Electronic Submittal (NPDES.Generalpermits@epa.gov)
July 31, 2017

U.S. Environmental Protection Agency
Office of Eco System Protection
EPA/OEP Application Coordinator
5 Post Office Square - Suite 100 (OEP06-01)
Boston, MA 02109-3912
Attn: Remediation General Permit NOI Processing

Re: 2017 RGP NOI
AMPET Service Station
100 Chelmsford Street
Chelmsford, MA 01824
UST Facility #9345
DEP RTN 3-4757

Dear Sir / Madam:

CarriageHouse Consulting, Inc. (CHCI) has prepared this correspondence on behalf of AMPET, Inc. (AMPET), who is seeking coverage under the U.S. Environmental Protection Agency's newly promulgated 2017 National Pollutant Discharge Elimination System (NPDES) Remediation General Permit (RGP) for discharge of treated groundwater from the AMPET Service Station property situated at 100 Chelmsford Street in Chelmsford, Massachusetts (the "site") to an unnamed tributary of the River Meadow Brook. Excavation dewatering and discharge of treated groundwater from the site is necessary to allow for replacement of existing single-wall steel underground storage tank (UST) systems pursuant to the Massachusetts UST Regulations, 310 CMR 80.00.

In accordance with Part 1of the RGP Notice of Intent (NOI) instructions, general facility/site information is included in Section A of the enclosed Suggested Format for the RGP NOI form, receiving water information in Part B, source water information in Part C, discharge information in Part D, treatment system information in Part E, chemical & additive information in Part F, Endangered Species Act information in Part G, and National Historic Act information in Part H. The proposed discharge has been determined to fall within the Activity Category I – Petroleum-Related Site Remediation with Contamination Type A – Inorganics, Type B - Non-Halogenated Volatile Organic Compounds, Type D - Non-Halogenated Semi-Volatile Organic Compounds, and Type F – Fuels Parameters. The treated effluent will be discharged through a three-inch discharge hose to a stormwater catch basin, which conveys water to the Outfall 001 location north of the subject site.

A Locus Plan illustrating the location of the Site relative to regional features is included as Figure 1. A Site Plan illustrating the location of the Site relative to nearby features, including property boundaries, and existing USTs is included as Figure 2. An Environmental Resources Plan generated from information obtained through the Massachusetts Geographic Information System and depicting information about potential receptors in the immediate vicinity of the subject property is included as Figure 3. A Discharge Schematic Diagram illustrating the proposed treatment system processes, direction of water flow, sampling points, and other pertinent information is included as Figure 4.

Also included herein to illustrate the flow path of the proposed treatment system effluent to the receiving water outfall to the unnamed stream are the following plans with comments by CHCI: *Zoning Board of Appeals Plan* prepared by Hancock Associates and dated May 3, 2017, *As-Built Plan* prepared by Hancock Associates and dated July 15, 2009, and a *Holiday Inn Express Hotel Proposed Additions* plan prepared by TAJ Engineering, LLC and dated December 9, 2016.

Should you have any questions, comments, or concerns, please do not hesitate to contact us directly by telephone at (508) 315-3146, or by email at jwiggin@carriagehouseinfo.com.

Sincerely,
CarriageHouse Consulting, Inc.

Jason T. Wiggin, EIT
Senior Project Manager

Brian D. Moore, LSP, PG
President

Enclosures

cc: Christina Papadopoulos, P.E., Town Engineer, Chelmsford Engineering Department, 9 Alpha Road, Chelmsford, MA 01824 *(electronic)*
Katharine Messer, Conservation Agent, Chelmsford Conservation Commission, 50 Billerica Rd, Room LL05, Chelmsford, MA 01824 *(electronic)*
AMPET, Inc., Mr. Mohammed Almadani *(electronic)*

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:
AMPET Service Station</td><td colspan="3">Site address: 100 Chelmsford Street
Street:</td></tr>
<tr><td>City: Chelmsford</td><td>State: MA</td><td>Zip: 01824</td></tr>
<tr><td rowspan="4">2. Site owner
AMPET, Inc.

Owner is (check one): ☐ Federal ☐ State/Tribal ■ Private
☐ Other; if so, specify:</td><td colspan="3">Contact Person: Mohammed Almadani</td></tr>
<tr><td colspan="2">Telephone: (978) 979-2878</td><td>Email: MALma12823@gmail.com</td></tr>
<tr><td colspan="3">Mailing address: 164 Dayton Street
Street:</td></tr>
<tr><td>City: Danvers</td><td>State: MA</td><td>Zip: 01923</td></tr>
<tr><td rowspan="4">3. Site operator, if different than owner
SAME AS OWNER</td><td colspan="3">Contact Person:</td></tr>
<tr><td colspan="2">Telephone:</td><td>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:

NPDES permit is (check all that apply: ■ RGP ☐ DGP ☐ CGP
☐ MSGP ☐ Individual NPDES permit ☐ Other; if so, specify:</td><td colspan="3">5. Other regulatory program(s) that apply to the site (check all that apply):
■ MA Chapter 21e; list RTN(s): 3-4757
☐ 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):
Unnamed tributary	n/a	Class B - Warm water, treated water supply, CSO

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

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

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

If yes, specify: NHESP Estimated Habitats of Rare Wildlife. No critical habitats per attached FWS Letter

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.

4. Indicate the seven day-ten-year low flow (7Q10) of the receiving water determined in accordance with the instructions in Appendix V for sites located in Massachusetts and Appendix VI for sites located in New Hampshire.	0 MGD
5. Indicate the requested dilution factor for the calculation of water quality-based effluent limitations (WQBELs) determined in accordance with the instructions in Appendix V for sites in Massachusetts and Appendix VI for sites in New Hampshire.	0

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:

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:

2. Source water contaminants:	
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): Treated groundwater will be conveyed from 100 Chelmsford Street property to stormwater drain through 3-inch diameter discharge hose, stormwater drains to Outfall 001 north of the subject site.	Outfall location(s): (Latitude, Longitude) 42.60373 -71.348266
Discharges enter the receiving water(s) via (check any that apply): ☐ Direct discharge to the receiving water ■ Indirect discharge, if so, specify: Discharge to storm drain, which empties to the Outfall 001 location north of subject site ☐ A private storm sewer system ■ A municipal storm sewer system If the discharge enters the receiving water via a private or municipal storm sewer system: Has notification been provided to the owner of this system? (check one): ■ Yes ☐ No Has the operator has received permission from the owner to use such system for discharges? (check one): ■ Yes ☐ No, if so, explain, with an estimated timeframe for obtaining permission: Has the operator attached a summary of any additional requirements the owner of this system has specified? (check one): ☐ Yes ■ No	
Provide the expected start and end dates of discharge(s) (month/year): August 14, 2017 Indicate if the discharge is expected to occur over a duration of: ■ less than 12 months ☐ 12 months or more ☐ is an emergency discharge	
Has the operator attached a site plan in accordance with the instructions in D, above? (check one): ■ Yes ☐ No	

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

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

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

4. Influent and Effluent Characteristics

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
A. Inorganics									
Ammonia		✓	1	350.1	0.10	1.27	1.27	Report mg/L	---
Chloride		✓	1	300.0	100,000	778,000	778,000	Report µg/l	---
Total Residual Chlorine	✓		0					0.2 mg/L	
Total Suspended Solids		✓	1	2540D	5	236	236	30 mg/L	---
Antimony	✓		1	200.7	10.0	<10.0	0	206 µg/L	
Arsenic		✓	1	3113B	5.0	14.6	14.6	104 µg/L	
Cadmium	✓		1	3113B	0.05	<0.05	0.05	10.2 µg/L	
Chromium III	✓		1	200.7	10.0	<10.0	0	323 µg/L	
Chromium VI	✓		1	3500Cr	10.0	<10.0	10.0	323 µg/L	
Copper		✓	1	200.7	4.0	8.8	8.8	242 µg/L	
Iron		✓	1	200.7	20.0	19,000	19,000	5,000 µg/L	
Lead	✓		1	3113B	1.0	<1.0	1.0	160 µg/L	
Mercury	✓		1	245.1	0.200	<0.200	0	0.739 µg/L	
Nickel	✓		1	200.7	10.0	<10.0	0	1,450 µg/L	
Selenium	✓		1	3113B	2.0	<2.0	2.0	235.8 µg/L	
Silver	✓		1	200.7	1.0	<1.0	0	35.1 µg/L	
Zinc		✓	1	200.7	10.0	22.0	22.0	420 µg/L	
Cyanide	✓		1	4500 CN	5.00	<5.00	0	178 mg/L	
B. Non-Halogenated VOCs									
Total BTEX		✓	1	524.2	7	134.9	134.9	100 µg/L	---
Benzene		✓	1	524.2	0.5	22.1	22.1	5.0 µg/L	---
1,4 Dioxane	✓		0					200 µg/L	---
Acetone	✓		1	524.2	0.005	<0.005	0	7.97 mg/L	---
Phenol	✓		1	420.1	100	<100	100	1,080 µg/L	

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
C. Halogenated VOCs									
Carbon Tetrachloride	✓		1	0.3	524.2	<0.3	0	4.4 µg/L	
1,2 Dichlorobenzene	✓		1	0.5	524.2	<0.5	0	600 µg/L	---
1,3 Dichlorobenzene	✓		1	0.5	524.2	<0.5	0	320 µg/L	---
1,4 Dichlorobenzene	✓		1	0.5	524.2	<0.5	0	5.0 µg/L	---
Total dichlorobenzene	✓		1	0.5	524.2	<0.5	0	763 µg/L in NH	---
1,1 Dichloroethane	✓		1	0.5	524.2	<0.5	0	70 µg/L	---
1,2 Dichloroethane	✓		1	0.5	524.2	<0.5	0	5.0 µg/L	---
1,1 Dichloroethylene	✓		0					3.2 µg/L	---
Ethylene Dibromide	✓		0					0.05 µg/L	---
Methylene Chloride	✓		0					4.6 µg/L	---
1,1,1 Trichloroethane	✓		1	0.5	524.2	<0.5	0	200 µg/L	---
1,1,2 Trichloroethane	✓		1	0.5	524.2	<0.5	0	5.0 µg/L	---
Trichloroethylene	✓		1	0.5	524.2	<0.5	0	5.0 µg/L	---
Tetrachloroethylene	✓		1	0.5	524.2	<0.5	0	5.0 µg/L	
cis-1,2 Dichloroethylene	✓		1	0.5	524.2	<0.5	0	70 µg/L	---
Vinyl Chloride	✓		1	0.2	524.2	<0.2	0	2.0 µg/L	---
D. Non-Halogenated SVOCs									
Total Phthalates	✓		1	1.94	625 SIM	<12.1	12.1	190 µg/L	
Diethylhexyl phthalate	✓		0					101 µg/L	
Total Group I PAHs		✓	1	0.6	625 SIM	9.08	9.08	1.0 µg/L	---
Benzo(a)anthracene		✓	1	0.10	625 SIM	0.89	0.89	As Total PAHs	
Benzo(a)pyrene		✓	1	0.10	625 SIM	1.38	1.38		
Benzo(b)fluoranthene		✓	1	0.10	625 SIM	2.37	2.37		
Benzo(k)fluoranthene		✓	1	0.10	625 SIM	0.70	0.70		
Chrysene		✓	1	0.10	625 SIM	1.75	1.75		
Dibenzo(a,h)anthracene		✓	1	0.10	625 SIM	0.31	0.31		
Indeno(1,2,3-cd)pyrene		✓	1	0.10	625 SIM	1.68	1.68		

