe, Warren, and Whitehall Watersheds
(8,700 acres, 2000) Grafton, Hopkinton, and Upton

Neponset River Estuary
(1,300 acres, 1995) Boston, Milton, and Quincy

Petapawag
(25,680 acres, 2002) Ayer, Dunstable, Groton, Pepperell, and Tyngsborough

Pleasant Bay
(9,240 acres, 1987) Brewster, Chatham, Harwich, and Orleans

Pocasset River
(160 acres, 1980) Bourne

Rumney Marshes
(2,800 acres, 1988) Boston, Lynn, Revere, Saugus, and Winthrop

Sandy Neck Barrier Beach System
(9,130 acres, 1978) Barnstable and Sandwich

Schenob Brook Drainage Basin
(13,750 acres, 1990) Mount Washington and Sheffield

Squannassit
(37,420 acres, 2002) Ashby, Ayer, Groton, Harvard, Lancaster, Lunenburg, Pepperell, Shirley, and Townsend

Three Mile River Watershed
(14,280 acres, 2008) Dighton, Norton, Taunton

Upper Housatonic River
(12,280 acres, 2009) Lee, Lenox, Pittsfield, Washington

Waquoit Bay
(2,580 acres, 1979) Falmouth and Mashpee

Weir River
(950 acres, 1986) Cohasset, Hingham, and Hull

Wellfleet Harbor
(12,480 acres, 1989) Eastham, Truro, and Wellfleet

Weymouth Back River
(800 acres, 1982) Hingham and Weymouth

ACEC acreages above are based on MassGIS calculations and may differ from numbers originally presented in designation documents and other ACEC publications due to improvements in accuracy of GIS data and boundary clarifications. Listed acreages have been rounded to the nearest 50 or 10 depending on whether boundary clarification has occurred. For more information please see, http://www.mass.gov/dcr/stewardship/acec/aboutMaps.htm.

Towns with ACECs within their Boundaries — November 2010

TOWN	ACEC
Ashby	Squannassit
Ayer	Petapawag
	Squannassit
Barnstable	Sandy Neck Barrier Beach System
Bolton	Central Nashua River Valley
Boston	Rumney Marshes
	Fowl Meadow and Ponkapoag Bog
	Neponset River Estuary
Bourne	Pocasset River
	Bourne Back River
	Herring River Watershed
Braintree	Cranberry Brook Watershed
Brewster	Pleasant Bay
	Inner Cape Cod Bay
Bridgewater	Hockomock Swamp
Canton	Fowl Meadow and Ponkapoag Bog
Chatham	Pleasant Bay
Cohasset	Weir River
Dalton	Hinsdale Flats Watershed
Dedham	Fowl Meadow and Ponkapoag Bog
Dighton	Three Mile River Watershed
Dunstable	Petapawag
Eastham	Inner Cape Cod Bay
	Wellfleet Harbor
Easton	Canoe River Aquifer
	Hockomock Swamp
Egremont	Karner Brook Watershed
Essex	Great Marsh
Falmouth	Waquoit Bay
Foxborough	Canoe River Aquifer
Gloucester	Great Marsh
Grafton	Miscoe-Warren-Whitehall Watersheds
Groton	Petapawag
	Squannassit
Harvard	Central Nashua River Valley
	Squannassit
Harwich	Pleasant Bay
Hingham	Weir River
	Weymouth Back River
Hinsdale	Hinsdale Flats Watershed
Holbrook	Cranberry Brook Watershed
Hopkinton	Miscoe-Warren-Whitehall Watersheds
	Cedar Swamp
Hull	Weir River
Ipswich	Great Marsh
Lancaster	Central Nashua River Valley
	Squannassit
Lee	Kampoosa Bog Drainage Basin
	Upper Housatonic River
Lenox	Upper Housatonic River
Leominster	Central Nashua River Valley
Lunenburg	Squannassit
Lynn	Rumney Marshes
Mansfield	Canoe River Aquifer
Mashpee	Waquoit Bay
Melrose	Golden Hills
Milton	Fowl Meadow and Ponkapoag Bog
	Neponset River Estuary
Mt. Washington	Karner Brook Watershed
	Schenob Brook
Newbury	Great Marsh
Norton	Hockomock Swamp
	Canoe River Aquifer
	Three Mile River Watershed
Norwood	Fowl Meadow and Ponkapoag Bog
Orleans	Inner Cape Cod Bay
	Pleasant Bay
Pepperell	Petapawag
	Squannassit
Peru	Hinsdale Flats Watershed
Pittsfield	Upper Housatonic River
Plymouth	Herring River Watershed
	Ellisville Harbor
Quincy	Neponset River Estuary
Randolph	Fowl Meadow and Ponkapoag Bog
Raynham	Hockomock Swamp
Revere	Rumney Marshes
Rowley	Great Marsh
Sandwich	Sandy Neck Barrier Beach System
Saugus	Rumney Marshes
	Golden Hills
Sharon	Canoe River Aquifer
	Fowl Meadow and Ponkapoag Bog
Sheffield	Schenob Brook
Shirley	Squannassit
Stockbridge	Kampoosa Bog Drainage Basin
Taunton	Hockomock Swamp
	Canoe River Aquifer
	Three Mile River Watershed
Truro	Wellfleet Harbor
Townsend	Squannassit
Tyngsborough	Petapawag
Upton	Miscoe-Warren-Whitehall Watersheds
Wakefield	Golden Hills
Washington	Hinsdale Flats Watershed
	Upper Housatonic River
Wellfleet	Wellfleet Harbor
W Bridgewater	Hockomock Swamp
Westborough	Cedar Swamp
Westwood	Fowl Meadow and Ponkapoag Bog
Weymouth	Weymouth Back River
Winthrop	Rumney Marshes

.

MassDEP - Bureau of Waste Site Cleanup

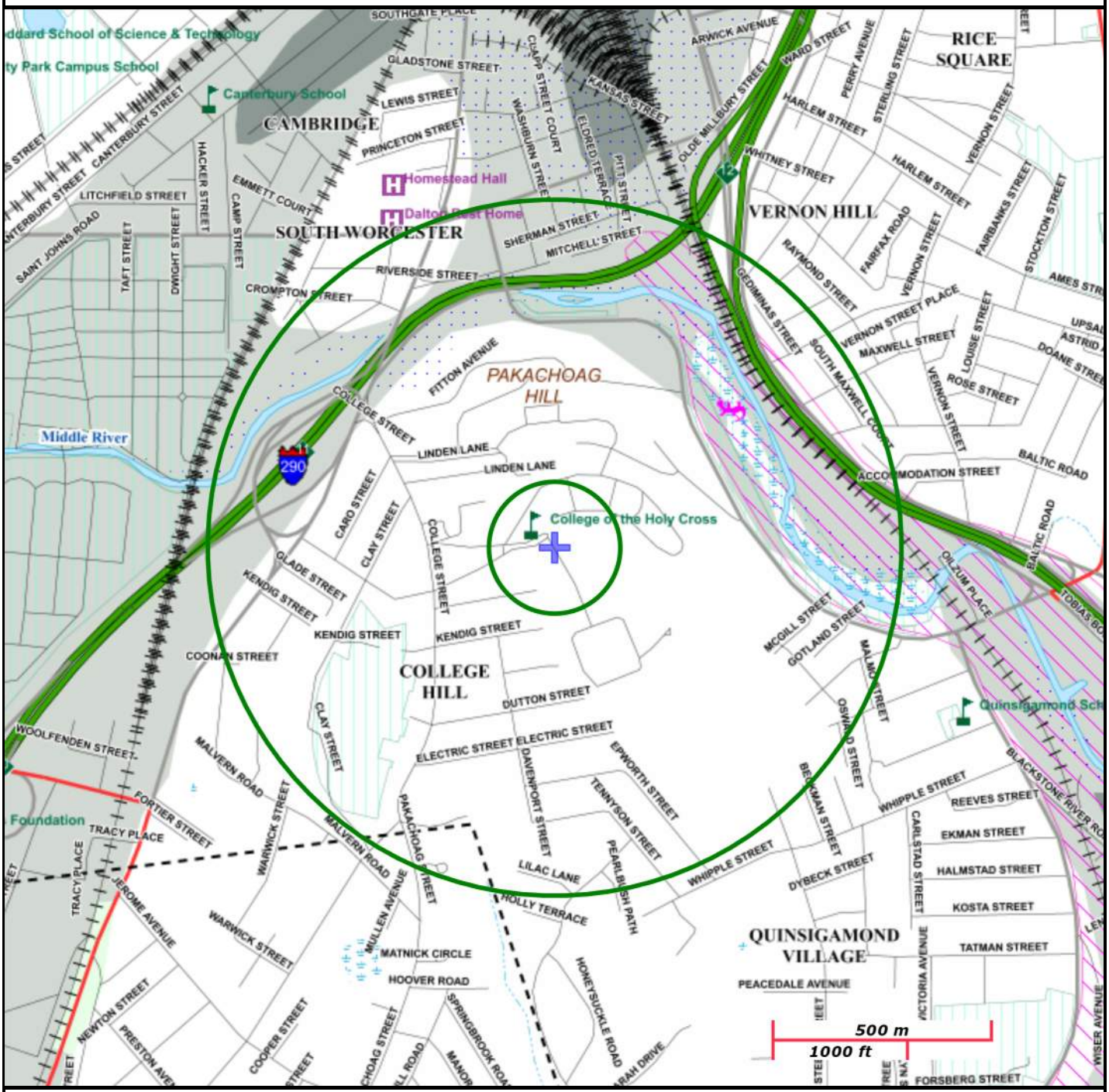
Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

Site Information:
PROPOSED PERFORMING CENTER - HOLY CROSS
1 COLLEGE STREET WORCESTER, MA

NAD83 UTM Meters:
4679916mN , 268331mE (Zone: 19)
May 14, 2019

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.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To:
Consultation Code: 05E1NE00-2019-SLI-1778
Event Code: 05E1NE00-2019-E-04369
Project Name: Holy Cross

May 22, 2019

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2019-SLI-1778

Event Code: 05E1NE00-2019-E-04369

Project Name: Holy Cross

Project Type: DEVELOPMENT

Project Description: Temporary Construction Dewatering

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/42.23714833431903N71.80696863219183W

Counties: Worcester, MA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. 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.

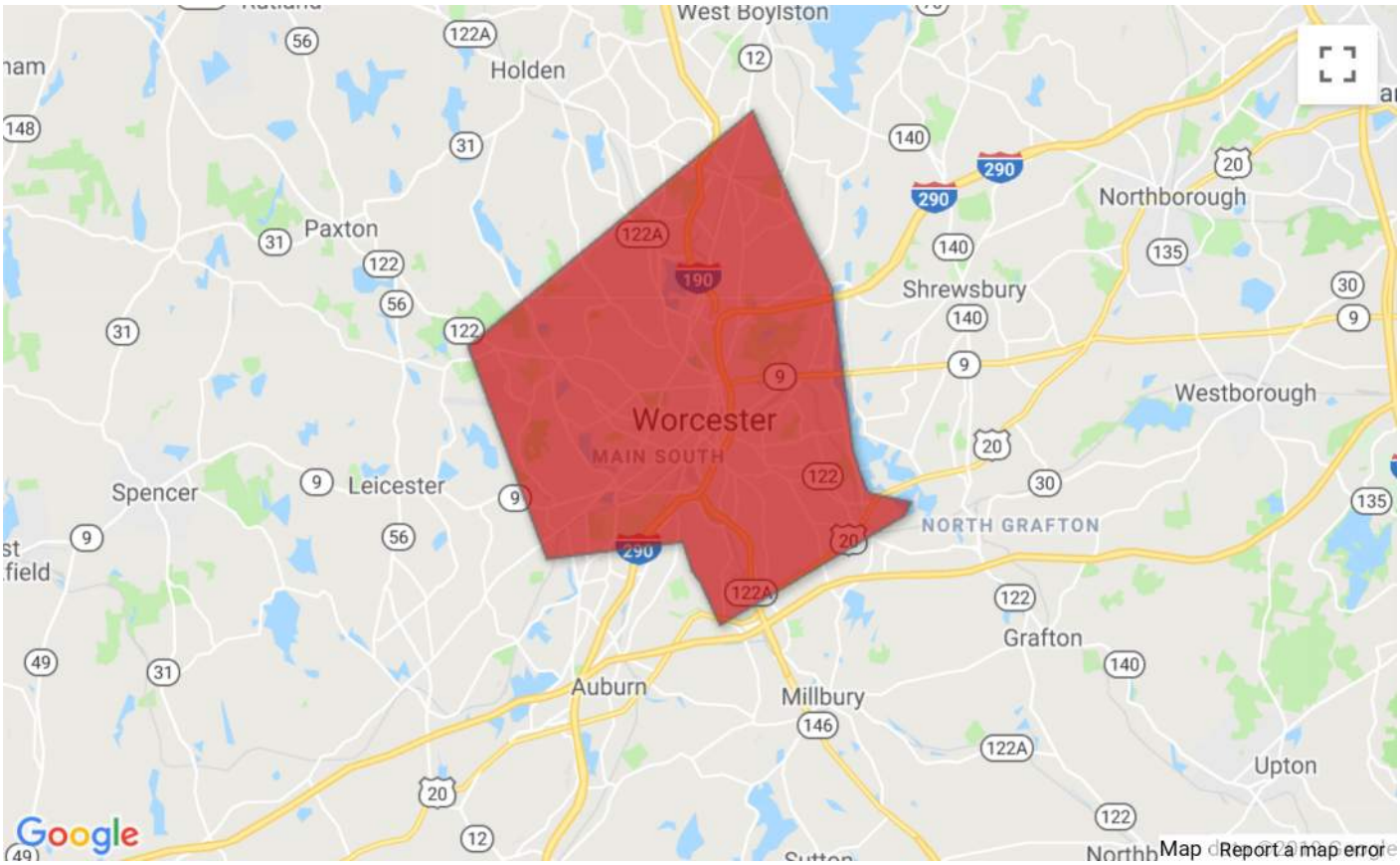
Mammals

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

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

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



Show 10 entries Search:

Town	Taxonomic Group	Scientific Name
WORCESTER	Vascular Plant	Adlumia fungosa
WORCESTER	Amphibian	Ambystoma opacum
WORCESTER	Bird	Ammodramus savannarum
WORCESTER	Vascular Plant	Asclepias purpurascens
WORCESTER	Bird	Bartramia longicauda
WORCESTER	Vascular Plant	Boechera laevigata
WORCESTER	Vascular Plant	Carex lenticularis
WORCESTER	Beetle	Cicindela purpurea
WORCESTER	Butterfly/Moth	Eacles imperialis
WORCESTER	Vascular Plant	Elymus villosus

Showing 1 to 10 of 21 entries

First Previous 1 2 3 Next Last

APPENDIX D

Laboratory Data Reports

ANALYTICAL REPORT

Lab Number:	L1918597
Client:	Haley & Aldrich, Inc. 465 Medford Street, Suite 2200 Charlestown, MA 02129-1400
ATTN:	Douglas Lindsay
Phone:	(617) 886-7580
Project Name:	HOLY CROSS PERFORMING ARTS CTR
Project Number:	41486-204
Report Date:	05/24/19

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: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1918597-01	HA16-B9-OW-1245	WATER	1 COLLEGE ST., WORCESTER, MA	05/03/19 12:45	05/03/19
L1918597-02	SW-1-1645	WATER	1 COLLEGE ST., WORCESTER, MA	05/03/19 16:45	05/03/19

Project Name:	HOLY CROSS PERFORMING ARTS CTR	**Lab Number:**	L1918597
Project Number:	41486-204	**Report Date:**	05/24/19

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	HOLY CROSS PERFORMING ARTS CTR	**Lab Number:**	L1918597
Project Number:	41486-204	**Report Date:**	05/24/19

Case Narrative (continued)

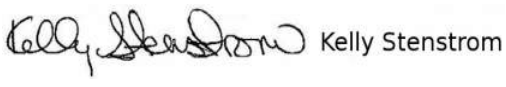
Report Revision

May 24, 2019: The analysis of Hardness was performed on L1918597-01 (HA16-B9-OW-1245).