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
Total Group II PAHs		✓	1	625 SIM	7.76	9.89	9.89	100 µg/L	---
Naphthalene		✓	1	625 SIM	0.97	3.23	3.23	20 µg/L	---
E. Halogenated SVOCs									
Total PCBs	✓		0					0.000064 µg/L	---
Pentachlorophenol	✓		1	625 SIM	4.37	<4.37	0	1.0 µg/L	---
F. Fuels Parameters									
Total Petroleum Hydrocarbons	✓		1	1664A	5	<5	0	5.0 mg/L	---
Ethanol		✓	1	D3695	10	<10	10	Report mg/L	---
Methyl-tert-Butyl Ether		✓	1	524.2	5.0	53.6	53.6	70 µg/L	
tert-Butyl Alcohol		✓	1	524.2	25.0	<25.0	25.0	120 µg/L in MA 40 µg/L in NH	---
tert-Amyl Methyl Ether		✓	1	524.2	1.0	10.2	10.2	90 µg/L in MA 140 µg/L in NH	---
Other (i.e., pH, temperature, hardness, salinity, LC_{50}, additional pollutants present); if so, specify:									
Hardess		✓	1	200.7	165	200,000	200,000		
pH		✓	1	HI9828	0.01	6.45	6.45		
Temperature		✓	1	HI9828	0.1	72.5	72.5		

E. Treatment system information

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

☐ Adsorption/Absorption ☐ Advanced Oxidation Processes ☐ Air Stripping ■ Granulated Activated Carbon ("GAC")/Liquid Phase Carbon Adsorption
☐ Ion Exchange ■ Precipitation/Coagulation/Flocculation ■ Separation/Filtration ☐ Other; if so, specify:

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

Sediment settling and equalization using baffle/weird 'frac' tanks in series. 'Floc Logs' may be added to primary frac tank if necessary to enhance settling though flocculation. Baffle/weir tanks would aslo serve as oil/water separator, if necessary (not anticipated). Bag filter units will be used to reduce sediment concentrations prior to passing through granular activated carbon (GAC)/liquid phase carbon adsoprtion units designed to remove organics. Refer to Figure 1 for Discharge Schematic Plan.

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: GAC/Liquid Phase Carbon Adsorption Units

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: GAC/Adsorption Units Is use of a flow meter feasible? (check one): ☐ Yes ☐ No, if so, provide justification:	200
Provide the proposed maximum effluent flow in gpm.	200
Provide the average effluent flow in gpm.	100
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:
Applied Polymer Systems, Inc. 703d #3 Floc Log - Non-toxic Anionic Water-Soluble Co-polymer Gel - Refer to attachments for SDS, Factsheet, and EPA Handout
a. Product name, chemical formula, and manufacturer of the chemical/additive;
b. Purpose or use of the chemical/additive or remedial agent;
c. Material Safety Data Sheet (MSDS) and Chemical Abstracts Service (CAS) Registry number for each chemical/additive;
d. The frequency (hourly, daily, etc.), duration (hours, days), quantity (maximum and average), and method of application for the chemical/additive;
e. Any material compatibility risks for storage and/or use including the control measures used to minimize such risks; and
f. If available, the vendor's reported aquatic toxicity (NOAEL and/or LC50 in percent for aquatic organism(s)).

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

G. Endangered Species Act eligibility determination

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

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

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

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

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

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

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

H. National Historic Preservation Act eligibility determination

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

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

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

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

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

Refer to attached map printed from National Park Service website illustrating that no historic places are present near the 100 Chelmsford Street property or proposed discharge location.

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

I. Supplemental information

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

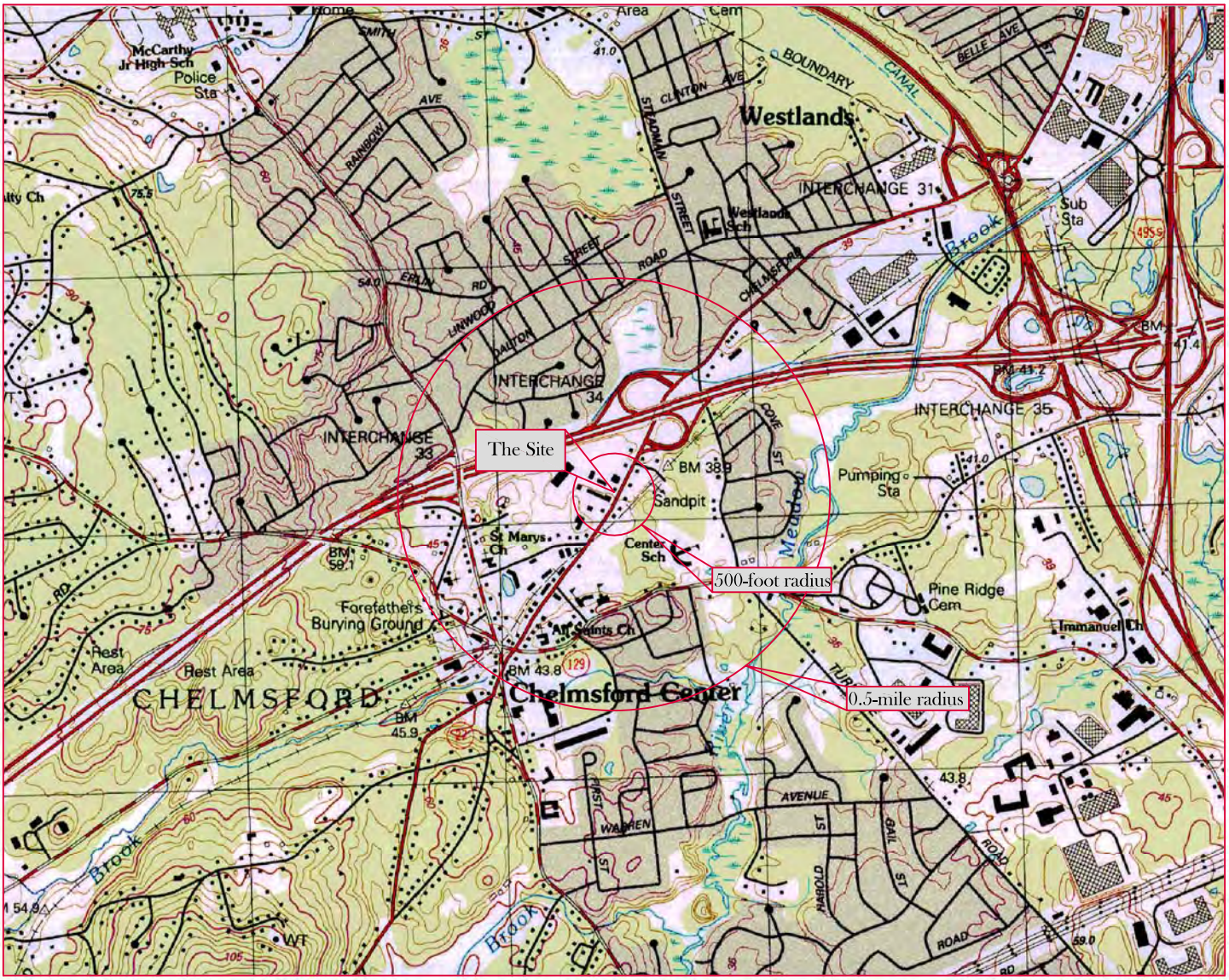
Has the operator attached data, including any laboratory case narrative and chain of custody used to support the application? (check one): ■ Yes ☐ No

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 developed and implemented upon initation of discharge.
Notification provided to the appropriate State, including a copy of this NOI, if required.	Check one: Yes ☐ No ☐
Notification provided to the municipality in which the discharge is located, including a copy of this NOI, if requested.	Check one: Yes ■ No ☐
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: Mohammed Almadani	Date: 7/27/17
Print Name and Title: Mohammed Almadani, Owner	



Universal Transverse Mercator Coordinates:

4 719 344 m North
307 494 m East
Grid Zone 19

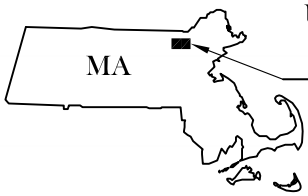
Latitude: 42° 36' 09" N
Longitude: 71° 20' 48" W

N

Scale 1 : 25,000

1000 0 1000 2000 3000 4000 FEET

Contour Intervals are 3 meters and based on National Geodetic Datum (Refer to References)



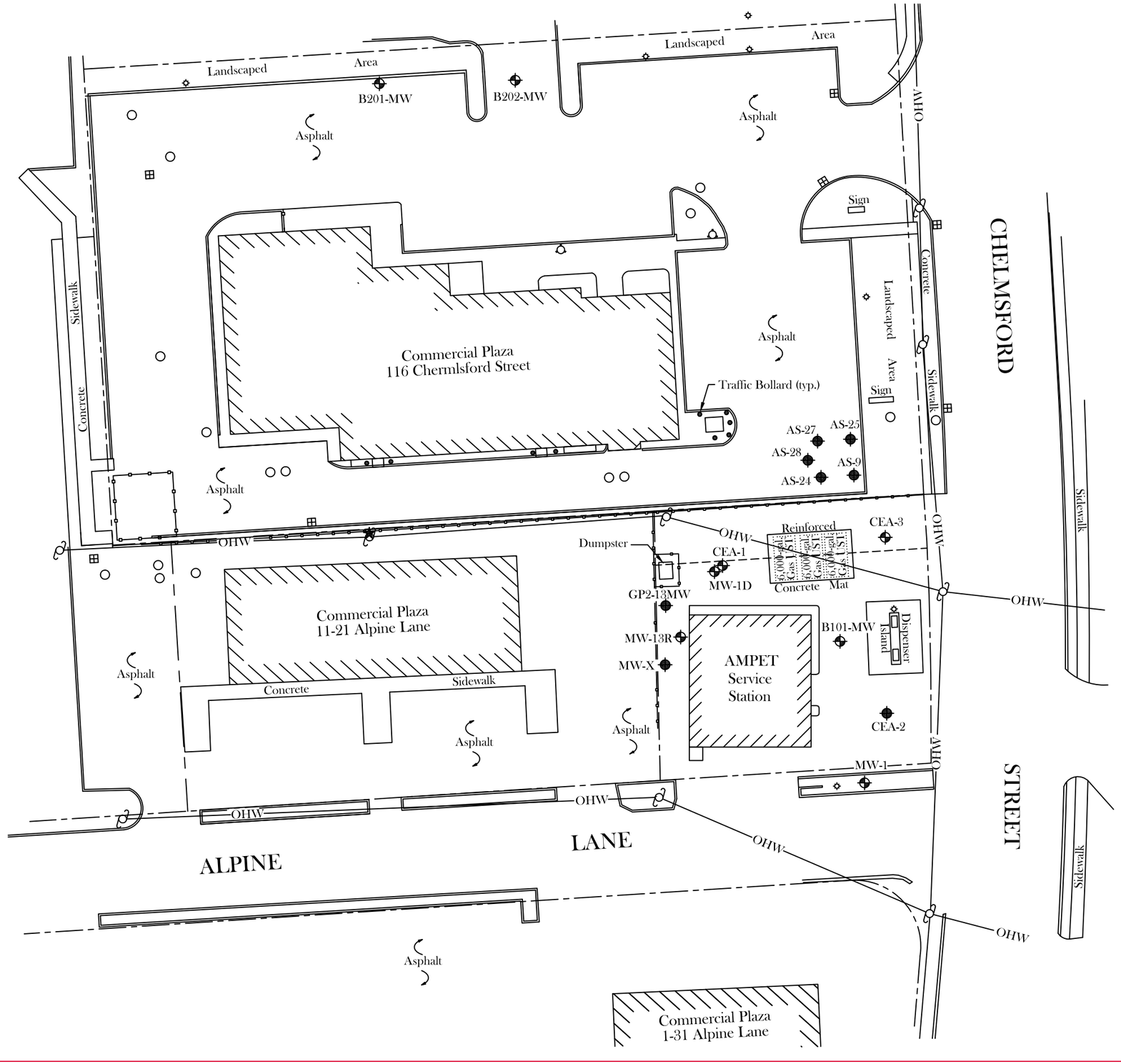
USGS Quadrangle Location(s)

Billerica, MA Quad

FIGURE 1

LOCUS PLAN
AMPET Service Station
100 Chelmsford Street
Chelmsford, Massachusetts

Ref.: Locus Plan	Checked By: BDM
Drafted By: ECS	Date: 05/14/14
Revised By: BDM	Date: 02/01/17
Source(s): United States Geologic Survey 15-Minute Series Topographic Map - Billerica, MA Quadrangle (1987)	



North

KEY

- Monitoring Well
- Abandoned Monitoring Well
- Property Boundary(ies)
- Catch Basin
- Utility Pole
- Light Pole
- Fire Hydrant
- Manhole Cover
- UST — Underground Storage Tank
- -OHW- — Location of Overhead Wires
- Chain Link Fence/Guardrail
- ★ — Location of Local Benchmark (cut spike) with established elevation of 120.60 feet above mean sea level.

0 40

Scale in feet

FIGURE 2

SITE PLAN
AMPET Service Station
100 Chelmsford Street
Chelmsford, Massachusetts

Ref.: Site Plan	Checked By: BDM
Drafted By: BDM	Date: 06/27/14
Revised By: BDM	Date: 02/01/17
Source: Hancock Associates, Howe Surveying Associates, and Brooks, Jordan & Graves Plans, and CHCI Field Recon.	

Legend

MADEP Tier Classified Sites (RTN)
- TIER-1A
- TIER-1B
- TIER-1C
- TIER-1D
- TIER-II
- MADEP AUL Sites (RTN)
- Railroads
- Limited Access Highway
- Multi-lane Hwy, not limited access
- Other Numbered Highway
- Major Road, Collector
- Minor Road, Arterial

Public Water Supply
- Public Water Supply
- Surface Water Protection Zone A
- Protected Openspace

- NHESP Certified Vernal Pools
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- Area of Critical Environmental Concern
- Solid Waste Facility
- Sole Source Aquifers
- Zone II
- IWPA
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune

Non-Potential Drinking Water Source Area

Yield
- High
- Medium

Potentially Productive Aquifers

Yield
- High
- Medium
- Transmission Lines
- Basin

GIS data provided by Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

This image based on GIS data obtained: July 10, 2017.

500 0 500 1000 1500 2000 FEET

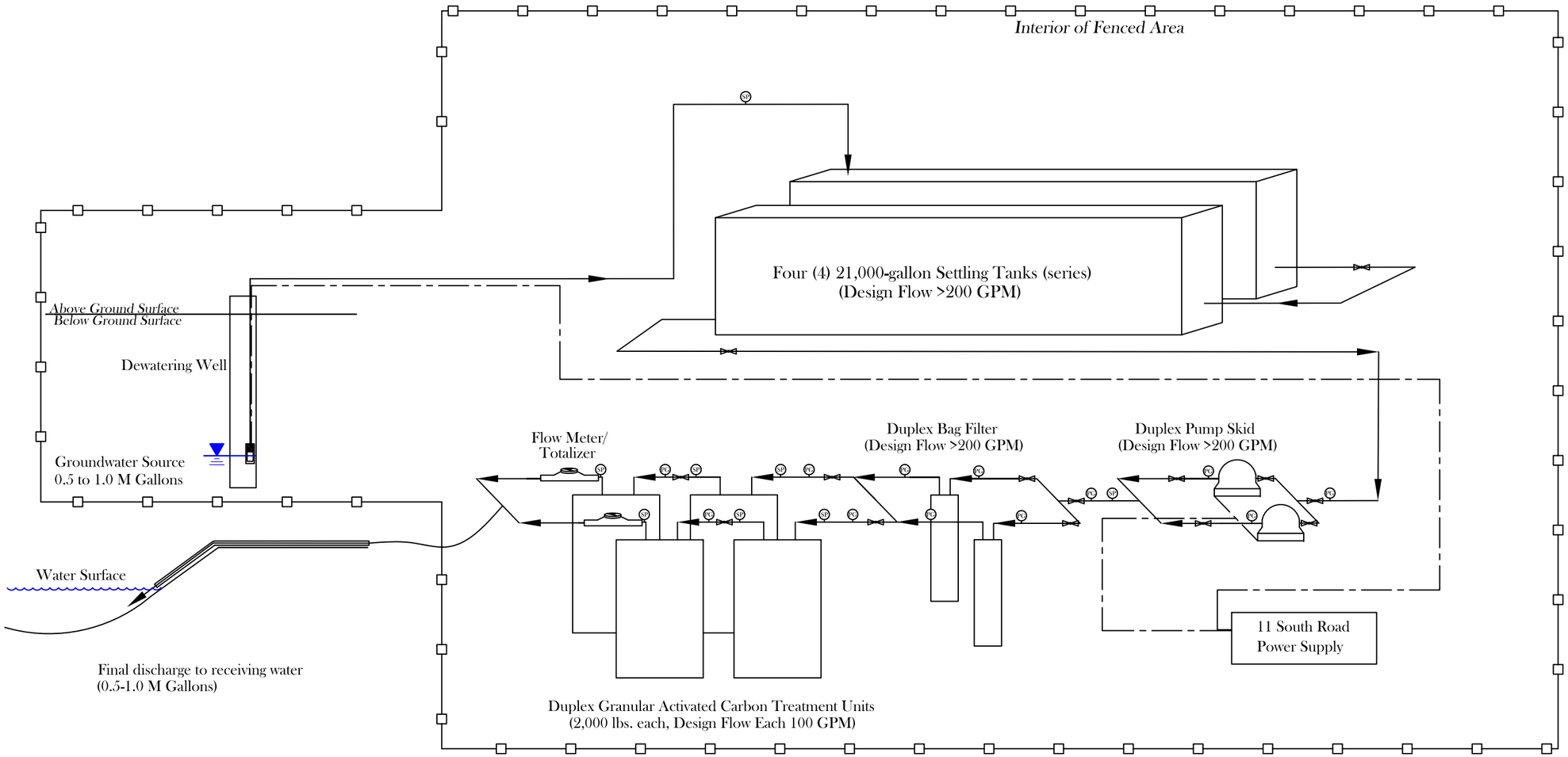
Scale 1 : 12,000

North

FIGURE 3

ENVIRONMENTAL RESOURCES PLAN
AMPET Service Station
100 Chelmsford Street
Chelmsford, Massachusetts

Ref.: 2017 07 10 ERP	Checked By: BDM
Drafted By: HKY	Date: 07/10/17
Revised By: BDM	Date: 07/11/17
Source: Massachusetts Geographic Information System	



KEY

	Gate Valve		Flow Direction
PG	Pressure Gauge		Piped Connection
SP	Sampling Port		Electrical Connection

FIGURE 4
DISCHARGE SCHEMATIC DIAGRAM
AMPET, Inc.
100 Chelmsford Street
Chelmsford, Massachusetts

Ref.: Discharge Schematic	Checked By: JTW
Drafted By: HKY	Date: 07/27/17
Revised By: JTW	Date: 07/27/17
Source: CHCI	

CARRIAGE HOUSE CONSULTING, INC.