Chlorine, Total Residual

The WG1233569-4 MS recovery (124%), performed on L1918597-01 (HA16-B9-OW-1245), is outside the acceptance criteria; however, the associated LCS recovery is within criteria. No further action was taken.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:  Kelly Stenstrom

Title: Technical Director/Representative Date: 05/24/19

ORGANICS

VOLATILES

Project Name: HOLY CROSS PERFORMING ARTS CTR **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01 Date Collected: 05/03/19 12:45
Client ID: HA16-B9-OW-1245 Date Received: 05/03/19
Sample Location: 1 COLLEGE ST., WORCESTER, MA Field Prep: None

Sample Depth:
Matrix: Water
Analytical Method: 128,624.1
Analytical Date: 05/07/19 12:31
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/l	1.0	--	1
1,1-Dichloroethane	ND		ug/l	1.5	--	1
Carbon tetrachloride	ND		ug/l	1.0	--	1
1,1,2-Trichloroethane	ND		ug/l	1.5	--	1
Tetrachloroethene	ND		ug/l	1.0	--	1
1,2-Dichloroethane	ND		ug/l	1.5	--	1
1,1,1-Trichloroethane	ND		ug/l	2.0	--	1
Benzene	ND		ug/l	1.0	--	1
Toluene	ND		ug/l	1.0	--	1
Ethylbenzene	ND		ug/l	1.0	--	1
Vinyl chloride	ND		ug/l	1.0	--	1
1,1-Dichloroethene	ND		ug/l	1.0	--	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	--	1
Trichloroethene	ND		ug/l	1.0	--	1
1,2-Dichlorobenzene	ND		ug/l	5.0	--	1
1,3-Dichlorobenzene	ND		ug/l	5.0	--	1
1,4-Dichlorobenzene	ND		ug/l	5.0	--	1
p/m-Xylene	ND		ug/l	2.0	--	1
o-xylene	ND		ug/l	1.0	--	1
Xylenes, Total	ND		ug/l	1.0	--	1
Acetone	ND		ug/l	10	--	1
Methyl tert butyl ether	ND		ug/l	10	--	1
Tert-Butyl Alcohol	ND		ug/l	100	--	1
Tertiary-Amyl Methyl Ether	ND		ug/l	20	--	1

Project Name: HOLY CROSS PERFORMING ARTS CTR **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01 Date Collected: 05/03/19 12:45

Client ID: HA16-B9-OW-1245 Date Received: 05/03/19

Sample Location: 1 COLLEGE ST., WORCESTER, MA Field Prep: None

Sample Depth:

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

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Pentafluorobenzene	91		60-140
Fluorobenzene	86		60-140
4-Bromofluorobenzene	93		60-140

Project Name: HOLY CROSS PERFORMING ARTS CTR
Lab Number: L1918597
Project Number: 41486-204
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01
Client ID: HA16-B9-OW-1245
Sample Location: 1 COLLEGE ST., WORCESTER, MA
Date Collected: 05/03/19 12:45
Date Received: 05/03/19
Field Prep: None

Sample Depth:
Matrix: Water
Analytical Method: 128,624.1-SIM
Analytical Date: 05/07/19 12:31
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS-SIM - Westborough Lab						
1,4-Dioxane	ND		ug/l	50	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Fluorobenzene	100		60-140
4-Bromofluorobenzene	99		60-140

Project Name: HOLY CROSS PERFORMING ARTS CTR
Lab Number: L1918597
Project Number: 41486-204
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01
Client ID: HA16-B9-OW-1245
Sample Location: 1 COLLEGE ST., WORCESTER, MA

Date Collected: 05/03/19 12:45
Date Received: 05/03/19
Field Prep: None

Sample Depth:
Matrix: Water
Analytical Method: 14,504.1
Analytical Date: 05/07/19 16:10
Analyst: AWS

Extraction Method: EPA 504.1
Extraction Date: 05/07/19 10:13

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

Project Name: HOLY CROSS PERFORMING ARTS CTR **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

Method Blank Analysis
Batch Quality Control

Analytical Method: 128,624.1
Analytical Date: 05/07/19 11:16
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1234348-8					
Methylene chloride	ND		ug/l	1.0	--
1,1-Dichloroethane	ND		ug/l	1.5	--
Carbon tetrachloride	ND		ug/l	1.0	--
1,1,2-Trichloroethane	ND		ug/l	1.5	--
Tetrachloroethene	ND		ug/l	1.0	--
1,2-Dichloroethane	ND		ug/l	1.5	--
1,1,1-Trichloroethane	ND		ug/l	2.0	--
Benzene	ND		ug/l	1.0	--
Toluene	ND		ug/l	1.0	--
Ethylbenzene	ND		ug/l	1.0	--
Vinyl chloride	ND		ug/l	1.0	--
1,1-Dichloroethene	ND		ug/l	1.0	--
cis-1,2-Dichloroethene	ND		ug/l	1.0	--
Trichloroethene	ND		ug/l	1.0	--
1,2-Dichlorobenzene	ND		ug/l	5.0	--
1,3-Dichlorobenzene	ND		ug/l	5.0	--
1,4-Dichlorobenzene	ND		ug/l	5.0	--
p/m-Xylene	ND		ug/l	2.0	--
o-xylene	ND		ug/l	1.0	--
Xylenes, Total	ND		ug/l	1.0	--
Acetone	ND		ug/l	10	--
Methyl tert butyl ether	ND		ug/l	10	--
Tert-Butyl Alcohol	ND		ug/l	100	--
Tertiary-Amyl Methyl Ether	ND		ug/l	20	--

Project Name: HOLY CROSS PERFORMING ARTS CTR **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

Method Blank Analysis
Batch Quality Control

Analytical Method: 128,624.1
Analytical Date: 05/07/19 11:16
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1234348-8					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Pentafluorobenzene	91		60-140
Fluorobenzene	87		60-140
4-Bromofluorobenzene	93		60-140

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204
Lab Number: L1918597
Report Date: 05/24/19

Method Blank Analysis
Batch Quality Control

Analytical Method: 14,504.1
Analytical Date: 05/07/19 14:22
Analyst: AWS

Extraction Method: EPA 504.1
Extraction Date: 05/07/19 10:13

Parameter	Result	Qualifier	Units	RL	MDL	
Microextractables by GC - Westborough Lab for sample(s): 01 Batch: WG1234353-1						
1,2-Dibromoethane	ND		ug/l	0.010	--	A

Project Name: HOLY CROSS PERFORMING ARTS CTR **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

Method Blank Analysis
Batch Quality Control

Analytical Method: 128,624.1-SIM
Analytical Date: 05/07/19 11:16
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS-SIM - Westborough Lab for sample(s): 01 Batch: WG1234899-4					
1,4-Dioxane	ND		ug/l	50	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Fluorobenzene	100		60-140
4-Bromofluorobenzene	101		60-140

Lab Control Sample Analysis
Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

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: WG1234348-7								
Methylene chloride	85		-		60-140	-		28
1,1-Dichloroethane	85		-		50-150	-		49
Carbon tetrachloride	105		-		70-130	-		41
1,1,2-Trichloroethane	115		-		70-130	-		45
Tetrachloroethene	125		-		70-130	-		39
1,2-Dichloroethane	95		-		70-130	-		49
1,1,1-Trichloroethane	100		-		70-130	-		36
Benzene	90		-		65-135	-		61
Toluene	110		-		70-130	-		41
Ethylbenzene	95		-		60-140	-		63
Vinyl chloride	85		-		5-195	-		66
1,1-Dichloroethene	90		-		50-150	-		32
cis-1,2-Dichloroethene	85		-		60-140	-		30
Trichloroethene	110		-		65-135	-		48
1,2-Dichlorobenzene	105		-		65-135	-		57
1,3-Dichlorobenzene	100		-		70-130	-		43
1,4-Dichlorobenzene	105		-		65-135	-		57
p/m-Xylene	100		-		60-140	-		30
o-xylene	90		-		60-140	-		30
Acetone	96		-		40-160	-		30
Methyl tert butyl ether	80		-		60-140	-		30
Tert-Butyl Alcohol	88		-		60-140	-		30
Tertiary-Amyl Methyl Ether	80		-		60-140	-		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

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: WG1234348-7								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Pentafluorobenzene	98				60-140
Fluorobenzene	91				60-140
4-Bromofluorobenzene	93				60-140

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits	Column
Microextractables by GC - Westborough Lab	Associated sample(s): 01		Batch: WG1234353-2						
1,2-Dibromoethane	97		-		80-120	-			A

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

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: WG1234899-3								
1,4-Dioxane	86		-		60-140	-		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Fluorobenzene	101				60-140
4-Bromofluorobenzene	101				60-140

Matrix Spike Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

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: WG1234353-3 QC Sample: L1917791-04 Client ID: MS Sample													
1,2-Dibromoethane	ND	0.251	0.253	101		-	-		80-120	-		20	A
1,2-Dibromo-3-chloropropane	ND	0.251	0.262	104		-	-		80-120	-		20	A

SEMIVOLATILES

Project Name: HOLY CROSS PERFORMING ARTS CTR
Lab Number: L1918597
Project Number: 41486-204
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01
Client ID: HA16-B9-OW-1245
Sample Location: 1 COLLEGE ST., WORCESTER, MA

Date Collected: 05/03/19 12:45
Date Received: 05/03/19
Field Prep: None

Sample Depth:
Matrix: Water
Analytical Method: 129,625.1
Analytical Date: 05/10/19 07:38
Analyst: SZ

Extraction Method: EPA 625.1
Extraction Date: 05/06/19 16:31

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Bis(2-ethylhexyl)phthalate	ND		ug/l	2.2	--	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

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	92		42-122
2-Fluorobiphenyl	93		46-121
4-Terphenyl-d14	121		47-138

Project Name: HOLY CROSS PERFORMING ARTS CTR
Lab Number: L1918597
Project Number: 41486-204
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01
Client ID: HA16-B9-OW-1245
Sample Location: 1 COLLEGE ST., WORCESTER, MA

Date Collected: 05/03/19 12:45
Date Received: 05/03/19
Field Prep: None

Sample Depth:
Matrix: Water
Analytical Method: 129,625.1-SIM
Analytical Date: 05/11/19 14:50
Analyst: ALS

Extraction Method: EPA 625.1
Extraction Date: 05/10/19 16:25

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS-SIM - Westborough Lab						
Acenaphthene	ND		ug/l	0.10	--	1
Fluoranthene	ND		ug/l	0.10	--	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
Pentachlorophenol	ND		ug/l	1.0	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	56		25-87
Phenol-d6	35		16-65
Nitrobenzene-d5	90		42-122
2-Fluorobiphenyl	88		46-121
2,4,6-Tribromophenol	86		45-128
4-Terphenyl-d14	93		47-138

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204
Lab Number: L1918597
Report Date: 05/24/19

Method Blank Analysis
Batch Quality Control

Analytical Method: 129,625.1
Analytical Date: 05/10/19 06:15
Analyst: SZ

Extraction Method: EPA 625.1
Extraction Date: 05/06/19 16:31

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1234094-1					
Bis(2-ethylhexyl)phthalate	ND		ug/l	2.2	--
Butyl benzyl phthalate	ND		ug/l	5.0	--
Di-n-butylphthalate	ND		ug/l	5.0	--
Di-n-octylphthalate	ND		ug/l	5.0	--
Diethyl phthalate	ND		ug/l	5.0	--
Dimethyl phthalate	ND		ug/l	5.0	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	58		42-122
2-Fluorobiphenyl	60		46-121
4-Terphenyl-d14	78		47-138

Project Name: HOLY CROSS PERFORMING ARTS CTR **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

Method Blank Analysis
Batch Quality Control

Analytical Method: 129,625.1-SIM
Analytical Date: 05/11/19 14:23
Analyst: ALS

Extraction Method: EPA 625.1
Extraction Date: 05/10/19 16:25

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS-SIM - Westborough Lab for sample(s): 01 Batch: WG1235919-1					
Acenaphthene	ND		ug/l	0.10	--
Fluoranthene	ND		ug/l	0.10	--
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	--
Pentachlorophenol	ND		ug/l	1.0	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	59		25-87
Phenol-d6	37		16-65
Nitrobenzene-d5	92		42-122
2-Fluorobiphenyl	89		46-121
2,4,6-Tribromophenol	81		45-128
4-Terphenyl-d14	89		47-138

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

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: WG1234094-2								
Bis(2-ethylhexyl)phthalate	85		-		29-137	-		82
Butyl benzyl phthalate	95		-		1-140	-		60
Di-n-butylphthalate	90		-		8-120	-		47
Di-n-octylphthalate	95		-		19-132	-		69
Diethyl phthalate	74		-		1-120	-		100
Dimethyl phthalate	85		-		1-120	-		183

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Nitrobenzene-d5	69				42-122
2-Fluorobiphenyl	68				46-121
4-Terphenyl-d14	78				47-138

Lab Control Sample Analysis
Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

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: WG1235919-2								
Acenaphthene	103		-		60-132	-		30
Fluoranthene	107		-		43-121	-		30
Naphthalene	95		-		36-120	-		30
Benzo(a)anthracene	106		-		42-133	-		30
Benzo(a)pyrene	105		-		32-148	-		30
Benzo(b)fluoranthene	106		-		42-140	-		30
Benzo(k)fluoranthene	105		-		25-146	-		30
Chrysene	103		-		44-140	-		30
Acenaphthylene	101		-		54-126	-		30
Anthracene	106		-		43-120	-		30
Benzo(ghi)perylene	107		-		1-195	-		30
Fluorene	106		-		70-120	-		30
Phenanthrene	105		-		65-120	-		30
Dibenzo(a,h)anthracene	105		-		1-200	-		30
Indeno(1,2,3-cd)pyrene	109		-		1-151	-		30
Pyrene	107		-		70-120	-		30
Pentachlorophenol	119		-		38-152	-		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

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: WG1235919-2								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Fluorophenol	62				25-87
Phenol-d6	40				16-65
Nitrobenzene-d5	98				42-122
2-Fluorobiphenyl	97				46-121
2,4,6-Tribromophenol	86				45-128
4-Terphenyl-d14	91				47-138

PCBS

Project Name: HOLY CROSS PERFORMING ARTS CTR
Lab Number: L1918597
Project Number: 41486-204
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01
Client ID: HA16-B9-OW-1245
Sample Location: 1 COLLEGE ST., WORCESTER, MA

Date Collected: 05/03/19 12:45
Date Received: 05/03/19
Field Prep: None

Sample Depth:
Matrix: Water
Analytical Method: 127,608.3
Analytical Date: 05/07/19 23:20
Analyst: HT

Extraction Method: EPA 608.3
Extraction Date: 05/05/19 13:49
Cleanup Method: EPA 3665A
Cleanup Date: 05/05/19
Cleanup Method: EPA 3660B
Cleanup Date: 05/06/19

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	64		37-123	B
Decachlorobiphenyl	62		38-114	B
2,4,5,6-Tetrachloro-m-xylene	60		37-123	A
Decachlorobiphenyl	56		38-114	A

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204
Lab Number: L1918597
Report Date: 05/24/19

Method Blank Analysis
Batch Quality Control

Analytical Method: 127,608.3
Analytical Date: 05/08/19 00:11
Analyst: HT

Extraction Method: EPA 608.3
Extraction Date: 05/05/19 13:49
Cleanup Method: EPA 3665A
Cleanup Date: 05/05/19
Cleanup Method: EPA 3660B
Cleanup Date: 05/06/19

Parameter	Result	Qualifier	Units	RL	MDL	Column
Polychlorinated Biphenyls by GC - Westborough Lab for sample(s): 01 Batch: WG1233789-1						
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	75		37-123	B
Decachlorobiphenyl	80		38-114	B
2,4,5,6-Tetrachloro-m-xylene	70		37-123	A
Decachlorobiphenyl	75		38-114	A

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

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: WG1233789-2									
Aroclor 1016	68		-		50-140	-		36	A
Aroclor 1260	65		-		8-140	-		38	A

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	75				37-123	B
Decachlorobiphenyl	82				38-114	B
2,4,5,6-Tetrachloro-m-xylene	72				37-123	A
Decachlorobiphenyl	78				38-114	A

METALS

Project Name: HOLY CROSS PERFORMING ARTS CTR
Lab Number: L1918597
Project Number: 41486-204
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01
Client ID: HA16-B9-OW-1245
Sample Location: 1 COLLEGE ST., WORCESTER, MA
Date Collected: 05/03/19 12:45
Date Received: 05/03/19
Field Prep: None