NOTES:

1. UNDERGROUND UTILITIES WERE NOT INCLUDED AS A PART OF THIS SURVEY. UNDERGROUND UTILITIES MAY EXIST. IT SHALL BE THE RESPONSIBILITY OF THE DESIGN ENGINEER AND THE CONTRACTOR TO VERIFY THE LOCATION, SIZE & ELEVATION OF ALL UTILITIES WITHIN THE AREA OF PROPOSED WORK AND TO CONTACT "DIG-SAFE" AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION, DEMOLITION OR CONSTRUCTION.
2. THE LOCATION OF UNDERGROUND STORAGE TANKS ARE UNKNOWN.
3. THIS SURVEY WAS PREPARED TO MEET NATIONAL MAP ACCURACY STANDARDS AT A SCALE OF 1"=20' HORIZONTALLY. ANY REPRODUCTIONS OR RE-SCALING MAY EFFECT THE MAP ACCURACY.
4. THE LOCUS IS SUBJECT TO A GAS MAIN EASEMENT AS SET FORTH IN DEED BOOK 2558, PAGE 83.
5. THE WETLANDS LINE SHOWN HEREON WAS FLAGGED ON OR BEFORE MARCH 24, 2008 BY HANCOCK ASSOCIATES.

ASSESSORS:

MAP 73, BLOCK 295, LOT 4

REFERENCES:

DEED BOOK 20866, PAGE 971
PLAN BOOK 69, PLAN 92
PLAN BOOK 92, PLAN 137
PLAN BOOK 137, PLAN 106A
PLAN BOOK 76, PLAN 58B
PLAN ENTITLED "PERMIT SITE PLAN" BY HANCOCK ASSOCIATES DATED 4/29/08

RECORD OWNER:

AMPET, INC.
100 CHELMSFORD STREET
CHELMSFORD, MA 01824

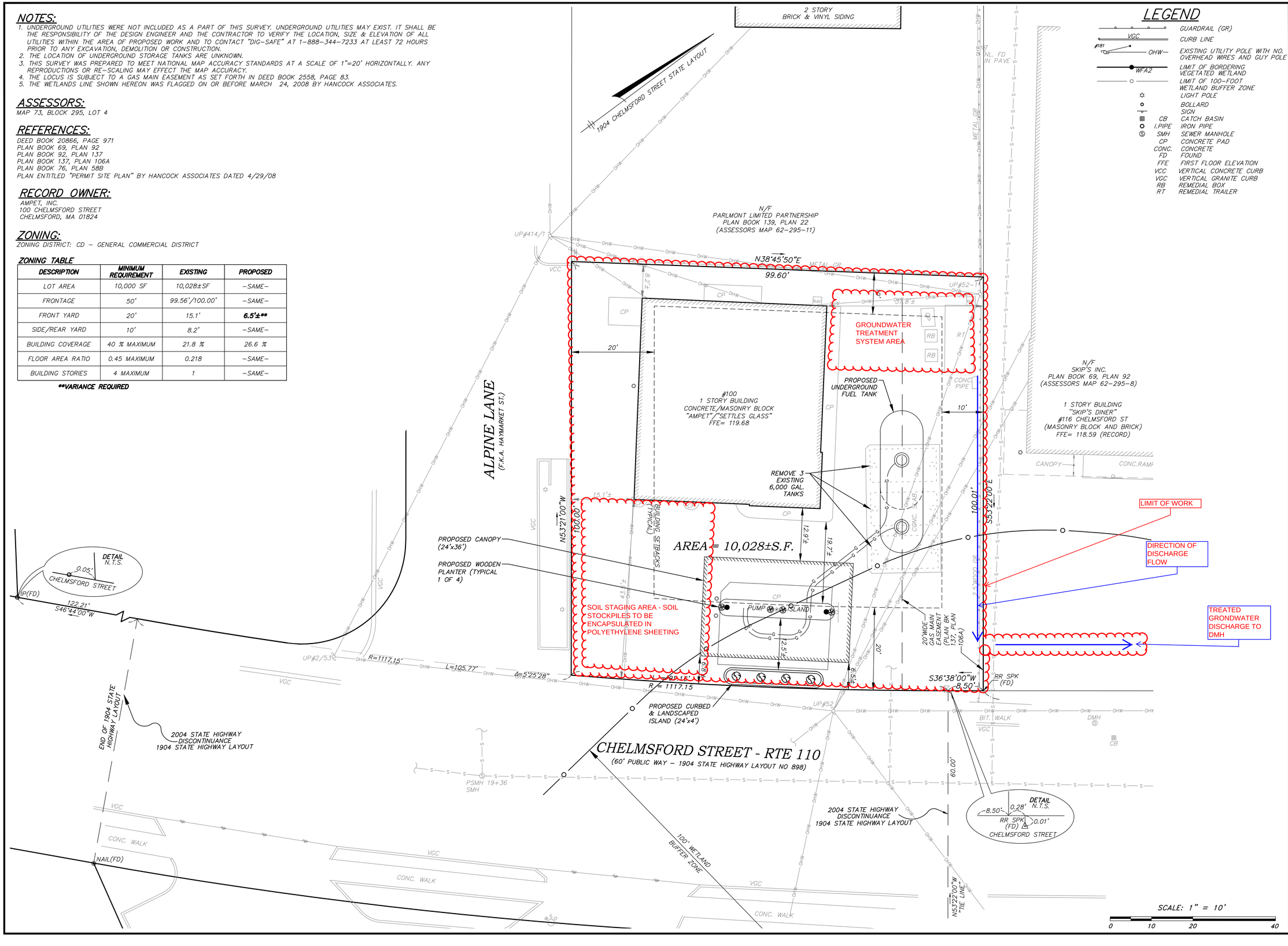
ZONING:

ZONING DISTRICT: CD – GENERAL COMMERCIAL DISTRICT

ZONING TABLE

DESCRIPTION	MINIMUM REQUIREMENT	EXISTING	PROPOSED
LOT AREA	10,000 SF	10,028±SF	–SAME–
FRONTAGE	50'	99.56'/100.00'	–SAME–
FRONT YARD	20'	15.1'	**6.5'±****
SIDE/REAR YARD	10'	8.2'	–SAME–
BUILDING COVERAGE	40 % MAXIMUM	21.8 %	26.6 %
FLOOR AREA RATIO	0.45 MAXIMUM	0.218	–SAME–
BUILDING STORIES	4 MAXIMUM	1	–SAME–

****VARIANCE REQUIRED**



LEGEND

	GUARDRAIL (GR)
VGC	CURB LINE
#181 OHW	EXISTING UTILITY POLE WITH NO. OVERHEAD WIRES AND GUY POLE
WFA2	LIMIT OF BORDERING VEGETATED WETLAND
	LIMIT OF 100-FOOT WETLAND BUFFER ZONE
	LIGHT POLE
	BOLLARD
	SIGN
CB	CATCH BASIN
I.PIPE	IRON PIPE
SMH	SEWER MANHOLE
CP	CONCRETE PAD
CONC.	CONCRETE
FD	FOUND
FFE	FIRST FLOOR ELEVATION
VCC	VERTICAL CONCRETE CURB
VGC	VERTICAL GRANITE CURB
RB	REMEDIAL BOX
RT	REMEDIAL TRAILER

SITE ADDRESS:

AMPET, INC.

100 Chelmsford Street
Chelmsford, Massachusetts

PREPARED FOR:

MOHAMED ALMADANI

100 Chelmsford Street
Chelmsford, Massachusetts 01824

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Landscape Architects

Environmental Consultants

34 Chelmsford Street, Chelmsford, MA 01824
Voice (978) 244-0110, Fax (978) 244-1133
www.HancockAssociates.com

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION
1	MF	BG	5/3/17	REVISED CANOPY, FUEL TANK

DATE: 11/19/08 DRAWN BY: MCW/DTF
SCALE: 1" = 10' CHECK BY: MRS/MSH

ZONING BOARD OF APPEALS PLAN

DWG: 14599SP.dwg
LAYOUT: ZBA
SHEET: 1 OF 1

ZBA

PROJECT NO.: 14599

NOTES:

1) THE OFFSETS SHOWN ARE MEASURED TO THE OUTSIDE FACE OF CONCRETE FOUNDATION UNLESS OTHERWISE NOTED.

2) THE LOCUS BENEFITS FROM A SHARED PARKING EASEMENT AS SET FORTH IN DEED BOOK 22494, PAGE 51.

3) THE LOCUS IS SUBJECT TO A UTILITY EASEMENT AS SET FORTH IN DEED BOOK 22760, PAGE 258.

4) THE LOCUS IS SUBJECT TO A BUFFER EASEMENT AS SET FORTH IN DEED BOOK 10171, PAGE 136.

5) THE LOCUS IS SUBJECT TO AND BENEFIT FROM A CROSS-ACCESS EASEMENT AS SET FORTH IN DEED BOOK 10171, PAGE 138.

6) THE LOCUS IS SUBJECT TO AND BENEFIT FROM AN ACCESS AND PARKING EASEMENT AS SET FORTH IN DEED BOOK 1060, PAGE 340.

7) THE WETLANDS LINE SHOWN HEREON WAS FLAGGED ON OR BEFORE MARCH 24, 2008 BY HANCOCK ASSOCIATES.

8) PROJECT SOURCE BENCHMARK IS BASED ON THE INVERT OF THE EXISTING SEWER MAIN IN CHELMSFORD STREET. SEE PLAN ENTITLED "CHELMSFORD CENTER LATERAL SEWERS AND APPURTENANT WORK CHELMSFORD STREET STA. 10+50 TO STA. 22+00" DATED NOVEMBER 5, 1987 REVISED FEBRUARY 1991 DRAWN BY WESTON AND SAMPSON ENGINEERS, INC. ON FILE WITH THE TOWN OF CHELMSFORD. SAID INVERT OF PSMH STA. 17+38 IS REPORTED TO BE 107.71 ON SAID PLAN..

9) UNDERGROUND UTILITIES SHOWN HEREON ARE COMPILED FROM FIELD LOCATIONS OF STRUCTURES ON OR BEFORE JULY 10, 2009 AND FROM AVAILABLE RECORD INFORMATION ON FILE AT THE TOWN ENGINEERING OFFICES, TOWN D.P.W., MASS HIGHWAY DEPT., UTILITY COMPANIES AND THE SITE CONTRACTOR. OTHER UNDERGROUND UTILITIES MAY EXIST. IT SHALL BE THE RESPONSIBILITY OF THE DESIGN ENGINEER AND THE CONTRACTOR TO VERIFY THE LOCATION, SIZE & ELEVATION OF ALL UTILITIES WITHIN THE AREA OF PROPOSED WORK AND TO CONTACT "DIG-SAFE" AT 1-888-344-7233 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION, DEMOLITION OR CONSTRUCTION.

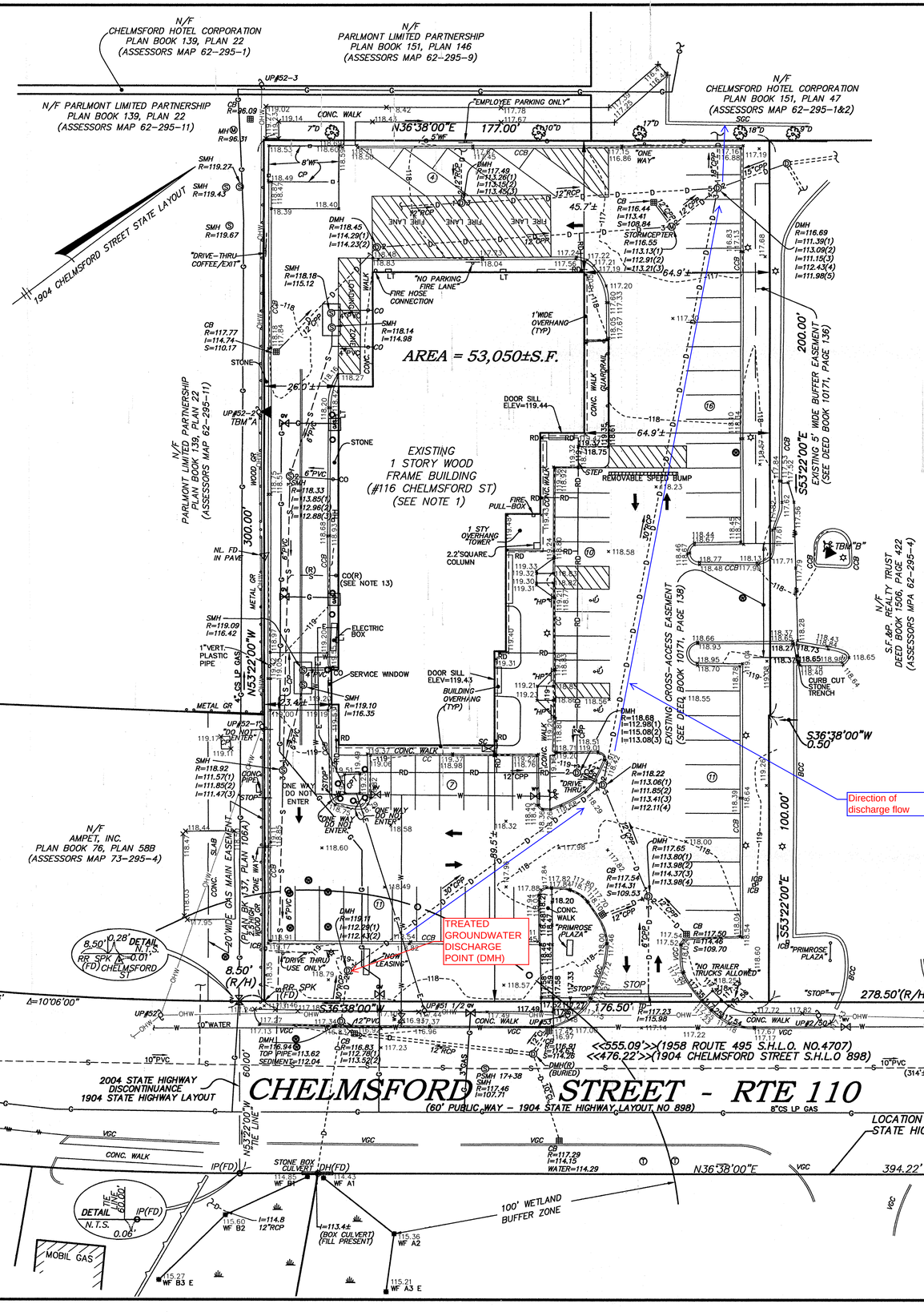
10) THE LOCATION OF UNDERGROUND STORAGE TANKS, IF ANY, ARE UNKNOWN.

11) THIS TOPOGRAPHIC SURVEY WAS PREPARED TO MEET NATIONAL MAP ACCURACY STANDARDS AT A SCALE OF 1"=20' HORIZONTALLY AND A 1 FOOT CONTOUR INTERVAL VERTICALLY. ANY REPRODUCTIONS OR RE-SCALING MAY EFFECT THE MAP ACCURACY.

12) A TOTAL OF 59 STRIPED PARKING SPACES WERE OBSERVED ON THE PREMISES, 3 OF WHICH ARE HANDICAP PARKING SPACES.

13) RECORD SEWER CLEANOUT AND LINE SHOWN HEREON ARE LOCATED PER CONTRACTOR DATA AND HAVE NOT BEEN VERIFIED BY THIS OFFICE.(SEE NOTE 14)

14) LOCATIONS OF NEW UNDERGROUND WATER, GAS, ELECTRIC, ROOF DRAIN AND SEWER SERVICE HAVE BEEN COMPILED FROM DATA PROVIDED BY THE CONTRACTOR AND HAVE NOT BEEN VERIFIED BY THIS OFFICE. (SEE NOTE 9 AND 13 ALSO).



ELEVATION BENCH MARKS
DATUM: (SEE NOTE 8)

NO.	DESCRIPTION	ELEV.
"A"	CUT SPIKE SET 1.5' A.G. IN UP#52-2	120.60
"B"	BOLT OVER MAIN OUTLET ON HYDRANT	120.97

LEGEND

- 234 — SURFACE CONTOUR
- GUARDRAIL (GR)
- EDGE OF PAVEMENT
- 5' HIGH WOOD FENCE
- 8' HIGH WOOD FENCE
- 26.75 / 26.25 — CURB WITH TOP AND BOTTOM CURB ELEVATION
- EDGE OF WOODED AREA
- 8"CI — SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
- 12"RCP — DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
- W 6"CI — WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
- G 10"DI — GAS MAIN WITH SIZE & GATE VALVE
- OHW — EXISTING UTILITY POLE WITH NO. OVERHEAD WIRES AND GUY POLE
- E — ELECTRIC MANHOLE & UG ELECTRIC LINES
- T — TELEPHONE MANHOLE & UG TELEPHONE LINES
- RETAINING WALL
- 208.8 WFA2 — LIMIT OF BORDERING VEGETATED WETLAND
- LIMIT OF 100-FOOT WETLAND BUFFER ZONE
- × 232.6 — SPOT ELEVATION
- 26.8 12"M — PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
- 26.8 18"P — PROMINENT CONIFEROUS TREE WITH ELEVATION, SIZE AND SPECIES
- EXTERIOR LIGHT MOUNTED ON BUILDING
- LIGHT POLE
- MONITORING WELL
- BOLLARD
- SIGN
- MANHOLE (UNKNOWN UTILITY)
- BM — BENCHMARK
- CB — CATCH BASIN
- DH — DRILL HOLE
- DHSB — DRILL HOLE IN STONE BOUND
- DMH — DRAIN MANHOLE
- I.PIPE — IRON PIPE
- SMH — SEWER MANHOLE
- TRAFFIC FLOW STRIPING

ASB.	ASBESTOS PIPE
BB	BITUMINOUS BERM
BIT.	BITUMINOUS
BS	BOTTOM SLOPE
(C)	CALCULATED
CC	CONCRETE CURB
CCB	CAPE COD BERM
CL	CLAY PIPE
CMP	CORRUGATED METAL PIPE
CP	CONCRETE PAD
CPT	CONCRETE PAD WITH TRANSFORMER
CO	CLEAN OUT
CONC.	CONCRETE
CTR. BK.	CENTER BACK
EB	ELECTRIC BOX
EPLP	ESCUTCHEON PIN IN A LEAD PLUG
FD	FOUND
FDN	FOUNDATION
FFE	FIRST FLOOR ELEVATION
GR	GUARD RAIL
HH	HAND HOLE
"HP"	HANDICAP PARKING SIGN
ICB	IRRIGATION CONTROL BOX
MCB	MODIFIED CAPE COD BERM
MP	METAL POST
NPV	NO PIPES VISIBLE
(7)	PARKING SPACES
P	PLANTER
PVC	POLYVINYL CHLORIDE
(R)	RECORD
RR SPK	RAILROAD SPIKE
RCP	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
SC	FIRE DEPARTMENT SPRINKLER CONNECTION
SGC	SLOPED GRANITE CURB
STY	STORY
UG	UNDERGROUND
VC	VITRIFIED CLAY
VGC	VERTICAL GRANITE CURB
WF	WOOD FENCE

ASSESSORS:
MAP 62, BLOCK 295, LOT 8

ZONING:
CD - GENERAL COMMERCIAL DISTRICT

REFERENCES:
DEED BOOK 22494 PAGE 53

RECORD OWNER:
RYAN DEVELOPMENT LLC
2 LAN DRIVE
WESTFORD, MA 01886

SITE ADDRESS:
116 Chelmsford Street
Chelmsford, Massachusetts

PREPARED FOR:
WALKER REALTY, LLC
2 Lan Drive
Westford, Massachusetts

HANCOCK ASSOCIATES
Civil Engineers
Land Surveyors
Environmental Consultants
315 Elm Street, Marlborough, MA 01752
Voice (508) 460-1111, Fax (508) 460-1121
www.hancockassociates.com

COMMONWEALTH OF MASSACHUSETTS CARLOS M. FRIAS No. 41407 REGISTERED PROFESSIONAL LAND SURVEYOR
7/15/09

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 7/15/09 DRAWN BY: MCW
SCALE: 1" = 20' CHECK BY: JDB