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	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Arsenic, Total	0.00280		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Cadmium, Total	0.00185		mg/l	0.00020	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Chromium, Total	0.00227		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Copper, Total	0.01978		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Iron, Total	0.980		mg/l	0.050	--	1	05/07/19 18:35	05/08/19 02:27	EPA 3005A	19,200.7	AB
Lead, Total	ND		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Mercury, Total	ND		mg/l	0.00020	--	1	05/06/19 16:45	05/07/19 11:23	EPA 245.1	3,245.1	GD
Nickel, Total	0.03960		mg/l	0.00200	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Selenium, Total	0.01754		mg/l	0.00500	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Silver, Total	0.00859		mg/l	0.00040	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Zinc, Total	0.04269		mg/l	0.01000	--	1	05/07/19 18:35	05/08/19 11:19	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	298		mg/l	0.660	NA	1	05/07/19 18:35	05/08/19 02:27	EPA 3005A	19,200.7	AB
General Chemistry - Mansfield Lab											
Chromium, Trivalent	ND		mg/l	0.010	--	1		05/08/19 11:19	NA	107,-	

Project Name: HOLY CROSS PERFORMING ARTS CTR
Lab Number: L1918597
Project Number: 41486-204
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-02
Client ID: SW-1-1645
Sample Location: 1 COLLEGE ST., WORCESTER, MA
Date Collected: 05/03/19 16:45
Date Received: 05/03/19
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	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Arsenic, Total	0.00299		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Chromium, Total	0.00143		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Copper, Total	0.1012		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Iron, Total	0.414		mg/l	0.050	--	1	05/07/19 18:35	05/08/19 00:12	EPA 3005A	19,200.7	AB
Lead, Total	0.1066		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Mercury, Total	ND		mg/l	0.00020	--	1	05/06/19 16:45	05/07/19 11:25	EPA 245.1	3,245.1	GD
Nickel, Total	0.00342		mg/l	0.00200	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Zinc, Total	0.02654		mg/l	0.01000	--	1	05/07/19 18:35	05/08/19 11:23	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	142		mg/l	0.660	NA	1	05/07/19 18:35	05/08/19 00:12	EPA 3005A	19,200.7	AB

Project Name: HOLY CROSS PERFORMING ARTS CTR **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-02 Batch: WG1234087-1										
Mercury, Total	ND		mg/l	0.00020	--	1	05/06/19 16:45	05/07/19 10:31	3,245.1	GD

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): 01-02 Batch: WG1234574-1										
Antimony, Total	ND		mg/l	0.00400	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Arsenic, Total	ND		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Chromium, Total	ND		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Copper, Total	ND		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Lead, Total	ND		mg/l	0.00100	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Nickel, Total	ND		mg/l	0.00200	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	05/07/19 18:35	05/08/19 10:58	3,200.8	AM
Zinc, Total	ND		mg/l	0.01000	--	1	05/07/19 18:35	05/08/19 10:58	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): 01-02 Batch: WG1234578-1										
Iron, Total	ND		mg/l	0.050	--	1	05/07/19 18:35	05/08/19 00:32	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Project Name: HOLY CROSS PERFORMING ARTS CTR **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Hardness by SM 2340B - Mansfield Lab for sample(s): 01-02 Batch: WG1234578-1										
Hardness	ND		mg/l	0.660	NA	1	05/07/19 18:35	05/08/19 00:32	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1234087-2								
Mercury, Total	105		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1234574-2								
Antimony, Total	98		-		85-115	-		
Arsenic, Total	98		-		85-115	-		
Cadmium, Total	111		-		85-115	-		
Chromium, Total	99		-		85-115	-		
Copper, Total	100		-		85-115	-		
Lead, Total	107		-		85-115	-		
Nickel, Total	105		-		85-115	-		
Selenium, Total	104		-		85-115	-		
Silver, Total	105		-		85-115	-		
Zinc, Total	108		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1234578-2								
Iron, Total	101		-		85-115	-		
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01-02 Batch: WG1234578-2								
Hardness	102		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234087-3 QC Sample: L1917584-01 Client ID: MS Sample												
Mercury, Total	ND	0.005	0.00513	103		-	-		70-130	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234574-3 QC Sample: L1918505-02 Client ID: MS Sample												
Antimony, Total	0.07032	0.5	0.7070	127		-	-		70-130	-		20
Arsenic, Total	ND	0.12	0.1282	107		-	-		70-130	-		20
Cadmium, Total	ND	0.051	0.05147	101		-	-		70-130	-		20
Chromium, Total	ND	0.2	0.2180	109		-	-		70-130	-		20
Copper, Total	0.02037	0.25	0.2599	96		-	-		70-130	-		20
Lead, Total	0.03823	0.51	0.5793	106		-	-		70-130	-		20
Nickel, Total	ND	0.5	0.4998	100		-	-		70-130	-		20
Selenium, Total	ND	0.12	0.1126	94		-	-		70-130	-		20
Silver, Total	ND	0.05	0.05552	111		-	-		70-130	-		20
Zinc, Total	ND	0.5	0.4864	97		-	-		70-130	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234578-3 QC Sample: L1918505-02 Client ID: MS Sample												
Iron, Total	3.56	1	4.45	89		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234578-3 QC Sample: L1918505-02 Client ID: MS Sample												
Hardness	2700	66.2	2650	**0**	Q	-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234578-7 QC Sample: L1918194-01 Client ID: MS Sample												
Iron, Total	0.081	1	1.12	104		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234578-7 QC Sample: L1918194-01 Client ID: MS Sample												
Hardness	279	66.2	332	80		-	-		75-125	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234087-4 QC Sample: L1917584-01 Client ID: DUP Sample						
Mercury, Total	ND	ND	mg/l	NC		20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234574-4 QC Sample: L1918505-02 Client ID: DUP Sample						
Antimony, Total	0.07032	0.07199	mg/l	2		20
Arsenic, Total	ND	ND	mg/l	NC		20
Cadmium, Total	ND	ND	mg/l	NC		20
Chromium, Total	ND	ND	mg/l	NC		20
Copper, Total	0.02037	0.02069	mg/l	2		20
Lead, Total	0.03823	0.03745	mg/l	2		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): 01-02 QC Batch ID: WG1234578-4 QC Sample: L1918505-02 Client ID: DUP Sample						
Iron, Total	3.56	3.57	mg/l	0		20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1234578-8 QC Sample: L1918194-01 Client ID: DUP Sample						
Iron, Total	0.081	0.081	mg/l	1		20

INORGANICS
&
MISCELLANEOUS

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204
Lab Number: L1918597
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-01
Client ID: HA16-B9-OW-1245
Sample Location: 1 COLLEGE ST., WORCESTER, MA
Sample Depth:
Matrix: Water

Date Collected: 05/03/19 12:45
Date Received: 05/03/19
Field Prep: None

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total Suspended	32.		mg/l	5.0	NA	1	-	05/06/19 11:30	121,2540D	DR
Cyanide, Total	ND		mg/l	0.005	--	1	05/05/19 16:10	05/06/19 10:39	121,4500CN-CE	ML
Chlorine, Total Residual	ND		mg/l	0.02	--	1	-	05/03/19 23:25	121,4500CL-D	JW
Nitrogen, Ammonia	0.110		mg/l	0.075	--	1	05/04/19 20:59	05/08/19 20:52	121,4500NH3-BH	AT
TPH, SGT-HEM	ND		mg/l	4.00	--	1	05/06/19 16:20	05/06/19 21:20	74,1664A	MM
Phenolics, Total	ND		mg/l	0.030	--	1	05/06/19 05:20	05/07/19 07:41	4,420.1	GD
Chromium, Hexavalent	ND		mg/l	0.010	--	1	05/03/19 23:15	05/03/19 23:43	1,7196A	AS
Anions by Ion Chromatography - Westborough Lab										
Chloride	5060		mg/l	125	--	250	-	05/08/19 01:42	44,300.0	AU

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204
Lab Number: L1918597
Report Date: 05/24/19

SAMPLE RESULTS

Lab ID: L1918597-02
Client ID: SW-1-1645
Sample Location: 1 COLLEGE ST., WORCESTER, MA
Sample Depth:
Matrix: Water

Date Collected: 05/03/19 16:45
Date Received: 05/03/19
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Ammonia	0.166		mg/l	0.075	--	1	05/07/19 16:45	05/07/19 23:52	121,4500NH3-BH	AT

Project Name: HOLY CROSS PERFORMING ARTS C **Lab Number:** L1918597

Project Number: 41486-204 **Report Date:** 05/24/19

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: WG1233528-1										
Chromium, Hexavalent	ND		mg/l	0.010	--	1	05/03/19 23:15	05/03/19 23:42	1,7196A	AS
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1233569-1										
Chlorine, Total Residual	ND		mg/l	0.02	--	1	-	05/03/19 23:25	121,4500CL-D	JW
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1233700-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	05/04/19 20:59	05/08/19 20:46	121,4500NH3-BH	AT
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1233797-1										
Cyanide, Total	ND		mg/l	0.005	--	1	05/05/19 16:10	05/06/19 10:10	121,4500CN-CE	ML
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1233879-1										
Phenolics, Total	ND		mg/l	0.030	--	1	05/06/19 05:20	05/07/19 07:36	4,420.1	GD
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1233904-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	05/06/19 11:30	121,2540D	DR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1234062-1										
TPH, SGT-HEM	ND		mg/l	4.00	--	1	05/06/19 16:20	05/06/19 21:20	74,1664A	MM
General Chemistry - Westborough Lab for sample(s): 02 Batch: WG1234471-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	05/07/19 16:45	05/07/19 23:46	121,4500NH3-BH	AT
Anions by Ion Chromatography - Westborough Lab for sample(s): 01 Batch: WG1235051-1										
Chloride	ND		mg/l	0.500	--	1	-	05/07/19 17:54	44,300.0	AU

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1233528-2								
Chromium, Hexavalent	96		-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1233569-2								
Chlorine, Total Residual	92		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1233700-2								
Nitrogen, Ammonia	98		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1233797-2								
Cyanide, Total	91		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1233879-2								
Phenolics, Total	108		-		70-130	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1234062-2								
TPH	72		-		64-132	-		34
General Chemistry - Westborough Lab Associated sample(s): 02 Batch: WG1234471-2								
Nitrogen, Ammonia	99		-		80-120	-		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR

Project Number: 41486-204

Lab Number: L1918597

Report Date: 05/24/19

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 Batch: WG1235051-2					
Chloride	98	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

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: WG1233528-4 QC Sample: L1918597-01 Client ID: HA16-B9-OW-1245												
Chromium, Hexavalent	ND	0.1	0.091	91		-	-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233569-4 QC Sample: L1918597-01 Client ID: HA16-B9-OW-1245												
Chlorine, Total Residual	ND	0.25	0.31	**124**	Q	-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233700-4 QC Sample: L1918202-01 Client ID: MS Sample												
Nitrogen, Ammonia	ND	4	3.70	92		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233797-4 QC Sample: L1918117-02 Client ID: MS Sample												
Cyanide, Total	ND	0.2	0.185	92		-	-		90-110	-		30
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233879-4 QC Sample: L1918597-01 Client ID: HA16-B9-OW-1245												
Phenolics, Total	ND	0.4	0.39	98		-	-		70-130	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1234062-4 QC Sample: L1918597-01 Client ID: HA16-B9-OW-1245												
TPH	ND	21.1	14.8	70		-	-		64-132	-		34
General Chemistry - Westborough Lab Associated sample(s): 02 QC Batch ID: WG1234471-4 QC Sample: L1918597-02 Client ID: SW-1-1645												
Nitrogen, Ammonia	0.166	4	3.67	88		-	-		80-120	-		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1235051-3 QC Sample: L1918830-01 Client ID: MS Sample												
Chloride	35.8	4	38.7	**72**	Q	-	-		90-110	-		18

Lab Duplicate Analysis

Batch Quality Control

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233528-3 QC Sample: L1918597-01 Client ID: HA16-B9-OW-1245						
Chromium, Hexavalent	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233569-3 QC Sample: L1918597-01 Client ID: HA16-B9-OW-1245						
Chlorine, Total Residual	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233700-3 QC Sample: L1918202-01 Client ID: DUP Sample						
Nitrogen, Ammonia	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233797-3 QC Sample: L1918117-01 Client ID: DUP Sample						
Cyanide, Total	ND	ND	mg/l	NC		30
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233879-3 QC Sample: L1918597-01 Client ID: HA16-B9-OW-1245						
Phenolics, Total	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1233904-2 QC Sample: L1918140-02 Client ID: DUP Sample						
Solids, Total Suspended	890	850	mg/l	5		29
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1234062-3 QC Sample: L1918505-01 Client ID: DUP Sample						
TPH	ND	ND	mg/l	NC		34
General Chemistry - Westborough Lab Associated sample(s): 02 QC Batch ID: WG1234471-3 QC Sample: L1918597-02 Client ID: SW-1-1645						
Nitrogen, Ammonia	0.166	0.193	mg/l	15		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1235051-4 QC Sample: L1918830-01 Client ID: DUP Sample						
Chloride	35.8	35.9	mg/l	0		18

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

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(*)
L1918597-01A	Plastic 250ml HNO3 preserved	A	<2	<2	3.4	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),TRICR-CALC(1),CR-2008T(180),PB-2008T(180),SB-2008T(180)
L1918597-01B	Plastic 250ml unpreserved split	A	7	7	3.4	Y	Absent		-
L1918597-01C	Amber 1000ml Na2S2O3	A	7	7	3.4	Y	Absent		PCB-608.3(7)
L1918597-01D	Amber 1000ml Na2S2O3	A	7	7	3.4	Y	Absent		PCB-608.3(7)
L1918597-01E	Amber 1000ml Na2S2O3	A	7	7	3.4	Y	Absent		625.1-SIM-RGP(7)
L1918597-01F	Amber 1000ml Na2S2O3	A	7	7	3.4	Y	Absent		625.1-SIM-RGP(7)
L1918597-01G	Amber 1000ml Na2S2O3	A	7	7	3.4	Y	Absent		625.1-RGP(7)
L1918597-01H	Amber 1000ml Na2S2O3	A	7	7	3.4	Y	Absent		625.1-RGP(7)
L1918597-01I	Vial Na2S2O3 preserved	A	NA		3.4	Y	Absent		504(14)
L1918597-01J	Vial Na2S2O3 preserved	A	NA		3.4	Y	Absent		504(14)
L1918597-01K	Vial Na2S2O3 preserved	A	NA		3.4	Y	Absent		624.1-RGP(7)
L1918597-01L	Vial Na2S2O3 preserved	A	NA		3.4	Y	Absent		624.1-RGP(7)
L1918597-01M	Vial Na2S2O3 preserved	A	NA		3.4	Y	Absent		624.1-RGP(7)
L1918597-01N	Plastic 250ml NaOH preserved	A	>12	>12	3.4	Y	Absent		HOLD-WETCHEM()
L1918597-01O	Plastic 950ml unpreserved	A	7	7	3.4	Y	Absent		CL-300(28),HEXCR-7196(1),TRC-4500(1)
L1918597-01P	Plastic 500ml H2SO4 preserved	A	<2	<2	3.4	Y	Absent		NH3-4500(28)
L1918597-01Q	Plastic 250ml NaOH preserved	A	>12	>12	3.4	Y	Absent		TCN-4500(14)
L1918597-01R	Amber 950ml H2SO4 preserved	A	<2	<2	3.4	Y	Absent		TPHENOL-420(28)
L1918597-01S	Plastic 950ml unpreserved	A	7	7	3.4	Y	Absent		TSS-2540(7)
L1918597-01T	Vial Na2S2O3 preserved	A	NA		3.4	Y	Absent		624.1-SIM-RGP(7)
L1918597-01U	Vial Na2S2O3 preserved	A	NA		3.4	Y	Absent		624.1-SIM-RGP(7)

*Values in parentheses indicate holding time in days

Project Name: HOLY CROSS PERFORMING ARTS CTR
Project Number: 41486-204

Lab Number: L1918597
Report Date: 05/24/19

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1918597-01V	Vial Na2S2O3 preserved	A	NA		3.4	Y	Absent		624.1-SIM-RGP(7)
L1918597-01X	Plastic 120ml HNO3 preserved Filtrates	A	NA		3.4	Y	Absent		HOLD-METAL-DISSOLVED(180)
L1918597-01Y	Amber 1000ml HCl preserved	A	NA		3.4	Y	Absent		TPH-1664(28)
L1918597-01Z	Amber 1000ml HCl preserved	A	NA		3.4	Y	Absent		TPH-1664(28)
L1918597-02A	Plastic 500ml H2SO4 preserved	A	<2	<2	3.4	Y	Absent		NH3-4500(28)
L1918597-02B	Plastic 250ml HNO3 preserved	A	<2	<2	3.4	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)

*Values in parentheses indicate holding time in days

Project Name:	HOLY CROSS PERFORMING ARTS CTR	**Lab Number:**	L1918597
Project Number:	41486-204	**Report Date:**	05/24/19

GLOSSARY

Acronyms

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

Report Format: Data Usability Report

Project Name:	HOLY CROSS PERFORMING ARTS CTR	**Lab Number:**	L1918597
Project Number:	41486-204	**Report Date:**	05/24/19

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.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

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 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.

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

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

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

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

Report Format: Data Usability Report

Project Name:	HOLY CROSS PERFORMING ARTS CTR	**Lab Number:**	L1918597
Project Number:	41486-204	**Report Date:**	05/24/19

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.

14 Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water. EPA/600/4-88/039, Revised July 1991.

19 Inductively Coupled Plasma Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes. Appendix C, Part 136, 40 CFR (Code of Federal Regulations). July 1, 1999 edition.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

74 Method 1664,Revision A: N-Hexane Extractable Material (HEM; Oil & Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry, EPA-821-R-98-002, February 1999.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

127 Method 608.3: Organochlorine Pesticides and PCBs by GC/HSD, EPA 821-R-16-009, December 2016.

128 Method 624.1: Purgeables by GC/MS, EPA 821-R-16-008, December 2016.

129 Method 625.1: Base/Neutrals and Acids by GC/MS, EPA 821-R-16-007, December 2016.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene
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 6860: SCM: Perchlorate

SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 5/3/19

ALPHA Job #: L1918597

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Project Information
- Project Name: Holy Cross Art Center
- Project Location: 1 College St Worcester MA
- Project #: 41486-204
- Project Manager: Doug Lindsay
- ALPHA Quote #:

Report Information - Data Deliverables
☐ ADEx ☐ EMAIL

Billing Information
☐ Same as Client info PO #:

Client Information
- Client: Haley & Aldrich
- Address: 3 Bedford Farms Rd. Bedford NH
- Phone: 603-625-5353
- Email: DLindsay@haleyaldrich.com

Regulatory Requirements & Project Information Requirements
- ☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
- ☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
- ☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
- ☒ Yes ☐ No NPDES RGP
- ☐ Other State /Fed Program _____ Criteria _____

Turn-Around Time
☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due:

Additional Project Information:
Dissolved Metal allocated to TSS Container. (NOT field filtered)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC: ☐ 8260 ☒ 624 ☐ 524.2 TCV	SVOC: ☐ ABN ☐ PAH ☐ 625.1	METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15 Hardness ☐ RCRA5 ☐ RCRA8 ☐ PP13	EPH: ☐ Ranges & Targets ☐ Ranges Only ACP PACP	VPH: ☐ Ranges & Targets ☐ Ranges Only	☐ PCB ☐ PEST	TPH: ☐ Quant Only ☐ Fingerprint TPH 1664	TPHENOL	HEXCR TRC-4500.CL	TSS	TTL Metals	NH3	TCN	Sample Comments	TOTAL # BOTTLES
18597 01	HA16-B9-GW-1245	5/3/19	1245	water	SLG	X	X		X		X	X	X	X	X	X	+	+	+	23
02	SW-1-1645	5/3/19	1645	water	SLG			X										X		2

Container Type
Preservative

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Shawna Goulet	5/3/19 17:55	AAL	5/3/19 1758

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

APPENDIX E

Contractor Dewatering Cut Sheets and SDSs

Lockwood Remediation Technologies, LLC

700 Series Floc Logs

Polyacrylamide Sediment and Turbidity Control Applicator Logs

700 Series Floc Logs are a group of soil-specific tailored log-blocks that contain blends of water treatment components and polyacrylamide co-polymer for water clarification. They reduce and prevent fine particles and colloidal clays from suspension in stormwater. There are several types of Floc Logs designed to treat most water and soil types. Contact Applied Polymer Systems, Inc. or your local distributor for free testing and site-specific application information.

Primary Applications

- Mine tailings and waste pile ditches
- Stormwater drainage from construction and building sites
- Road and highway construction runoff ditches
- Ditch and treatment system placement for all forms of highly turbid waters (less than 4% solids)
- Dredging operations as a flocculent

Features and Benefits

- Removes solubilized soils and clay from water
- Prevents colloidal solutions in water within ditch systems
- Binds cationic metals within water, reducing solubilization
- Binds pesticides and fertilizers within runoff water
- Reduces operational and cleanup costs
- Reduces environmental risks and helps meet compliance

Specifications / Compliances

- ANSI/NSF Standard 60 Drinking water treatment chemical additives
- 48h or 96h Acute Toxicity Tests (*D. magna* or *O. mykiss*)
- 7 Day Chronic Toxicity Tests *(P. promealas* or *C. dubia*

Packaging

700 Series Floc Logs are packaged in boxes of four (4)

Technical Information

Appearance - semi-solid block
Biodegradable internal coconut skeleton
Percent Moisture - 40% maximum
pH 0.5% Solution - 6-8
Shelf Life – up to 5 years when stored out of UV rays

Office: 774-450-7177 • Fax: 888-835-0617 89 Crawford Street • Leominster, MA 01453

Placement

Floc Logs are designed for placement within ditches averaging three feet wide by two feet deep. Floc log placement is based on gallon per minute flow rates. Note: actual GPM or dosage will vary based on site criteria and soil/water testing.

Directions for Use

(Water and Floc Log Mixing is Very Important!)

700 Series Floc Logs should be placed within the upper quarter to half of a *stabilized* ditch system or as close as possible to active earth moving activities. Floc Logs have built in ropes with attachment loops which can be looped over stakes to ensure they remain where placed. Mixing is key! If the flow rate is too slow, adding sand bags, cinder blocks, etc., can create the turbulence required for proper mixing. Floc Logs are designed to treat dirty water, not liquid mud; when the water contains heavy solids (exceeding 4%), it will be necessary to create a sediment or grit pit to let the heavy solids settle before treating the water.

Floc Logs must not be placed in areas where heavy erosion would result in the Floc Logs becoming buried. Where there is heavy sedimentation, maintenance will be required.

700 Series Floc Logs can easily be moved to different locations as site conditions change. Water quality will be improved with the addition of a dispersion field or soft armor covered ditch checks below the Floc Log(s) to collect flocculated particulate. Construction of mixing weirs may be required in areas where short ditch lines, swelling clays, heavy particle concentrations, or steep slopes may be encountered.

Cleanup:

Latex or rubber gloves are recommended for handling during usage. Use soap and water to wash hands after handling.

Precautions / Limitations

- 700 Series Floc Logs are extremely slippery when wet.
- Clean up spills quickly. Do not use water unless necessary as extremely slippery conditions will result and if water is necessary, use pressure washer.
- Floc Log will remain viable for up to 5 years when stored out of UV rays.
- 700 Series Floc Logs have been specifically tailored to specific water and soil types and samples must be tested. Testing is necessary and is free.

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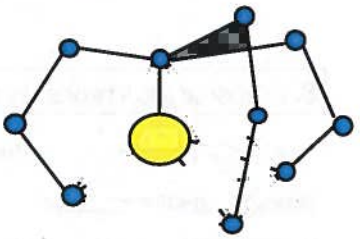

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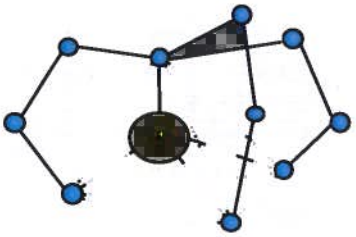

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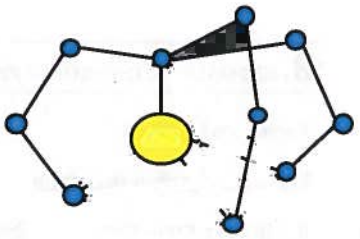

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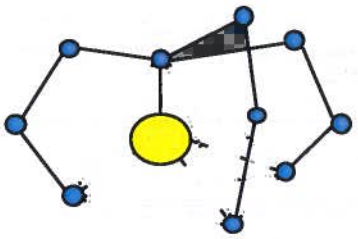

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8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls: Use local exhaust if dusting occurs. Natural ventilation is adequate in absence of dust.
Personal protection equipment
Respiratory Protection: Dust safety masks are recommended where dusting may occur.
Hand protection: Dry cloth, leather or rubber gloves.
Eye Protection: Safety glasses with side shields or face masks. Do not wear contact lenses.
Skin protection: No special protective clothing required.
Hygiene measures: Wash hands before breaks and at end of work day.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form: Granular solid
Color: White
Odor: None
pH: 7-8
Melting point: N/A
Flash point: N/A
Vapor density: N/A

10. STABILITY AND REACTIVITY

Stability: Product is stable, no hazardous polymerization will occur.
Materials to avoid: Oxidizing agents may cause exothermic reactions.
Hazardous decomposition products: Thermal decomposition may produce nitrogen oxides (NOx), carbon oxides.

11. TOXICOLOGICAL INFORMATION

Acute toxicity: (EPA/600/4-90/027F)

LD 50 / *Rattus norvegicus* / oral / > 5000 mg/kg
LC 50 / *Oncorhynchus mykiss* / 96h / 530 mg/L
LC 50 / *Daphnia magna* / 48h / >420mg/L
EC 50 / *Selenastrum capricornutum* / 96h / >500mg/L

12. ECOLOGICAL INFORMATION

Chronic Toxicity : (EPA/600/R-98/182)

IC_{25} (Survival) / *P. promelas* / 7 day / 358 ppm
NOEC (Survival) / *P. promelas* / 7 day / 840 ppm

IC_{25} (Survival) / *C. dubia* / 7 day / 157.5 ppm
NOEC (Survival) / *C. dubia* / 7 day / 105 ppm

IC_{25} (Growth) / *P. promelas* / 7 day / 94 ppm
NOEC (Growth) / *P. promelas* / 7 day / 105 ppm

IC_{25} (Reproduction) / *C. dubia* / 7 day / 27.7 ppm
NOEC (Reproduction) / *C. dubia* / 7 day / 26.25 ppm

Inhalation: The product is not expected to be toxic by inhalation.

Dermal: The results of testing on rabbits showed no toxicity even at high dose levels.

Bioaccumulation: The product is not expected to bioaccumulate.

Persistence / degradability: Not readily biodegradable: (~40% after 28 days).

Chronic toxicity: A 2 yr feeding study on rats did not reveal adverse health effects.

13. DISPOSAL CONSIDERATIONS

Waste from residues/unused products.
Any disposal practice must be in compliance with local, state and federal laws and regulations (contact local or state environmental agency for specific rules).

14. TRANSPORT INFORMATION

Not regulated by DOT, RCRA status-Not a hazardous waste

15. REGULATORY INFORMATION

TSCA Chemical Substances Inventory: **All components of this product are either listed on the inventory or are exempt from listing.**

SARA Section 311 / 312 Hazard Class: **Not concerned**
RCRA Status: **Not RCRA hazardous**

16. TRANSPORT AND REGULATORY INFORMATION

NFPA and HMIS ratings:

NFPA	**Health:**	**1**	**Flammability:**	**1**	**Reactivity:**	**0**
HMIS	**Health**	**1**	**Flammability**	**1**	**Reactivity**	**0**

DATE EDITED: Oct. 29th 2015

Updated November 4, 2015

Applied Polymer Systems, Inc.

Safety Data Sheet

1. IDENTIFICATION OF THE PRODUCT AND THE COMPANY

Product Name: APS 703d Floc Log®

Supplied:
Applied Polymer Systems, Inc.
519 Industrial Drive
Woodstock, GA 30189
Tel. 678-494-5998
Fax. 678-494-5298
www.siltstop.com

2. HAZARD IDENTIFICATION

Placement of these materials on wet walking surface will create extreme slipping hazard.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Identification of the preparation: Anionic water-soluble Co-polymer gel

4. FIRST AID MEASURES

Inhalation: None

Skin contact: Contact with wet skin could cause dryness and chapping. Wash with water and soap.

Eye contact: Rinse thoroughly with plenty of water, also under the eyelids, seek medical attention in case of persistent irritation.

Ingestion: Consult a physician

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Water, water spray, foam, carbon dioxide, dry powder.

Special fire-fighting precautions: Floc Logs that become wet render surfaces extremely slippery.

Protective equipment for firefighters: No special equipment required.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: No special precautions required.

Methods for cleaning up: Dry wipe as well as possible, Keep in suitable and closed containers for disposal. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Handling: Avoid contact with skin and eyes. Wash hands after handling.

Storage: Keep in a cool, dry place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls: Use dry handling areas only.

Personal protection equipment

Respiratory Protection:	**None**
Hand protection:	**Dry cloth, leather or rubber gloves.**
Eye Protection:	**Safety glasses with side shields. Do not wear contact lenses.**
Skin protection:	**No special protective clothing required.**
Hygiene measures:	**Wash hands before breaks and at end of work day.**

9. PHYSICAL AND CHEMICAL PROPERTIES

Form:	**Granular semi-solid gel**
Color:	**Blue**
Odor:	**None**
pH:	**7.37**
Melting point:	**N/A**
Flash point:	**N/A**
Vapor density:	**N/A**

10. STABILITY AND REACTIVITY

Stability: **Product is stable, no hazardous polymerization will occur.**

Materials to avoid: **Oxidizing agents may cause exothermic reactions.**

Hazardous decomposition products: **Thermal decomposition may produce nitrogen oxides (NOx), carbon oxides.**

11. TOXICOLOGICAL INFORMATION

Acute toxicity (EPA/600/4-90/027F)

LD 50 / *Rattus norvegicus* / oral / > 5000 mg/kg
LC 50 / *Daphnia magna* / 48h / >383mg/L
LC 50 / *Oncorhynchus mykiss* / 96h / 1900 mg/L

Chronic toxicity (EPA/600/4-91/002)

IC 25 (Survival) / *P. promelas* / 7 day / 110 ppm
NOEC (Survival) / *P. promelas* / 7 day/ 105 ppm

IC 25 (Survival) / *C. dubia* / 7 day / 99.8 ppm
NOEC (Survival) / *C. dubia* / 7 day/ 52.5 ppm

IC 25 (Growth) / *P. promelas* / 7 day / 130 ppm
NOEC (Growth) / *P. promelas* / 7 day / 105 ppm

IC 25 (Reproduction) / *C. dubia* / 7 day / 58.2 ppm
NOEC (Reproduction) / *C. dubia* / 7 day / 105 ppm

12. ECOLOGICAL INFORMATION

Fish: LC 50 / *Pimephales promelas* / 96h / >1000 mg/l
Water Flea: LC 50 / *Daphnia magna* / 48h / 383mg/l
Algae: EC 50 / *Selenastrum capricornutum* / 96h / >500mg/l

Bioaccumulation: The product is not expected to bioaccumulate.
Persistence / degradability: Not readily biodegradable: (~85% after 180 days).

13. DISPOSAL INFORMATION

Waste from residues/unused products.
Any disposal practice must be in compliance with local, state and federal laws and regulations (contact local or state environmental agency for specific rules).

14. TRANSPORT INFORMATION

Not regulated by DOT, RCRA status-Not a hazardous waste

15. REGULATORY INFORMATION

TSCA Chemical Substances Inventory: All components of this product are either listed on the inventory or are exempt from listing.

SARA Section 311 / 312 Hazard Class: **Not concerned**
RCRA Status: **Not RCRA hazardous**

16. OTHER INFORMATION

NFPA and HMIS ratings:

NFPA	**Health:**	**1**	**Flammability:**	**0**	**Reactivity:**	**0**
HMIS	**Health**	**1**	**Flammability**	**0**	**Reactivity**	**0**

DATE EDITED: Nov 4th 2015

Technical Guidance for the Use of Polyacrylamides (PAM) and PAM Blends for Soil Erosion Control and Storm Water clarification

(Courtesy of Applied Polymer Systems, Inc.)