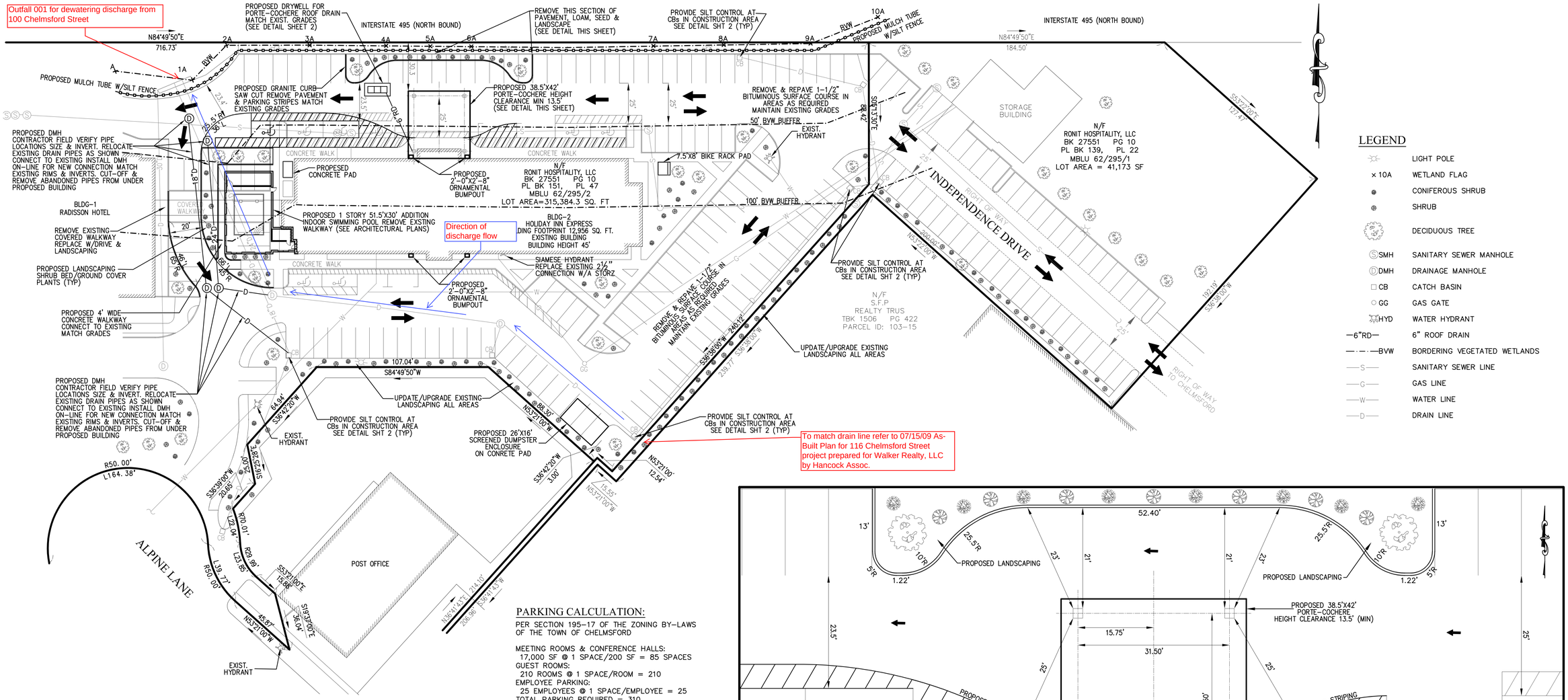
AS-BUILT PLAN

PLOT DATE: Jul 15, 2009 2:03 pm
PATH: L:\14278\dwg\

DWG: 14278SV.dwg
LAYOUT: AB
SHEET: 1 OF 1

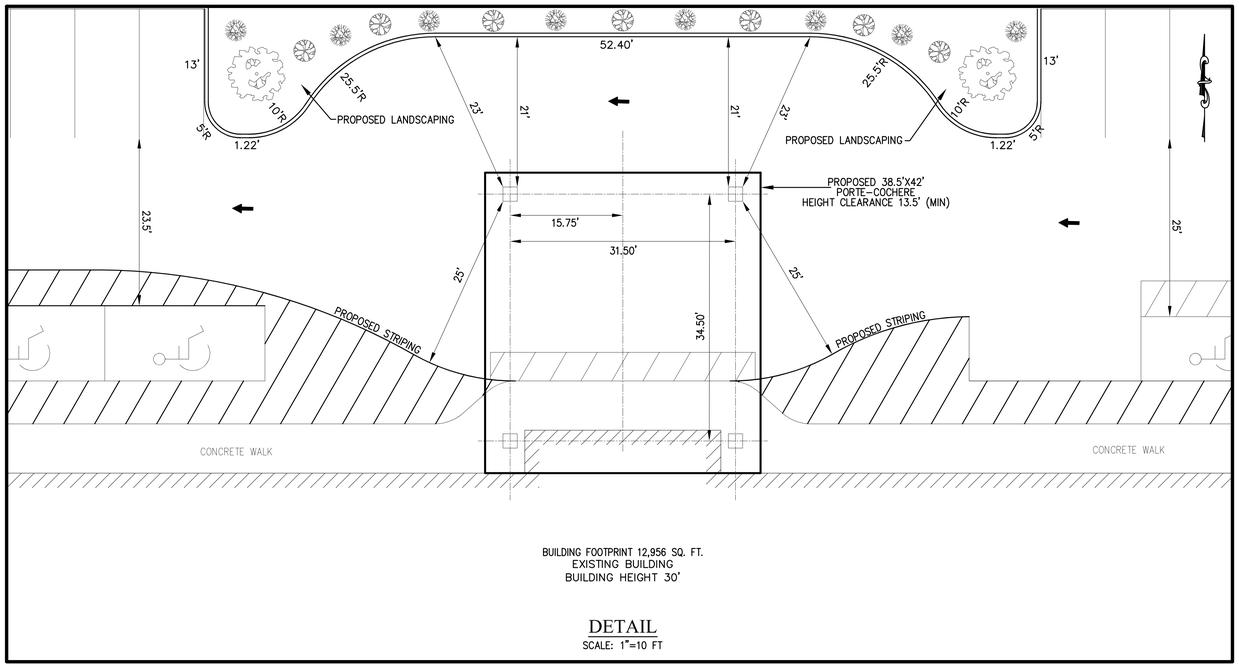
AB

PROJECT NO.: 14278



LEGEND

- LIGHT POLE
- 10A WETLAND FLAG
- CONIFEROUS SHRUB
- SHRUB
- DECIDUOUS TREE
- SMH SANITARY SEWER MANHOLE
- DMH DRAINAGE MANHOLE
- CB CATCH BASIN
- GG GAS GATE
- HYD WATER HYDRANT
- 6"RD 6" ROOF DRAIN
- BVW BORDERING VEGETATED WETLANDS
- S SANITARY SEWER LINE
- G GAS LINE
- W WATER LINE
- D DRAIN LINE



BUILDING FOOTPRINT 12,956 SQ. FT.
EXISTING BUILDING
BUILDING HEIGHT 30'

DETAIL

SCALE: 1"=10 FT

PARKING CALCULATION:

PER SECTION 195-17 OF THE ZONING BY-LAWS OF THE TOWN OF CHELMSFORD

MEETING ROOMS & CONFERENCE HALLS:
17,000 SF @ 1 SPACE/200 SF = 85 SPACES
GUEST ROOMS:
210 ROOMS @ 1 SPACE/ROOM = 210
EMPLOYEE PARKING:
25 EMPLOYEES @ 1 SPACE/EMPLOYEE = 25
TOTAL PARKING REQUIRED = 310

EXISTING PARKING PRE-ALTERATIONS = 486
PARKING REMOVED POST-ALTERATIONS = 29
TOTAL PARKING PROVIDED = 486 - 29 = 457

ZONING:

ZONING DISTRICT: GENERAL COMERCIAL (CD)
LOT REQUIREMENTS:

LOT AREA (MIN):	10,000 SF
FRONTAGE (MIN):	50'
WIDTH (MIN):	50'
DEPTH (MIN):	0'

YARD REQUIREMENTS:

FRONT (MIN):	20'
SIDE (MIN):	10'
REAR (MIN):	10'

BUILDING REQUIREMENTS:

COVERAGE (MAX)	40%
STORIES/HEIGHT (MAX)	4/45'
FLOOR AREA RATIO (MAX)	0.45

FIRE PROTECTION:

1. EXISTING BUILDING IS FULLY SPRINKLED. FOR THE PROPOSED REMODELING EXISTING SPRINKLER SYSTEM WILL MODELED PER NFPA 13 SPRINKLER CODE. CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS AND SHOP DRAWINGS TO CHELMSFORD FIRE DEPARTMENT FOR APPROVAL.
2. CONTRACTOR SHALL REPLACE EXISTING 2½" SIAMESE CONNECTION & PIPING TO THE SPRINKLER MAIN WITH AN APPROVED 4" "STORZ" CONNECTION & PIPING. SUBMIT SHOP DRAWINGS FOR REVIEW & APPROVAL.
3. WATER SUPPLY PRESSURE & FLOW TEST WILL BE PERFORMED & PROVIDED BY FIRE PROTECTION CONTRACTOR AS PART OF SHOP DRAWING SUBMITTAL TO OBTAIN PERMIT.
4. SEE PLUMBING DRAWING P101 FOR FIRE PROTECTION DETAILS.

SWIMMING POOL DECK SHOWERS:

1. THE SHOWER AND DECK DRAINS FOR THE POOL FLOW INTO A SUMP LOCATED IN THE POOL MECHANICAL ROOM AND ARE INDIRECTLY PUMPED INTO THE EXISTING HOUSE-WASTE-LINE TO THE SANITARY SEWER SYSTEM (SEE P-101). THIS PREVENTS ANY BACKFLOW FROM BLOCKAGES IN THE SEWER FROM CONTAMINATING THE POOL DECK AND GETTING INTO THE POOL.
2. CONTRACTOR SHALL FIELD VERIFY LOCATION OF SEWER PIPE UNDER SLAB FOR PROPOSED CONNECTIONS WHERE REQUIRED.
3. THERE IS NO CONNECTION BETWEEN THE POOL DRAIN AND THE HOUSE SEWER. THE POOL PUMP HAS A DISCHARGE CONNECTION IN THE POOL MEHANICAL ROOM. IF THE POOL NEEDS TO BE DRAINED, THE WATER WILL BE PUMPED INTO A TRUCK AND TAKEN OFF SITE.

OWNER OF RECORD

RONIT HOSPITALITY LLC
C/O JAMSAN HOTEL MANAGEMENT INC
440 BEDFORD STREET
LEXINGTON, MA 02420
BOOK 27551, PAGE 10
MBLU 62/295/2 & 62/295/1

CHANGE IN AREAS (SF)

BUILDING FOOTPRINT AREA INCREASE: 1,755 SF. (INDOOR SWIMMING POOL)
LANDSCAPE AREA INCREASE: 2,820 SF.
PAVEMENT AREA DECREASE: 2,820 SF.

DATE	REVISIONS	BY
12-23-16	PORTE-COCHER ROOF DRAINS	HSA

GRAPHIC SCALE
0 30 45 60 90
SCALE: 1"=30'

JOB. NO:	16-360
DATE:	12/9/2016
SCALE:	1" = 30 FT.
SHEET:	1 OF 2

CHECK:	HSA
SURVEY:	HSA
CALC:	HSA
DRAFT:	SC/EJ

HOLIDAY INN EXPRESS HOTEL
PROPOSED ADDITIONS
10 INDEPENDENCE DRIVE (BLDG 2)
CHELMSFORD, MA 01824
PREPARED FOR:
RONIT HOSPITALITY LLC

TAJ ENGINEERING, LLC
225 STEDMAN ST. SUITE 36B, LOWELL, MA, 01851
7 MONTVIEW ROAD, CHELMSFORD, MA, 01824
(P) 978-250-8173 (M) 978-4304585 (F) 978-770-0632
e-mail: Tajengg@aol.com

Table 1
Summary of Receiving Water Quality Data
AMPET Service Station
Chelmsford, MA

Sample Location [1]:		**Unnamed Tributary**
Sample Name:		**SW-1**
Sample Date:		**7/10/2017**
Sample Time:		**18:15**
Laboratory Sample No.		**1707149-01**
Analyte (Laboratory)	**Units**	**Result**
Ammonia as N	ug/L	**210**
Antimony, Total	ug/L	<10.0
Arsenic, Total	ug/L	**2.8**
Cadmium, Total	ug/L	**0.09**
Hexavalent Chromium	ug/L	<10.0
Copper, Total	ug/L	<4.0
Hardness, Total	ug/L	**151,000**
Iron, Total	ug/L	**1,570**
Lead, Total	ug/L	<1.0
Mercury, Total	ug/L	<0.200
Nickel, Total	ug/L	<10.0
Selenium, Total	ug/L	<2.0
Silver, Total	ug/L	<1.0
Zinc, Total	ug/L	**19.5**
pH[2]	Standard Units	6.45
Temperature[2]	Fahrenheit	72.5

NOTES:
ug/L - micrograms per liter
<# - analyte not detected at presented quantitation limit
1. Sample collected upstream of proposed discharge location.
2. Temperature and pH measured in the field with a Hanna-brand HI9828 multi-parameter probe on the date indicated.

Enter number values in green boxes below

Enter values in the units specified

↓

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

Enter a dilution factor, if other than zero

↓

0

Enter values in the units specified

↓

200	C_d = Enter influent hardness in **mg/L** $CaCO_3$
151	C_s = Enter receiving water hardness in **mg/L** $CaCO_3$

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

↓

6.45	pH in **Standard Units**
22.5	Temperature in **°C**
0.21	Ammonia in **mg/L**
151	Hardness in **mg/L** $CaCO_3$
0	Salinity in **ppt**
0	Antimony in **µg/L**
2.8	Arsenic in **µg/L**
0.09	Cadmium in **µg/L**
0	Chromium III in **µg/L**
0	Chromium VI in **µg/L**
0	Copper in **µg/L**
1570	Iron in **µg/L**
0	Lead in **µg/L**
0	Mercury in **µg/L**
0	Nickel in **µg/L**
0	Selenium in **µg/L**
0	Silver in **µg/L**
19.5	Zinc in **µg/L**

Enter **influent** concentrations in the units specified

↓

0	TRC in **µg/L**
1.27	Ammonia in **mg/L**
0	Antimony in **µg/L**
14.6	Arsenic in **µg/L**
0	Cadmium in **µg/L**
0	Chromium III in **µg/L**
0	Chromium VI in **µg/L**
8.8	Copper in **µg/L**
19,000	Iron in **µg/L**
0	Lead in **µg/L**
0	Mercury in **µg/L**
0	Nickel in **µg/L**
0	Selenium in **µg/L**
0	Silver in **µg/L**
22	Zinc in **µg/L**
0	Cyanide in **µg/L**
0	Phenol in **µg/L**
0	Carbon Tetrachloride in **µg/L**
0	Tetrachloroethylene in **µg/L**
0	Total Phthalates in **µg/L**
0	Diethylhexylphthalate in **µg/L**
0.89	Benzo(a)anthracene in **µg/L**
1.38	Benzo(a)pyrene in **µg/L**
2.37	Benzo(b)fluoranthene in **µg/L**
0.7	Benzo(k)fluoranthene in **µg/L**
1.75	Chrysene in **µg/L**
0.31	Dibenzo(a,h)anthracene in **µg/L**
1.68	Indeno(1,2,3-cd)pyrene in **µg/L**
53.6	Methyl-tert butyl ether in **µg/L**

Notes:

Freshwater: Q_R equal to the 7Q10; enter alternate Q_R if approved by the State; enter 0 if no dilution factor approved
Saltwater (estuarine and marine): enter Q_R if approved by the State; enter 0 if no entry

Discharge flow is equal to the design flow or 1 MGD, whichever is less
Only if approved by State as the entry for Q_R; leave 0 if no entry

Saltwater (estuarine and marine): only if approved by the State
Leave 0 if no entry

Freshwater only

pH, temperature, and ammonia required for all discharges
Hardness required for freshwater
Salinity required for saltwater (estuarine and marine)
Metals required for all discharges if present and if dilution factor is > 1
Enter 0 if non-detect or testing not required

if >1 sample, enter maximum
if >10 samples, may enter 95th percentile
Enter 0 if non-detect or testing not required

Dilution Factor	1.0					
A. Inorganics	TBEL applies if bolded		WQBEL applies if bolded		Compliance Level applies if shown	
Ammonia	**Report**	mg/L	---			
Chloride	**Report**	µg/L	---			
Total Residual Chlorine	0.2	mg/L	**11**	µg/L	50	µg/L
Total Suspended Solids	**30**	mg/L	---			
Antimony	**206**	µg/L	640	µg/L		
Arsenic	104	µg/L	**10**	µg/L		
Cadmium	**10.2**	µg/L	0.4523	µg/L		
Chromium III	**323**	µg/L	152.0	µg/L		
Chromium VI	**323**	µg/L	11.4	µg/L		
Copper	**242**	µg/L	16.9	µg/L		
Iron	5000	µg/L	**1000**	µg/L		
Lead	**160**	µg/L	7.69	µg/L		
Mercury	**0.739**	µg/L	0.91	µg/L		
Nickel	**1450**	µg/L	93.8	µg/L		
Selenium	**235.8**	µg/L	5.0	µg/L		
Silver	**35.1**	µg/L	12.5	µg/L		
Zinc	**420**	µg/L	215.6	µg/L		
Cyanide	**178**	mg/L	5.2	µg/L	---	µg/L
B. Non-Halogenated VOCs						
Total BTEX	**100**	µg/L	---			
Benzene	**5.0**	µg/L	---			
1,4 Dioxane	**200**	µg/L	---			
Acetone	**7970**	µg/L	---			
Phenol	**1,080**	µg/L	300	µg/L		
C. Halogenated VOCs						
Carbon Tetrachloride	**4.4**	µg/L	1.6	µg/L		
1,2 Dichlorobenzene	**600**	µg/L	---			
1,3 Dichlorobenzene	**320**	µg/L	---			
1,4 Dichlorobenzene	**5.0**	µg/L	---			
Total dichlorobenzene	**---**	µg/L	---			
1,1 Dichloroethane	**70**	µg/L	---			
1,2 Dichloroethane	**5.0**	µg/L	---			
1,1 Dichloroethylene	**3.2**	µg/L	---			
Ethylene Dibromide	**0.05**	µg/L	---			
Methylene Chloride	**4.6**	µg/L	---			
1,1,1 Trichloroethane	**200**	µg/L	---			
1,1,2 Trichloroethane	**5.0**	µg/L	---			
Trichloroethylene	**5.0**	µg/L	---			
Tetrachloroethylene	**5.0**	µg/L	3.3	µg/L		
cis-1,2 Dichloroethylene	**70**	µg/L	---			
Vinyl Chloride	**2.0**	µg/L	---			
D. Non-Halogenated SVOCs						
Total Phthalates	**190**	µg/L	---	µg/L		
Diethylhexyl phthalate	**101**	µg/L	2.2	µg/L		
Total Group I Polycyclic Aromatic Hydrocarbons	**1.0**	µg/L	---			
Benzo(a)anthracene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Benzo(a)pyrene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Benzo(b)fluoranthene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Benzo(k)fluoranthene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Chrysene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Dibenzo(a,h)anthracene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Indeno(1,2,3-cd)pyrene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Total Group II Polycyclic Aromatic Hydrocarbons	**100**	µg/L	---			
Naphthalene	**20**	µg/L	---			
E. Halogenated SVOCs						
Total Polychlorinated Biphenyls	**0.000064**	µg/L	---		0.5	µg/L
Pentachlorophenol	**1.0**	µg/L	---			
F. Fuels Parameters						
Total Petroleum Hydrocarbons	**5.0**	mg/L	---			
Ethanol	**Report**	mg/L	---			
Methyl-tert-Butyl Ether	70	µg/L	**20**	µg/L		
tert-Butyl Alcohol	**120**	µg/L	---			
tert-Amyl Methyl Ether	**90**	µg/L	---			

Updated February 3, 2014

Applied Polymer Systems, Inc.

Safety Data Sheet

1. IDENTIFICATION OF THE PRODUCT AND THE COMPANY

Product Name: **APS 703d #3 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/INFORMAION 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. Use of gloves recommended.**

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: **7.73**
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 / ECOLOGICAL INFORMATION

Acute toxicity (EPA-821-R-02-012)

LC 50 (Survival) / *Ceriodaphnia dubia* / 48h / 673 ppm
NOAEC (Survival) / *Ceriodaphnia dubia* / 48h / 420 ppm
LC 50 / *Oncorhynchus mykiss* / 96h / 2928 ppm

Chronic toxicity (EPA-821-R-02-013)

IC 25 (Survival) / *P. promelas* / 7 day / 77.8 ppm
NOEC (Survival) / *P. promelas* / 7 day / 52.5 ppm

IC 25 (Survival) / *C. dubia* / 7 day / 78.7 ppm
NOEC (Survival) / *C. dubia* / 7 day / 52.7 ppm

IC 25 (Growth) / *P. promelas* / 7 day / 50.1 ppm
NOEC (Growth) / *P. promelas* / 7 day / 52.5 ppm

IC 25 (Reproduction) / *C. dubia* / 7 day / 66.8 ppm
NOEC (Reproduction) / *C. dubia* / 7 day / 52.5 ppm

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

12. 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).