Practice Description

PAM is a water-soluble anionic polyacrylamide product used to minimize soil erosion caused by water and wind to decrease soil sealing by binding soil particles, especially clays, to hold them on site. In addition, these types of materials may also be used as a water treatment additive to remove suspended particles from runoff. When PAM is used on construction sites in the Southeast it is typically applied with temporary seeding and or mulching on areas where the timely establishment of temporary erosion control is so critical that seedings and mulching need additional reinforcement. It may be used alone on sites where no disturbances will occur until site work is continued and channel erosion is not a significant potential problem. Permanent grassing applications can be better established using PAM as a tackifier and soil conditioner.

PAMs are manufactured in various forms to be used on specific soil types, and are generally applied at a rate of up to 25 pounds/acre for dry products and 2 ½ gallons/acre of emulsion-liquid products. Using the wrong form of a PAM on a soil will result in some degree of performance failure, and increase the potential for this material to enter surface waters. PAM used alone may not reduce NTU values resulting in non-compliance water quality discharges or poor soil binding conditions. Site-specific soil-PAM testing must be performed. Exceeding the maximum application rates for this product does not increase the effectiveness of the product.

Block or Log forms of PAM and PAM blends are manufactured for specific use in drainage waterways to remove suspended particulates from runoff.

General Components of the Practice

Prior to the start of construction, a qualified professional should design the application of PAM and plans and specifications should be available to field personnel.

The application should conform to the design and specifications provided in the plans. Typical applications include the following components.

- Site Preparation
- Equipment Preparation
- PAM Application

Application

Site Preparation

Prepare site following design and specifications.

Equipment Preparation

If using a liquid application system, pump a surfactant through the injection system before and after injecting concentrated liquid PAM into sprinkler irrigation systems to help prevent valves and tubing from clogging.

PAM used in hydroseeding applications should be added as the last additive to the mix.

After their use, rinse all PAM mixing and application equipment thoroughly with water to avoid formation of PAM residues. Rinse residue should be applied to soil areas to create binding to the soil structure and increase erosion reduction.

PAM Application- Criteria for Land applied PAM Specifications

PAM shall be mixed and/or applied in accordance with all Occupational Safety and Health Administration (OSHA) Material Safety Data Sheet (MSDS) requirements and the manufacturer's recommendations for the specified use conforming to all federal, state and local laws, rules and regulations.

1.) **Toxicity**

All venders and suppliers of PAM, PAM mix or blends shall present or supply a written toxicity report which verifies that the PAM, PAM mix or blend exhibits acceptable toxicity parameters which meet or exceed the EPA requirements for the state and federal water quality standards. Whole effluent testing does not meet this requirement as primary reactions have occurred and toxic potentials have been reduced. **Cationic forms of PAM, polymers and chitosan are not allowed for use under this guideline due to their high levels of toxicity to aquatic organisms. Emulsions shall never be applied directly to stormwater runoff or riparian waters due to surfactant toxicity.**

2.) **Performance**

All venders and suppliers of PAM, PAM mix or blends shall supply written "site specific" testing results demonstrating that a performance of 95% or greater reduction of NTU or TSS from stormwater discharges.

Emulsion batches shall be mixed following recommendations of a testing laboratory that determines the proper product and rate to meet site requirements. Application method shall insure uniform coverage to the target area. **(Emulsions shall never be applied directly to stormwater runoff or riparian waters)**

Dry form (powder) may be applied by hand spreader or a mechanical spreader. Mixing with dry silica sand will aid in spreading. Pre-mixing of dry form PAM into fertilizer, seed or other soil amendments is allowed when specified in the design plan. Application method shall insure uniform coverage to the target area.

Block or Log forms shall be applied following site testing results to assure proper placement and performance and shall meet or exceed state and federal water quality requirements.

Common Problems

Consult with a registered design professional for assistance if any of the following occur:

- Problems with application equipment clogging.
- PAM alone may not meet testing requirements for NTU reduction and soil stabilization. Site specific "blends" may be needed to meet these requirements.
- Application specifications for PAM cannot be met; alternatives may be required. Unapproved application techniques could lead to failure.
- Visible erosion occurs after application.

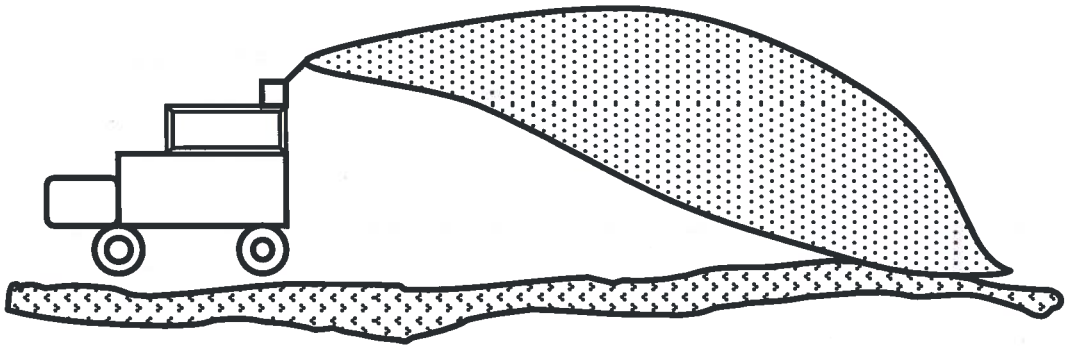
Maintenance

An operation and maintenance plan must be prepared for use by the operator responsible for PAM application. Plan items should include the following items.

- Reapply PAM to disturbed or tilled areas that require continued erosion control.
- Maintain equipment to provide uniform application rates.
- Rinse all PAM mixing and application equipment thoroughly with water to avoid formation of PAM residues and discharge rinse water to soil areas where PAM stabilization may be helpful.
- Downstream deposition from the use of PAM may require periodic sediment removal to maintain normal functions.

PM-H

(Silt Stop Application of Temporary and Permanent Grassing)



Notes:

1) **For use on all slope conditions which are not matted.**

2) **Application rate shall be 1.5 gallons of Silt Stop emulsion/acre or 10 pounds of Silt Stop powder/acre.**

3) **Silt Stop emulsion or powder shall be added to all hydroseeding mixes at a rate of 3000 gallons of mix/acre.**

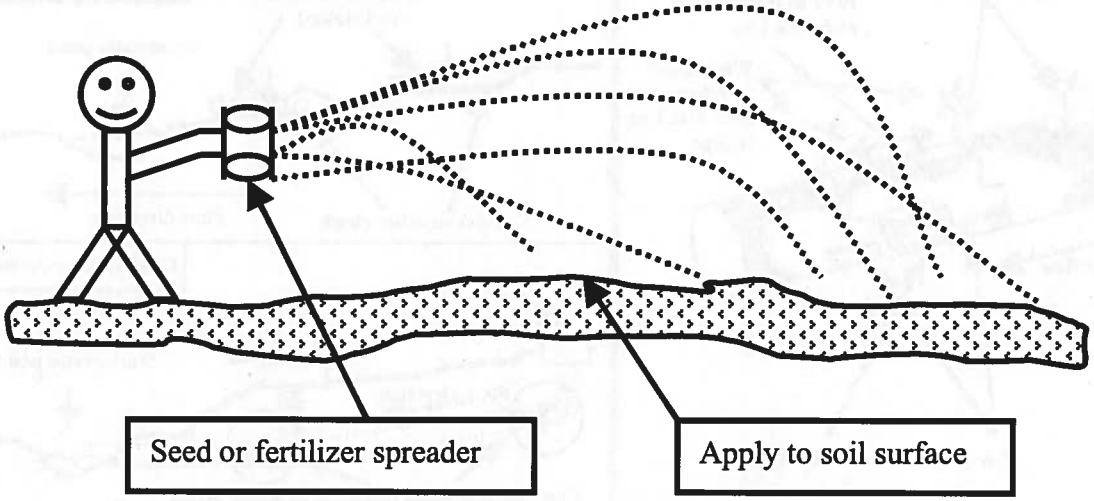
4) **Silt Stop shall be the final additive to the hydroseeding mix.**

5) **Straw cover may be applied over the hydroseeded application.**

(All Silt Stop shall be site specific, soil tested achieving 95% NTU reduction or better and must have acute and chronic toxicity testing reports.)

PM-D

PM (Dry Silt Stop Form)



Notes:

1) **Dry Silt Stop shall be applied using a seed or fertilizer spreader or may be mixed with other dry spread additives.**

2) **Dry Silt Stop shall be covered with straw, mulch, matting or jute.**

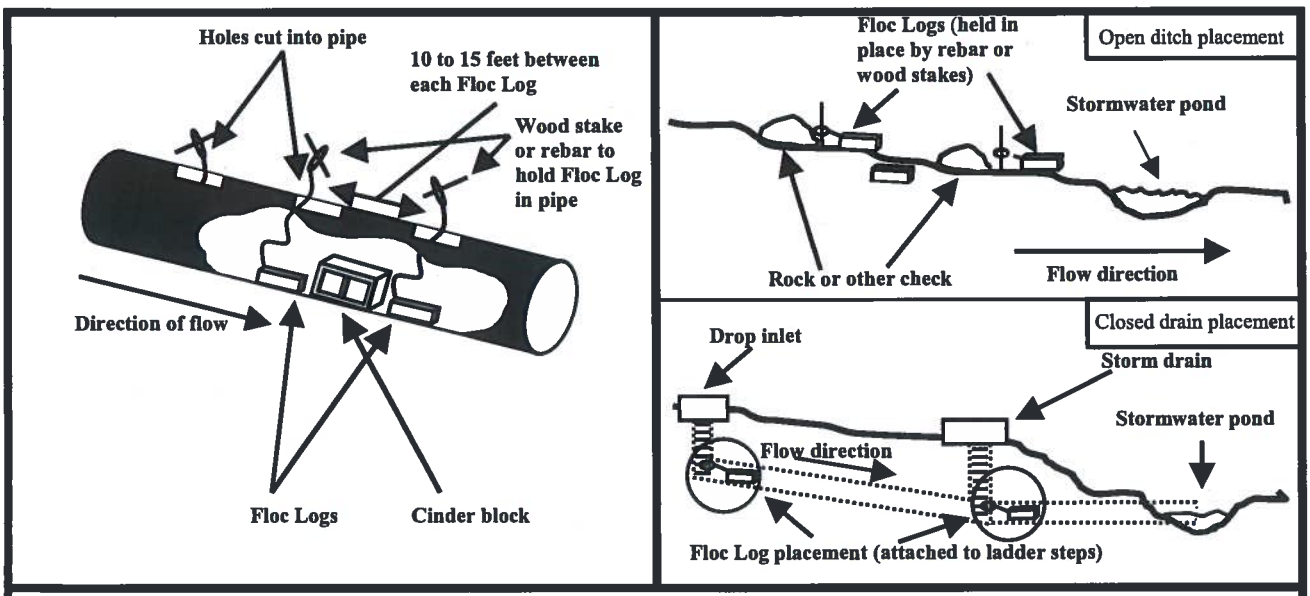
3) **Application rate shall be 10 pounds/acre but not greater than 25 pounds/acre.**

4) **For use on all slope conditions.**

(All Silt Stop shall be site specific, soil tested achieving 95% NTU reduction or better and must have acute and chronic toxicity testing reports.)

PM-F

(Floc Log placement for pipes, ditch and storm drains)



Notes:

1) **Place Floc Logs far enough upstream in turbid flows to allow adequate mixing time. (Mixing time and Floc Log type are determined from the sample analysis.)**

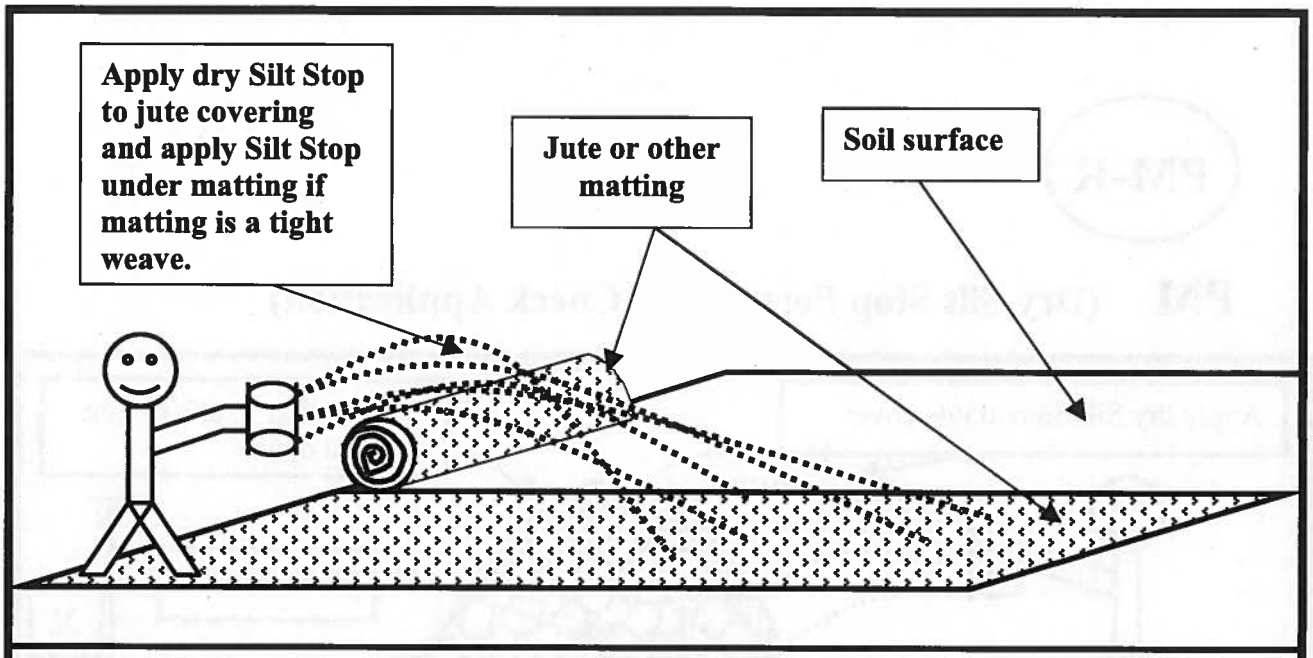
2) **Floc Logs should be placed 10 to 15 feet apart in a row or at points of highest water velocity; whichever is most convenient.**

3) **The number of Floc Logs placed on the site is based on results from the sample analysis. Floc Logs shall be placed in <u>all</u> catch basins and after <u>all</u> downsides of rock checks.**

(All Floc Logs shall be site specific, soil tested achieving 95% NTU reduction or better and must have acute and chronic toxicity testing reports.)

PM-M

(Dry Silt Stop Form Soft Armoring Technique for Matting)



Notes:

1) **For use on all slope conditions.**

2) **One layer of jute or other matting shall be applied to the surface of all exposed soil on 1:1 slopes.**

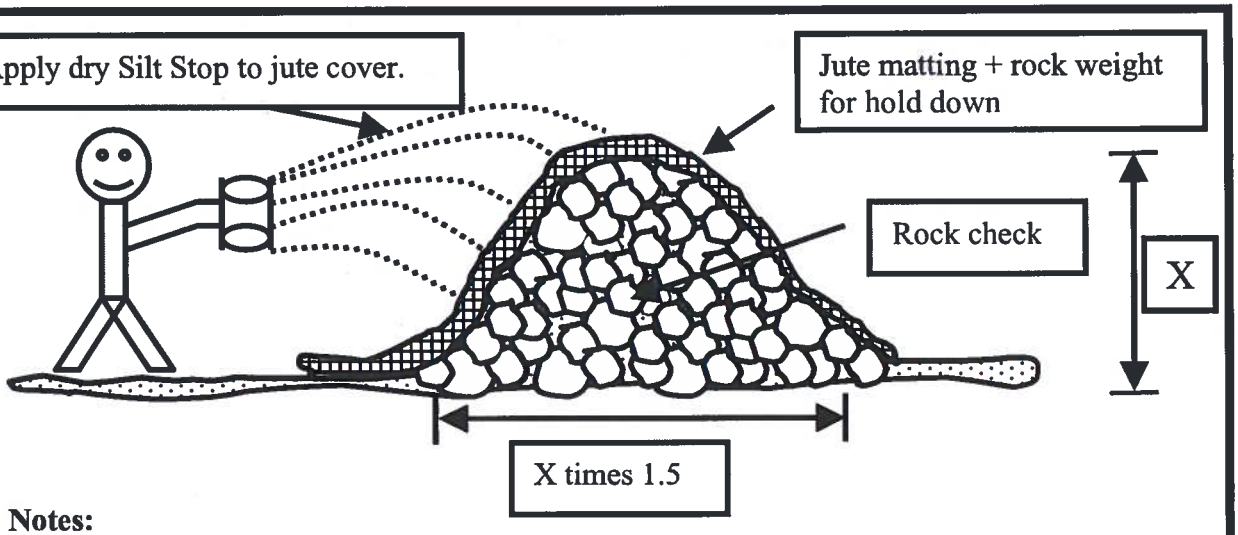
3) **Dry Silt Stop shall be applied to the soil if tight weave matting is used and also to the jute or burlap matting cover using a seed or fertilizer spreader.**

4) **Application rate shall be 10 pounds/acre but not greater than 25 pounds/acre.**

(All Silt Stop shall be site specific, soil tested achieving 95% NTU reduction or better and must have acute and chronic toxicity testing reports.)

PM-R

PM (Dry Silt Stop Form Rock Check Application)



Notes:

1) One layer of jute matting shall be applied to the surface of all rock checks.

2) Dry Silt Stop shall be applied to the jute cover using a seed or fertilizer spreader.

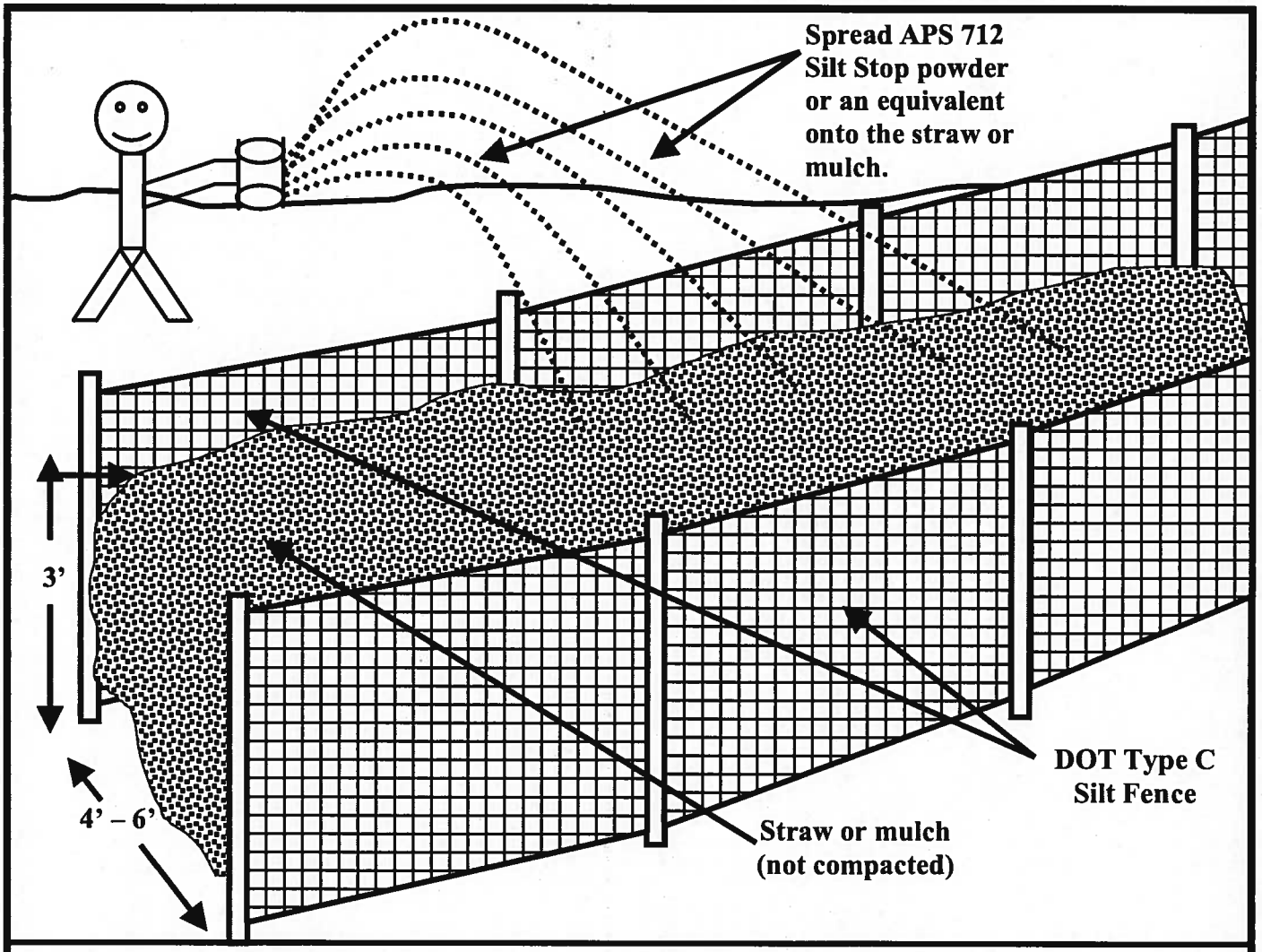
3) Application rate shall be 10 pounds/acre but not greater than 25 pounds/acre.

(All Silt Stop shall be site specific, soil tested achieving 95% NTU reduction or better and must have acute and chronic toxicity testing reports.)

SRB

(SRB) Sediment Retention Barrier

Use for fine sediment retention between silt fences. Install at low areas during grading.



1) Use in all low areas during the grading phase.

2) Place 2 rows of DOT type C silt fence 4 to 6 feet apart. Place straw or mulch 3 feet deep between the silt fences.

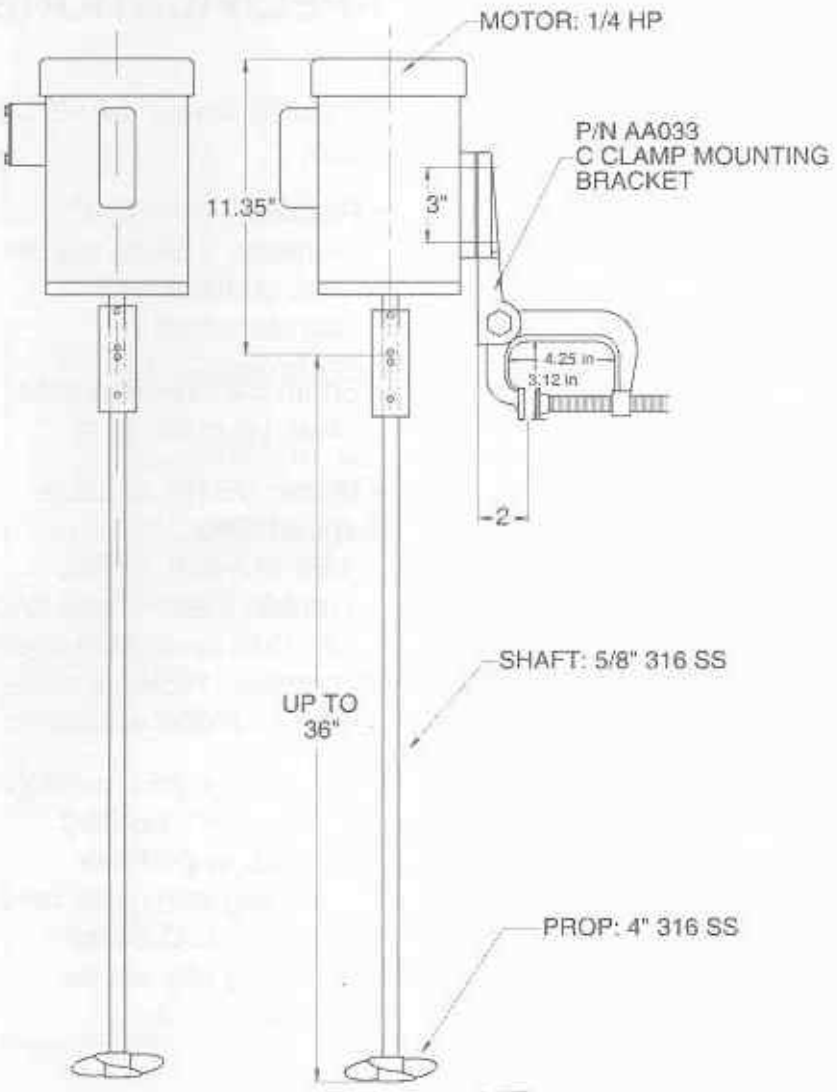
3) Dry Silt Stop powder or an equivalent should be spread throughout the straw or mulch using a seed or fertilizer spreader.

(All Silt Stop shall be site specific, soil tested achieving 95% NTU reduction or better and must have acute and chronic toxicity testing reports.)

pH System Components

MADDEN

MIXER MODEL NO. AA102A



AA102A

SPECIFICATIONS

- Speed: 1,725 rpm
- Propeller: (1 or 2) 4" diameter, 3 blade marine type, material: 316 stainless steel
- Shaft: 5/8" 316 stainless steel, up to 36" long
- Motor: 1/4 HP, 1,725 rpm, 1/60/115-230, capacitor start, or 3/60/230-460, TEFC
- Mounting: rigid mounting to fixed mixer mounting bracket, or portable mounting with mixer motor mounted to C clamp mounting bracket no. AA033.

PULSAFEEDER®
An IDEX Water & Wastewater Business

pulsafeeder.com

The Pulsatron Series E Plus offers manual control over stroke length and stroke rate as standard with the option to choose between 4-20mA and external pace inputs for automatic control.

Twenty distinct models are available, having pressure capabilities to 300 PSIG (21 BAR) @ 3 GPD (0.5 lph), and flow capacities to 600 GPD (94.6 lph) @ 30 PSIG (2 BAR), with a turndown ratio of 100:1. Metering performance is reproducible to within ± 2% of maximum capacity.
Please refer to the reverse side for Series E PLUS specifications.

Features

- Automatic Control, available with 4-20mADC direct or external pacing, with stop function.
- Manual Control by on-line adjustable stroke rate and stroke length.
- Auto-Off-Manual switch.
- Highly Reliable timing circuit.
- Circuit Protection against voltage and current upsets.
- Panel Mounted Fuse.
- Solenoid Protection by thermal overload with auto-reset.
- Water Resistant, for outdoor and indoor applications.
- Indicator Lights, panel mounted.
- Guided Ball Check Valve Systems, to reduce back flow and enhance outstanding priming characteristics.
- Safe & Easy Priming with durable leak-free bleed valve assembly (standard).

Controls

Manual Stroke Rate
- Turn-Down Ratio 10:1

Manual Stroke Length
- Turn-Down Ratio 10:1

4-20mADC Direct or External Pacing with Stop
- Automatic Control

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)

PULSAtron® Series E Plus Electronic Metering Pumps

PULSAtron® Series E Plus

Specifications and Model Selection

MODEL		LPK2	LPB2	LPA2	LPD3	LPB3	LPA3	LPK3	LPF4	LPD4	LPB4	LPH4	LPG4	LPE4	LPK5	LPH5	LPH6	LPK7	LPH7	LPJ7	LPH8
Capacity	GPH	0.13	0.21	0.25	0.5	0.50	0.50	0.60	0.85	0.90	1.00	1.70	1.75	1.85	2.50	3.15	5.00	8.00	10.00	10.00	25.00
nominal	GPD	3	5	6	12	12	12	14	20	22	24	41	42	44	60	76	120	192	240	240	600
(max.)	LPH	0.5	0.8	0.9	1.9	1.9	1.9	2.3	3.2	3.4	3.8	6.4	6.6	7	9.5	11.9	18.9	30.3	37.9	37.9	94.6
Pressure	PSIG	300	250	150	250	150	100	100	250	150	100	250	150	100	150	150	100	50	35	80	30
(max.)	BAR	21	17	10	17	10	7	7	17	10	7	17	10	7	10	10	7	3.3	2.4	5.5	2
Connections	Tubing	1/4" ID X 3/8" OD 3/8" ID X 1/2" OD													3/8" ID X 1/2" OD 1/2" ID X 3/4" OD (LPH8 ONLY)						
	Piping	1/4" FNPT													1/4" FNPT 1/2" FNPT						

Engineering Data

Pump Head Materials Available:	GFPPL
	PVC
	PVDF
	316 SS
Diaphragm:	PTFE-faced CSPE-backed
Check Valves Materials Available:	
Seats/O-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:	+/- 2% at maximum capacity
Viscosity Max CPS :	

For viscosity up to 3000 CPS, select connection size 3, 4, B or C with 316SS ball material. Flow rate will determine connection/ball size. Greater than 3000 CPS require spring loaded ball checks. See Selection Guide for proper connection.

Stroke Frequency Max SPM:	125
Stroke Frequency Turn-Down Ratio:	10:1
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:	1.0 Amps
@ 230 VAC; Amps:	0.5 Amps
Peak Input Power:	300 Watts
Average Input Power @ Max SPM:	130 Watts

Custom Engineered Designs – Pre-Engineered Systems

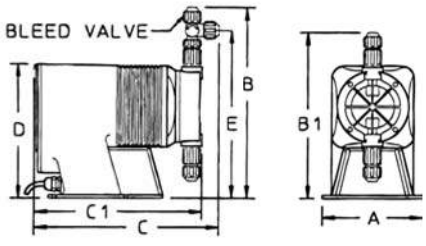
Pre-Engineered Systems

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 HDPE frame offers maximum chemical compatibility and structural rigidity. Each system is factory assembled and hydrostatically tested prior to shipment.

Dimensions

Series E Plus Dimensions (inches)																	
Model No.	A	B	B1	C	C1	D	E	Shpg Wt	Model No.	A	B	B1	C	C1	D	E	Shpg Wt
LPA2	5.4	10.3	-	10.8	-	7.5	8.9	13	LPH4	6.2	10.9	-	11.2	-	8.2	9.5	21
LPA3	5.4	10.6	-	10.7	-	7.5	9.2	13	LPH5	6.2	11.3	-	11.2	-	8.2	9.9	21
LPB2	5.4	10.3	-	10.8	-	7.5	8.9	13	LPH6	6.2	11.3	-	11.9	-	8.2	9.9	21
LPB3	5.4	10.6	-	10.7	-	7.5	9.2	13	LPH7	6.1	11.7	-	11.9	-	8.2	10.3	21
LPB4	5.4	10.6	-	10.7	-	7.5	9.2	13	LPH8*	6.1	-	10.9	-	11.3	8.2	-	26
LPD3	5.4	10.6	-	11.2	-	7.5	9.2	15	LPK2	5.4	10.3	-	10.8	-	7.5	8.9	13
LPD4	5.4	10.6	-	11.2	-	7.5	9.2	15	LPK3	5.4	10.6	-	10.7	-	7.5	9.2	13
LPE4	5.4	10.6	-	11.2	-	7.5	9.2	15	LPK5	5.4	10.9	-	11.7	-	7.5	9.5	18
LPF4	5.4	10.6	-	11.7	-	7.5	9.2	18	LPK7	6.1	11.7	-	11.2	-	8.2	10.3	21
LPG4	5.4	10.6	-	11.7	-	7.5	9.2	18	LPJ7	6.1	10	-	10.7	-	-	-	21

NOTE: Inches X 2.54 = cm /* the LPH8 is designed without a bleed valve available



+GF+® Signet pH/ORP Controllers

Versatile mounting options allow you to customize the installation for particular applications

NEW

- Large, scratch-resistant, self-healing display

+GF+ Signet controllers are designed for broad application and ease of setup and operation. Multiple mounting options allow for installation best suited to your particular application. Intuitive software and four-button keypad arrangement make it easy to access important information such as measurement values, calibration data, relay setup menus, and more.

Optional universal mounting kit allows for mounting of field-mount units on pipes, tanks, and walls. RC filter kit prevents premature wearing of the relay outputs by providing protection from electrical noise. Order separately below.

Required *System Components*

1. Controller
2. Preamplifier
3. Electrode

Field-mount controller 56560-20

Panel-mount controller 56560-30

Specifications

ISO9001:2000 CERTIFIED SUPPLIER · c UL us · CE · IP65 Meter only · 2 year warranty Meter only

Model		+GF+ Signet 8750-1	+GF+ Signet 8750-2	+GF+ Signet 8750-3
Range	pH	0.00 to 14.00	0.00 to 14.00	0.00 to 14.00
	mV	–1000 to 2000 mV	–1000 to 2000 mV	–1000 to 2000 mV
	Temperature	–13 to 248°F (–25 to 120°C)	–13 to 248°F (–25 to 120°C)	–13 to 248°F (–25 to 120°C)
Resolution	pH	0.01	0.01	0.01
	mV	1 mV	1 mV	1 mV
	Temperature	0.1°C (0.1°F)	0.1°C (0.1°F)	0.1°C (0.1°F)
Accuracy	pH	±0.03	±0.03	±0.03
	mV	±2 mV	±2 mV	±2 mV
	Temperature	±0.5°C (±1°F)	±0.5°C (±1°F)	±0.5°C (±1°F)
Temperature compensation		Automatic, 3 kΩ Balco	Automatic, 3 kΩ Balco	Automatic, 3 kΩ Balco
Control type		On/off (limit) or proportional	On/off (limit) or proportional	On/off (limit) or proportional
Number of set points		Two (low, high)	Two (low, high)	Two (low, high)
Output	Relay	—	Two SPDT relays, 5 A at 30 VDC or 250 VAC resistive load maximum	—
	Current	One 4 to 20 mA, isolated, fully adjustable and reversible	One 4 to 20 mA, isolated, fully adjustable and reversible	Two 4 to 20 mA, isolated, fully adjustable and reversible
	Open collector	One open-collector, optically isolated, 50 mA max	—	Two open-collector, optically isolated, 50 mA max
Dead band		User adjustable	User adjustable	User adjustable
Housing		NEMA 4X (IP65) front panel	NEMA 4X (IP65) front panel	NEMA 4X (IP65) front panel
Display		2 x 16 alphanumeric LCD	2 x 16 alphanumeric LCD	2 x 16 alphanumeric LCD
Dimensions (W x H x D)		Field-mount: 3 13/16" x 3 13/16" x 4 3/16" (96 x 96 x 106 mm) Panel-mount: 3 13/16" x 3 13/16" x 3 13/16" (96 x 96 x 97 mm)		
Power		12 to 24 VDC	12 to 24 VDC	12 to 24 VDC

1 Controllers

Catalog number	Model	Mounting style	Price
S-56560-18 **S-56560-28**	+GF+ Signet 8750-1 +GF+ Signet 8750-1P	Field mount Panel mount, ¼ DIN	
S-56560-20 **S-56560-30**	+GF+ Signet 8750-2 +GF+ Signet 8750-2P	Field mount Panel mount, ¼ DIN	
S-56560-22 **S-56560-32**	+GF+ Signet 8750-3 +GF+ Signet 8750-3P	Field mount Panel mount, ¼ DIN	

S-05631-50 Universal mounting kit for field-mount units .....

S-19007-52 RC filter kit for relay use. Pack of 2 .....

S-17106-20 NIST-traceable calibration .....

2 Preamplifiers

Preamplifiers protect the relatively weak output signal of the pH or ORP electrode from electrical interferences common in industrial environments and are required for initial system installation. Unique DryLoc® connectors allow you to quickly form robust assemblies for submersible and in-line applications.

Catalog number	Thread size	Price
S-56560-03 **S-56560-04**	¾" NPT(M) ISO 7-1 R¾"	

DryLoc® pH and ORP electrodes

3 Electrodes

Feature-packed pH and ORP electrodes feature unique DryLoc connectors which offer resistance to intrusion from dirt and moisture. Extended reference path length extends electrode life over traditional combination electrodes. Electrode bodies are Ryton® PPS for added chemical resistance and feature a ¾" NPT(M) or ISO 7-1 R¾" threads for in-line installation. Flat-surface electrodes minimize abrasion and breakage problems by allowing sediment to sweep past the measurement surface. Bulb-style electrodes feature quick response and are well-suited to general-purpose applications. HF-resistant electrodes resist hydrofluoric acid in concentration less than 2%. LC-bulb electrodes are designed for ultrapure, low-conductivity water applications. All have a 3 kΩ Balco ATC element and measure 0 to 14 pH.

Catalog number	Type	Thread size	Price
S-56561-02 **S-56561-03**	pH, flat surface	¾" NPT(M) ISO 7-1 R¾"	
S-56561-10 **S-56561-11**	pH, bulb style	¾" NPT(M) ISO 7-1 R¾"	
S-56561-06 **S-56561-07**	pH, HF-resistant bulb	¾" NPT(M) ISO 7-1 R¾"	
S-56561-14 **S-56561-15**	pH, LC bulb	¾" NPT(M) ISO 7-1 R¾"	
S-56561-16 **S-56561-17**	ORP, flat surface	¾" NPT(M) ISO 7-1 R¾"	

NorFalco Inc.
NorFalco Sales Inc.

Material Safety Data Sheet

77% - 100% SULFURIC ACID

SECTION 1. PRODUCT IDENTIFICATION

Trade Name	**77 % - 100 % Sulfuric Acid**
Product Code	None
Manufacturers/Distributors	NorFalco Inc., 6000 Lombardo Center, The Genesis Blg, suite 650 Seven Hills, OH 44131 NorFalco Sales Inc., 6755 Mississauga Road, Suite 304, Mississauga, Ontario L5N 7Y2
Information Contact	André Auger, Administration Assistant
Product Information	1-905-542-6901 (Mississauga)
Phone Number (Transportation Emergency)	Canada 1-877-ERP-ACID (377-2243)
Phone Number (Transportation Emergency)	U.S.A. 1-800-424-9300 CHEMTREC
Phone Number (Medical Emergency)	**1-418-656-8090**
Phone Number (Emergency)	**CANUTEC 1-613-996-6666**
Synonyms	Dihydrogen Sulfate ; Oil of Vitriol ; Vitriol Brown Oil ; Sulphuric Acid. Acide sulfurique (French)
Name / Chemical Formula	Sulfuric Acid / H_2SO_4
Chemical Family	Acid
Utilization	Chemical industries ; Water treatment ; Fertilizer ; Pulp and Paper.

Manufacturers CEZinc on behalf of Noranda Income Limited Partnership, Salaberry-de-Valleyfield (Quebec) Canada J6T 6L4
Xstrata Copper, Home Smelter, Rouyn-Noranda (Quebec) J9X 5B6
Xstrata Zinc, Brunswick Smelting, Belledune, New Brunswick E0B 1G0
Xstrata Copper, Kidd Metallurgical Division, Timmins, Ontario P4N 7K1
Xstrata Nickel, Sudbury Operations, Falconbridge, Ontario P0M 1S0

SECTION 2. HAZARDS IDENTIFICATION

WHMIS (Canada) CLASS D-1A : Very toxic material causing immediate and serious effects
CLASS E : Corrosive material

Labeling (EEC) C Corrosive

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Name	CAS #	Percentage (%)	# CE	R Phrases[1]
Sulfuric (Acid)	7664-93-9	77 % to 100 %	231-639-5	R35
60 Deg Technical		77.7		
66 Deg Technical		93.2		
1.835 Electrolyte		93.2		
98 % Technical		98		
99 % Technical		99		
100 % Technical		100		
Water	7732-18-5	0-22		

Note 1 : See section 15 for the complete wording of risk phrases.

SECTION 4. FIRST-AID MEASURES

Eye Contact Remove contact lenses if present. Immediately flush eyes with plenty of water, holding eyelids open for at least 15 minutes. Consult a physician. Possibility of conjonctivitis, severe irritation, severe burns, permanent eye damage.

Skin Contact Remove contaminated clothing and shoes as quickly as possible protecting your hands and body. Place under a deluge shower for 15 minutes. Flush exposed skin gently and thoroughly with running water (Pay particular attention to : Folds, crevices, creases, groin). Call a physician if irritation persists. May irritate skin, cause burns (Highly corrosive) and possibility of some scarring.

Wash contaminated clothing before reusing. While the patient is being transported to a medical facility, continue the application of cold, wet compresses. If medical treatment must be delayed, repeat the flushing with cold water or soak the affected area with cold water to help remove the last traces of sulfuric acid. *Creams or ointments* ***SHOULD NOT*** *be applied before or during the washing phase of treatment.*

Inhalation Take precautions to avoid secondary contamination by residual acids. Remove the person to fresh air. If not breathing, give artificial respiration. Difficult breathing : Give oxygen. Get immediate medical attention. Possibility of damage to the upper respiratory tract and lung tissues. Maintain observation of the patient for delayed onset of pulmonary oedema. May cause irritation to the upper respiratory tract : Coughing, sore throat, shortness of breath.

Ingestion **DO NOT** INDUCE VOMITING. Conscious and alert person : Rinse mouth with water and give ½ to 1 cup of water or milk to dilute material. **Spontaneous vomiting** : Keep head below hips to prevent aspiration ; Rinse mouth and give ½ to 1 cup of water or milk. **UNCONSCIOUS** person : **DO NOT** induce vomiting or give any liquid. **Immediately** obtain medical attention.

Notes to Physicians
Continued washing of the affected area with cold or iced water will be helpful in removing the last traces of sulfuric acid. Creams or ointments should not be applied before or during the washing phase of the treatment.

SECTION 5. FIRE-FIGHTING MEASURES

Flash Point	Not available
Flammable Limits	Not available
Auto-Ignition Temperature	Not available
Products of Combustion	Releases of sulfur dioxide at extremely high temperatures.
Fire Hazard	Not flammable
Explosion Hazard	Reacts with most metals, especially when dilute : Hydrogen gas release (**Extremely** flammable, explosive). Risk of explosion if acid combined with water, organic materials or base solutions in enclosed spaces (Vaccum trucks, tanks). Mixing acids of different strengths/concentrations can also pose an explosive risk in an enclosed space/container.
Extinguishing media	ERG (Emergency Response Guidebook) : Guide 137 When material is not involved in fire, do not use water on material itself. **Small fire :** Dry chemical or CO_2. Move containers from fire area if you can do it without risk. **Large fire:** Flood fire area with large quantities of water, while knocking down vapors with water fog. If insufficient water supply: knock down vapors only. **Fire involving Tanks or Car/Trailer Loads :** Cool containers with flooding quantities of water until well after fire is out. Do not get water inside containers. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire.
Protective equipment	Evacuate personnel to a safe area. Keep personnel removed and upwind of fire. Generates heat upon addition of water, with possibility of spattering. Wear full protective clothing. Runoff from fire control may cause pollution. Neutralize run-off with lime, soda ash, etc., to prevent corrosion of metals and formation of hydrogen gas. Wear self-contained breathing apparatus if fumes or mists are present.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Spill	Review **Fire and Explosion Hazards** and **Safety Precautions** before proceeding with clean up. Stop flow if possible. Soak up small spills with dry sand, clay or diatomaceous earth.
Methods	Dike large spills, and cautiously dilute and neutralize with lime or soda ash, and transfer to waste water treatment system. Prevent liquid from entering sewers, waterways, or low areas. If this product is spilled and not recovered, or is recovered as a waste for treatment or disposal, the Reportable Quantity (U.S. DOT) is 1 000 lbs (Based on the sulfuric acid content of the solution spilled). Comply with Federal, State, and local regulations on reporting releases.
Protective equipment	Review Fire Fighting Measures and Handling (Personnel Protection) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

SECTION 7. HANDLING AND STORAGE

Handling	Do not get in eyes, on skin, or on clothing. Avoid breathing vapours or mist. Wear approved respirators if adequate ventilation cannot be provided. Wash thoroughly after handling. Ingestion or inhalation : Seek medical advice **immediately** and provide medical personnel with a copy of this MSDS.
Conditions for storage	Sulfuric acid must be stored in containers or tanks that have been specially designed for use with sulfuric acid. **DO NOT** add water or other products to contents in containers as violent reactions will result with resulting high heat, pressure and/or generation of hazardous acid mists. Keep containers away from heat, sparks, and flame. All closed containers must be safely vented before each opening. For more information on sulfuric acid tanks, truck tanks and tank cars including safe unloading information go to www.norfalco.com.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

		Control parameters	
		ACGIH (U.S.A.) 2008	OSHA (U.S.A.)
Name	**# CAS**	**TLV-TWA (mg/m³)**	**PEL - TWA (mg/m³)**
Sulfuric (Acid)	7664-93-9	0.2 (thoracic fr.)	1
60 Deg Technical	7664-93-9	0.2 (thoracic fr.)	1
66 Deg Technical	7664-93-9	0.2 (thoracic fr.)	1
1.835 Electrolyte	7664-93-9	0.2 (thoracic fr.)	1
98 % Technical	7664-93-9	0.2 (thoracic fr.)	1
99 % Technical	7664-93-9	0.2 (thoracic fr.)	1
100 % Technical	7664-93-9	0.2 (thoracic fr.)	1
Water	7732-18-5	Not established	Not established

ACGIH : American Conference of Governmental Industrial Hygienists. OSHA : Occupational Safety and Health Administration.

Note : **Sulfuric (Acid) :** Exposure limits may be different in other jurisdictions. NIOSH REL-TWA (≤10 hours) : 1 mg/m³ ; IDLH : 15 mg/m³. *Consult local authorities for acceptable exposure limits.*

Engineering Controls Good general ventilation should be provided to keep vapour and mist concentrations below the exposure limits.

Individual protection Chemical splash goggles ; Full-length face shield/chemical splash goggles combination ; Acid-proof gauntlet gloves, apron, and boots ; Long sleeve wool, acrylic, or polyester clothing ; Acid proof suit and hood ; Appropriate NIOSH respiratory protection.

In case of emergency or where there is a strong possibility of considerable exposure, wear a complete acid suit with hood, boots, and gloves. If acid vapour or mist are present and exposure limits may be exceeded, wear appropriate NIOSH respiratory protection.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State and Appearance	Liquid (Oily ; Clear to turbid)	**Odour**	Odourless
Molecular Weight	98.08	**Colour**	Colourless to light grey
pH (1% soln/water)	< 1	**Volatility**	< 1 (Butyl Acetate = 1.0)
Boiling Point	193°C to 327 °C (379°F to 621°F) @ 760 mm Hg	**Vapour Density**	3.4
Melting Point	-35°C to 11°C (-31°F to 52°F)	**Dispersion**	Yes (Water)
Vapour Pressure	< 0.3 mm Hg @ 25°C (77 °F) < 0.6 mm Hg @ 38°C (100 °F)	**Solubility**	Yes (Water)

GRADE	Boiling Point		Freezing Point		Specific Gravity
	DEG °C	DEG °F	DEG °C	DEG °F	
60 DEG TECHNICAL	193	380	- 12	10	1.706
66 DEG TECHNICAL	279	535	- 35	- 31	1.835
1.835 ELECTROLYTE	279	535	- 35	- 31	1.835
98 % TECHNICAL	327	621	- 2	29	1.844
99 % TECHNICAL	310	590	4	40	1.842
100 % TECHNICAL	274	526	11	51	1.839

SECTION 10. STABILITY AND REACTIVITY

Stability Yes (Under normal conditions of ambiant temperature)

Reactivity Reacts violently with water, organic substances and base solutions with evolution of heat and hazardous mists.

Conditions to avoid Heat : Possibility of decomposition. Release of dangerous gases (Sulfur oxides SO_2, SO_3)

Polymerization Polymerization will not occur.

Incompatibilities Vigorous reactions with : Water; alkaline solutions ; Metals, metal powder ; Carbides ; Chlorates ; Fulminates ; nitrates ; Picrates ; Strong oxidizing, reducing, or combustible organic materials. Hazardous gases are evolved on contact with chemicals such as cyanides, sulfides, and carbides.

Corrosivity Yes

SECTION 11. TOXICOLOGICAL INFORMATION

Routes of Entry Ingestion. Inhalation. Skin and eye contacts.

Carcinogenicity **Strong inorganic acid mists containing sulfuric acid (Occupational exposures) :** PROVEN (Human, Group 1, IARC) ; SUSPECTED (Human, Group A2, ACGIH) ; Group X (NTP) ; Classification not applicable to sulfuric acid and sulfuric acid solutions.

Mutagenicity Not applicable.

Teratogenicity Not applicable.

Acute toxicity ORAL (LD50) : 2 140 mg/kg (Rat) ; INHALATION (LC50, 2 hours) : 510 mg/m³ (Rat) ; 320 mg/m³ (Mouse). (RTECS).

Acute Effects May be **fatal** if inhaled or ingested in large quantity. Liquids or acid mists : May produce tissue damage : Mucous membranes (Eyes, mouth, respiratory tract). **Extremely** dangerous by eyes and skin contact **(Corrosive)**. Severe irritant for eyes : Inflammation (Redness, watering, itching). Very dangerous in case of inhalation (Mists) at high concentrations : May produce severe irritation of respiratory tract (Coughing, shortness of breath, choking).

Chronic Effects Target organs for acute and chronic overexposure (NIOSH 90-117) : Respiratory system, eyes, skin, teeth.

Acid mists : Overexposure to strong inorganic mists containing sulfuric acid : Possibility of laryngeal cancer (HSBD, IARC). Possibility of irritation of the nose and throat with sneezing, sore throat or runny nose. Headache, nausea and weakness. Gross overexposure : Possibility of irritation of nose, throat, and lungs with cough, difficulty breathing or shortness of breath. Pulmonary edema with cough, wheezing, abnormal lung sounds, possibly progressing to severe shortness of breath and bluish discoloration of the skin. Symptoms may be delayed. Repeated or prolonged exposure to mists may cause : Corrosion of teeth.

Contact (Skin) : Possibility of corrosion, burns or ulcers. Contact with a 1 % solution : Possibility of slight irritation with itching, redness or swelling. Repeated or prolonged exposure (Mist) : Possibility of irritation with itching, burning, redness, swelling or rash.

Contact (Eye) : Possibility of corrosion or ulceration (Blindness may result). Repeated or prolonged exposure (Mist) : Possibility of eye irritation with tearing, pain or blurred vision.

Ingestion : Immediate effects of overexposure : Burns of the mouth, throat, esophagus and stomach, with severe pain, bleeding, vomiting, diarrhea and collapse of blood pressure. Damage may appear days after exposure.

Toxicity

Persons with the following pre-existing conditions warrant particular attention :
Sulfuric (Acid) : Laryngeal irritation.

Eating, drinking and smoking must be prohibited in areas where this material is handled and processed. Wash hands and face before eating, drinking and smoking.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Aquatic toxicity : Slightly to moderately toxic.
Bluegill Sunfish (LC50 ; 48 hours) : 49 mg/l (Tap water, 20 °C, conditions of bioessay not specified). (HSBD).
Flounder (LC50 ; 48 hours) : 100-330 mg/l (Aerated water, conditions of bioessay not specified). (HSBD).

Toxicity to Animals

EYE : Concentrated compound is corrosive. 10 % solution : Moderate eye irritant.
SKIN : Concentrated compound is corrosive. 10 % solution : Slight skin irritant.
Single and repeated exposure : Irritation of the respiratory tract ; Corrosion of the respiratory tract ; Lung damage ; Labored breathing ; Altered respiratory rate ; Pulmonary oedema. Repeated exposure : Altered red blood cell count.

Mobility (Soil)

Easy soil seeping under rain action

Persistence and degradability

Sulfate ion : Ubiquitous in the environment. Metabolized by micro-organisms and plants.

Bioaccumulation

Sulfate ion : Ubiquitous in the environment. Metabolized by micro-organisms and plants whitout bioaccumulation.

Biodegradation Products

Not available

Biodegradation Products (Toxicity)

Not applicable

Remarks on Environment

Due to the product's composition, particular attention must be taken for transportation and storage. Protect from rain because the run-off water will become acidic and may be harmful to flora and fauna.

BOD5 and COD

Not available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Cleaned-up material may be an hazardous waste on *Resource Conservation and Recovery Act* (RCRA) on disposal due to the corrosivity characteristic. **DO NOT** flush to surface water or sanitary sewer system. Comply with Federal, State, and local regulations. If approved, neutralize and transfer to waste treatment system.

SECTION 14. TRANSPORT INFORMATION

TDG (Canada)

CLASS 8 Corrosives

PIN

UN1830 SULFURIC ACID PG II

Special Provisions (Transport)

None

DOT (U.S.A.)/IMO (Maritime)

Proper Shipping Name	SULFURIC ACID
Hazard Class	8
UN N°	1830
DOT/IMO Label	CORROSIVE
Packing Group	II
Reportable Quantity	1000 lbs (454 kg)
Shipping Containers	Tank Cars, Tank Trucks, Vessel

ERG

Guide 137

SECTION 15 REGULATORY INFORMATION

Labeling (EEC)

EU (Directive 67/548/EEC) :
Sulfuric (Acid) : C Corrosive (Pictogram)
Annex I Index number : 016-020-00-8 ; EU Consolidated Inventories : EC Number 231-639-5
$C \geq 15\ \%$ C ; R35 ; S2, 26, 30, 45.

Risk Phrases (EEC)

R35- Causes severe burns

Safety Phrases (EEC)

S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S30- Nerver add water to this product
S36/37/39- Wear suitable protective clothing, gloves and eye/face protection
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

CEPA DSL (CANADA)	CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) : On the Domestic Substances List (DSL) ; Acceptable for use under the provisions of CEPA. Sulfuric Acid is a Class B Drug Precursor under *Health Canada's Controlled Drugs and Substances Act* and *Precursor Control Regulations*.
Regulations (U.S.A.)	CERCLA Section 103 Hazardous substances (40 CFR 302.4) ; SARA Section 302 Extremely Hazardous Substances (40 CFR 355) : Yes ; SARA Section 313, Toxic Chemicals (40 CFR 372.65) ; US: TSCA Inventory : Listed : **Sulfuric (Acid)** (Final RQ) : 1 000 pounds (454 kg) Sulfuric Acid is subject to reporting requirements of Section 313, *Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA)*, 40 CFR Part 372. Certain companies must report emissions of Sulfuric Acid as required under *The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)*, 40 CFR Part 302 For more information call the *SARA Hotline* 800-424-9346. Strong Inorganic Acid Mists Containing Sulfuric Acid : Chemical listed effective March 14, 2003 to the *State of California, Proposal 65.* *U.S. FDA Food Bioterrorism Regulations* : These regulations apply to Sulfuric Acid when being distributed, stored or used for Food or Food Processing.
Classifications HCS (U.S.A.)	Corrosive liquid

NFPA (National Fire Protection Association) (U.S.A.)

Fire Hazard	**0**	**Reactivity**	**2**	**Health**	**3**	**Special Hazard**	**ACID**

NPCA- HMIS Rating

Fire Hazard	**0**	**Reactivity**	**2**	**Health**	**3**

SECTION 16. OTHER INFORMATION

References

- TLVs and BEIs (2008). Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. ACGIH, Cincinnati, OH – http://www.acgih.org
- CCOHS (2008) - Canadian Centre for Occupational Health and Safety - http://www.ccohs.ca/
- CSST (2008) - Commission de la Santé et de la Sécurité du Travail (Québec). Service du répertoire toxicologique - http://www.reptox.csst.qc.ca/
- ERG (2008). Emergency Response Guidebook, Developed by the U.S. Department of Transportation, Transport Canada, and the Secretariat of Communications and Transportation of Mexico
- HSDB (2008) - Hazardous Substances Data Bank. TOXNET® Network of databases on toxicology, hazardous chemicals, and environmental health. NLM Databases & Electronic Resources, U.S. National Library of Medicine, NHI, 8600 Rockville Pike, Bethesda, MD 20894 - http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB
- IARC - Monographs on the Evaluation of Carcinogenic Risks to Humans (collection) - http://www-cie.iarc.fr/
- Merck Index (1999). Merck & CO., Inc, 12th edition
- NIOSH U.S. (2008) - Pocket Guide to Chemical Hazards - http://www.cdc.gov/niosh/npg/
- Patty's Industrial Hygiene and Toxicology, 3rd Revised Edition
- Règlement sur les produits contrôlés (Canada)
- RTECS (2008). Registry of Toxic Effects of Chemical Substances, NIOSH, CDC
- Toxicologie industrielle & intoxication professionnelle, 3e édition, Lauwerys

Glossary

CSST	: Commission de la Santé et de la Sécurité du Travail (Québec).
HSDB	: Hazardous Substances Data Bank.
IARC	: International Agency for Research on Cancer.
NIOSH	: National Institute of Occupational Safety and Health.
NTP	: U.S. National Toxicology Program.
RTECS	: Registry of Toxic Effects of Chemical Substances

Note

For further information, see NorFalco Inc. Sulfuric Acid « Storage and Handling Bulletin ».

Because of its corrosive characteristics and inherent hazards, Sulfuric Acid should not be used in sewer or drain cleaners or any similar application; regardless of whether they are formulated for residential, commercial or industrial use. NorFalco will not knowingly sell sulfuric acid to individuals or companies who repackage the product for sale as sewer or drain cleaners, or any other similar use.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

For additional information, please visited our website : www.norfalco.com

Written by : Groupe STEM Consultants / NorFalco Sales Inc.

Complete revision : 2009-01-24 **Partial review :** None **Previous complete revision :** 2008-01-24

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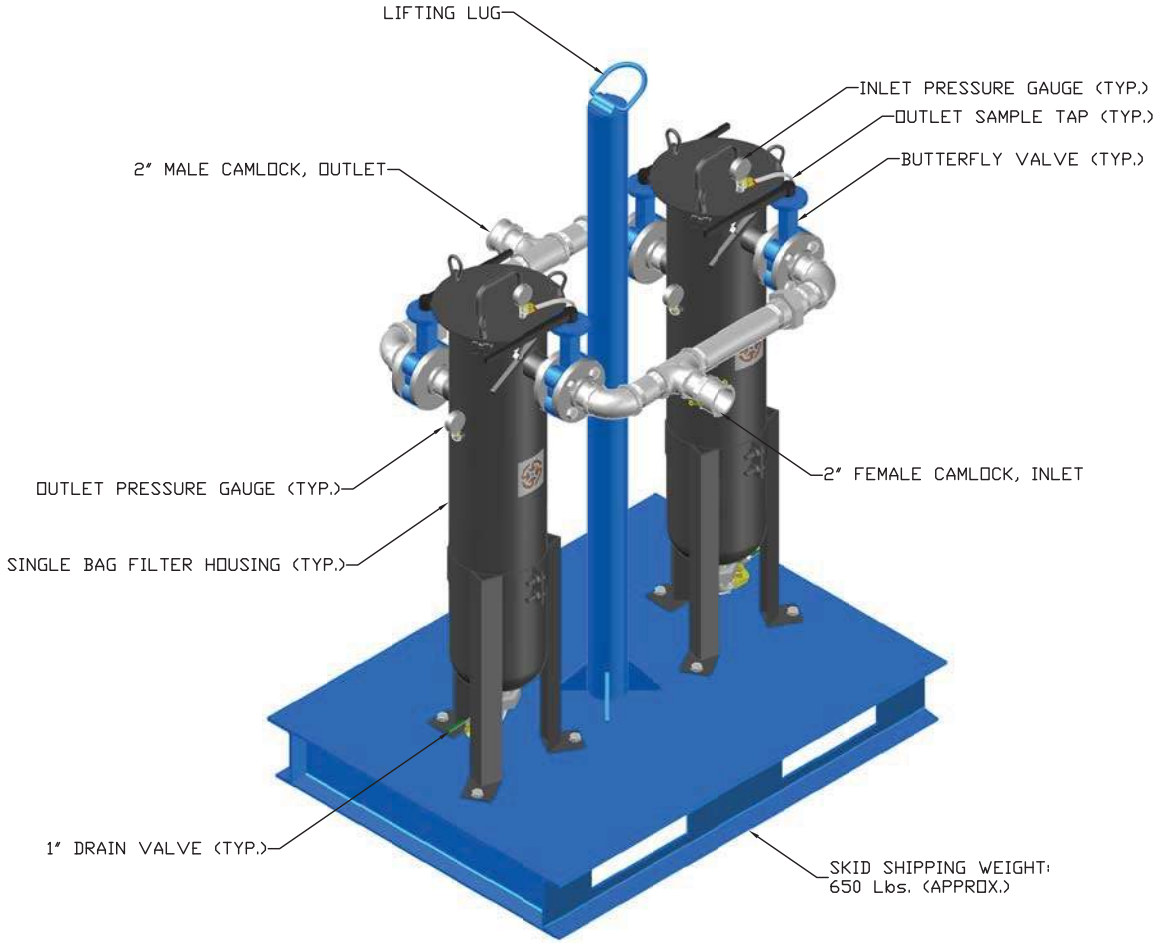
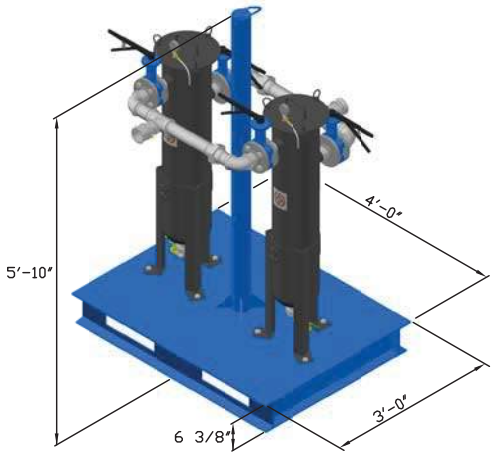
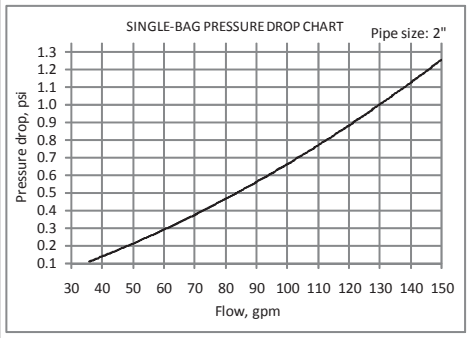
Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. NorFalco Sales Inc.extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This material safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations, therefore, your specific use of this product should he evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.





NOTE: THIS DRAWING DEPICTS A "TYPICAL" SKID.
ACTUAL DETAILS AND DIMENSIONS MAY VARY.

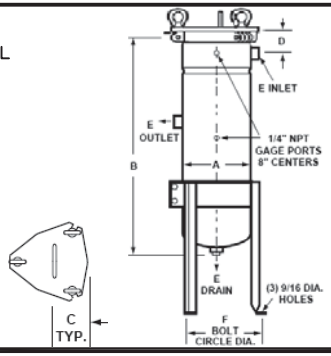


SINGLE BAG FILTER SPECIFICATIONS

- CONSTRUCTION:	CARBON STEEL
- HOUSING STYLE:	STANDARD
- NUMBER OF BASKETS:	1
- STRAINING FILTERING AREA:	26.4 SQR. FT.
- INLET/OUTLET SIZE:	2"
- DRAIN SIZE (1x):	2"
- NOMINAL FLOW RATE:	100 GPM
- STANDARD PRESSURE:	125 PSI
- WEIGHT (PER DRY UNIT):	70 Lbs.

BASIC DIMENSIONS

MODEL NUMBER & A: 8 (8.6")
LEG BOLT CIRCLE F: ø12.0"
B: 35.9" C: 6.0"
D: 3.5" E: 2.0"



NO.	REVISIONS	DATE
C	ADDED SKID WEIGHT	02/18/09

DUPLEX SINGLE BAG FILTER SKID STANDARD EQUIPMENT SPECIFICATION

SCALE: NTS	APPROVED BY: JB	DRAWN BY: AAV	
DATE: 02/18/09			

GROUND/WATER TREATMENT & TECHNOLOGY
P.O. BOX 1174
DENVILLE, NJ 07834

DWG SIZE: A	SHEET: 1 OF 1	DRAWING NUMBER: ST-0002-SPC	C

TENCATE Mirafi®

Mirafi® 140N

Mirafi® 140N is a needlepunched nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Mirafi® 140N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids. Mirafi® 140N meets Aashto M288-06 Class 3 for elongation > 50%.

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D4632	lbs (N)	120 (534)	120 (534)
Grab Tensile Elongation	ASTM D4632	%	50	50
Trapezoid Tear Strength	ASTM D4533	lbs (N)	50 (223)	50 (223)
CBR Puncture Strength	ASTM D6241	lbs (N)	310 (1380)	
Apparent Opening Size (AOS)[1]	ASTM D4751	U.S. Sieve (mm)	70 (0.212)	
Permittivity	ASTM D4491	sec^{-1}	1.7	
Flow Rate	ASTM D4491	$gal/min/ft^2$ ($l/min/m^2$)	135 (5500)	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	70	

[1] ASTM D4751: AOS is a Maximum Opening Diameter Value

Physical Properties	Unit	Typical Value	
Roll Dimensions (width x length)	ft (m)	12.5 x 360 (3.8 x 110)	15 x 360 (4.5 x 110)
Roll Area	yd^2 (m^2)	500 (418)	600 (502)
Estimated Roll Weight	lb (kg)	133 (60)	160 (72)

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