13. TRANSPORT AND REGULATORY INFORMATION

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

NFPA and HMIS ratings:

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

Applied Polymer Systems

519 Industrial Drive, Woodstock, GA 30189
www.siltstop.com
Phone: 678-494-5998
Toll-free: 866-200-9868
Fax: 678-494-5298

APS 700 Series Floc Logs®

Polyacrylamide Sediment and Turbidity Control Applicator Logs

APS 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

APS 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

Applied Polymer Systems

519 Industrial Drive, Woodstock, GA 30189
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Toll-free: 866-200-9868
Fax: 678-494-5298

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!)

APS 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.

APS 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

- APS 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.
- APS Floc Log will remain viable for up to 5 years when stored out of UV rays.
- APS 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.
- For product information, treatment system design assistance, or performance issues, contact Applied Polymer Systems.

EPA United States Environmental Protection Agency

Stormwater Best Management Practice

Polymer Flocculation

Permits for Clean Water NPDES

Minimum Measure

Construction Site Stormwater Runoff Control

Subcategory

Sediment Control

Stormwater Turbidity and Its Aquatic Life Toxicity

Turbidity is a measure of the amount of suspended material in a liquid. In stormwater or a natural waterbody (e.g., river, lake, or estuary), turbidity depends on the amount of suspended sediment, dissolved organic matter, and plankton in the water. Turbid stormwater entering a natural waterbody can significantly degrade the habitat of fish and other aquatic life. Reductions in light levels may reduce submerged aquatic vegetation that provides the cover necessary for survival of the prey species. Or reduced visibility may make it difficult for predators to find evasive prey. Gravel on the bottom of a riverbed, which is necessary for salmon to spawn successfully, may be covered with sediments. Often it's not just a few species but the whole food chain that's affected. One of the references on page 7 (Meager, 2013) is an article for non-scientists on how turbidity affects the growth, reproduction, and survival of fish. Another reference (Meager, 2006) lists over 185 technical publications, which thoroughly document the toxic effects of stormwater turbidity on aquatic life.

The instrument used to measure the turbidity of a liquid is called a nephelometer. It works by passing a light beam (source beam) through a sample of the liquid and then measuring the light scattered by the suspended particles with a light detector set to the side (often 90°) from the source beam. The particle density is a function of the light scattered toward the detector by the suspended particles in the liquid. The units of turbidity measured by a calibrated nephelometer are called Nephelometric Turbidity Units (NTU). Contractors can use a hand-held nephelometer to measure the turbidity of their construction site's stormwater runoff.

Polymer Flocculation for Reducing Stormwater Turbidity and Its Aquatic Life Toxicity

Flocculation is the process where a chemical agent (flocculant) is used to reduce the turbidity of a liquid by binding suspended particles in the liquid together to form larger particles (flocs) that are heavy enough to settle to the bottom of the liquid. When the liquid is stormwater runoff, this particle binding and settling process reduces soil erosion and the runoff's turbidity, as well as the aquatic life toxicity associated with turbidity. Some polymers are good flocculants. Polymers are chemical compounds that have very large molecules composed of one or more structural units that are joined together in a repeating pattern to form long chain-like macromolecules. The two red wavy ribbons in Figure 1 represent polymer molecules

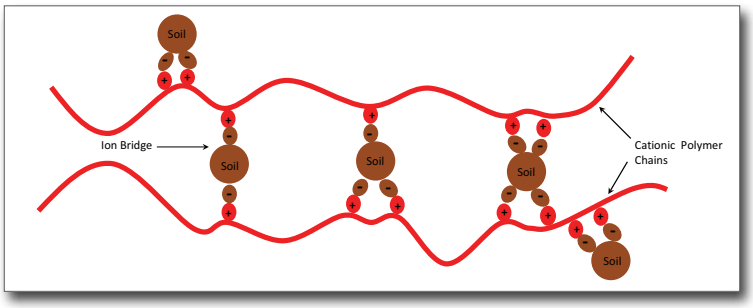


Figure 1. *Cationic polymer flocculation*

dissolved in water, and the brown circles represent suspended soil particles. Cationic polymer molecules have positive charges, and many soil particles (particularly clays) have negative charges. The negatively charged soil particles are attracted to the positively charged polymer molecules, and this causes the soil particles to bind with the polymer chains as shown in Figure 1. Many of the soil particles form ionic bridges between the polymer chains, and some bind to the outside of the polymer chains. This binding process continues until many thousands of polymer chains and soil particles combine to form a floc having sufficient mass to settle to the bottom, thereby reducing the water's turbidity.

Although cationic polymers are effective flocculants and do reduce turbidity, their positive charges make them toxic to aquatic organisms when dissolved in water. Consequently they should not be used as flocculants in stormwater that runs off

the land into natural waterbodies. However, anionic polymers, which carry a negative charge, are not toxic. If they're added to stormwater along with some positive ions, the soil particles will bind onto these anionic polymer molecules and form the ionic bridges shown in Figure 2. Adding positive calcium ions (Ca^{++}) to the anionic polymer enables anionic polymer flocculation, which can reduce the turbidity without harming the aquatic life.

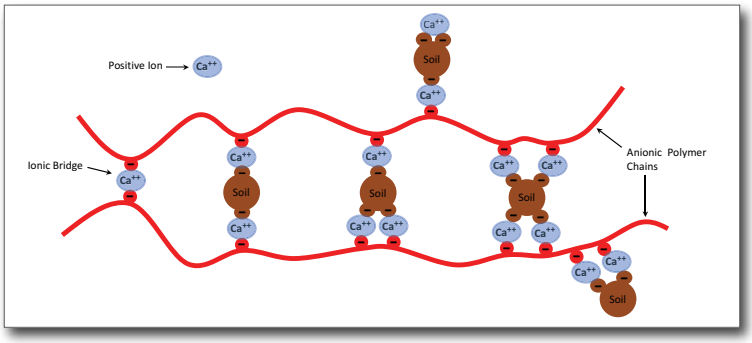


Figure 2. *Anionic polymer flocculation*

Floc collection becomes important if the stormwater runoff velocity is too high to allow the flocs to settle to the bottom. In these cases an attachment surface, such as the soft matting (jute, hemp, burlap, or coconut coir) shown in Figure 3, needs to be installed across the flow to collect the flocs. Polymer flocculation is based on three fundamental processes: chemical binding, settling, and floc collection.

Figure 3. *Matting used for floc collection*

Polymer Flocculation BMPs

Polymer flocculation provides the basis for a number of best management practices (BMPs) for reducing stormwater turbidity and its toxicity. Flocculants can be applied directly to: the soil surface, water flowing in a channel, a natural waterbody, or a settling pond. Examples of these four basic types of BMP applications are described below. One of them alone may be sufficient for a relatively simple project, or several of these BMPs may be used together to design a polymer flocculation system for a larger project.

Soil Surface Applications—3 examples

Soil stabilization. The objective is to bind soil particles together so they become more resistant to the erosive forces of wind or water and to promote revegetation following a soil disturbing activity such as construction. Soft matting can be applied over the ground (Figure 4) to provide an attachment surface for floc collection as runoff flows down the slope. If hydroseeding is used, the addition of a polymer flocculant in liquid form to the hydroseeding mix will bind the seed, fertilizer, and other additives to the soil until the new vegetation is established. The hydroseeding mix is then sprayed on the slope (Figure 5), and vegetation is established to stabilize the slope (Figure 6). When hydroseeding is not used, the powdered polymer can be applied by hand over the matting. When it rains, the powdered polymer dissolves and the soil particles become chemically bound to the long polymer molecules. The resulting flocs are sticky and adhere to the fibers of the soft matting to create a highly erosion resistant surface that supports vegetation. If straw or mulch is used instead of soft matting to cover the ground, the flocs will also adhere to either of them and provide good erosion resistance and revegetation support.

Figure 4. *Slope covered with floc collection matting*

Figure 5. *Hydroseeding the slope*

Figure 6. *Stabilization four weeks later*

Dispersion fields. The objective is to reduce the velocity, erosive force, and turbidity of rapidly flowing water by allowing it to spread out over a relatively level area. Checks or wattles can be placed perpendicular to the flow to reduce its velocity. Soft matting installed over the dispersion field and covered with a polymer powder will reduce the water's turbidity by binding the suspended particles together so they form particulate-polymer agglomerations that settle and adhere to the jute matting.

When wells are drilled during home construction to provide drinking water or geothermal water for heating and air

conditioning systems, the water discharged from the drilling operations can be laden with rock chips and sediment and is often toxic. A drilling rig and its settling pit that allows larger particles from the rig's discharge to settle out is shown in Figure 7. The water then flows through a flocculation ditch and a small dispersion field, which is lined with jute matting covered with polymer flocculant powder to clarify the water before it's discharged. The turbidity of water coming from the drilling rig was over 5,000 NTU. But after the settling pit and polymer flocculation in the mixing ditch and dispersion field, the discharged water's turbidity was reduced to 2 NTU.

Figure 7. *Drilling rig and settling pit*

A much larger dispersion field was needed to clarify the spoils from a dredging operation before they were discharged back into a Tennessee Valley Authority lake. The dredge spoils were initially pumped into a settling pond to allow the heaver particles to settle. Then after passing through the mixing ditch in Figure 8, they entered an 8,100 square foot dispersion field (Figure 9) lined with jute matting, which was covered with a powdered polymer flocculant. After passing over a dispersion field and through a sediment retention barrier, the clarified water was returned to Kentucky Lake (Figure 10). The dredge spoils pumped into the settling pond were 15% solids. After settling, the water discharged from the settling pond had a turbidity ranging from 500 to 600 NTUs. And after flocculation in the treatment ditch followed by additional flocculation and particle collection in the dispersion field and a sediment retention barrier, the turbidity was only 21 NTUs.

Figure 8. *Large mixing ditch*

Figure 9. *Dispersion field with jute matting and flocculant powder*

Figure 10. *Clarified dredge spoils returning back to the lake*

Dust control. The objective of dust control is to reduce airborne dust from haul roads, tailings piles, waste dumps, and open areas on construction sites. The polymer is mixed and dissolved in water and then sprayed directly on the road or other ground surface (Figure 11). A comparison of construction site road dust before and after polymer flocculation is shown in Figures 12 and 13. Using a flocculant to bind the dust particles will also reduce the amount of water needed to spray dusty construction areas.

Figure 11. *Water truck applying dissolved polymer flocculant*

Figure 12. *Road dust before applying polymer flocculant*

Figure 13. *Road dust after applying polymer flocculant*

Channel Applications—4 examples

Treatment ditches. When a construction site sediment basin like the one in Figure 14 needs to be dewatered, an above-ground treatment ditch built of hay bales covered with plastic can be used to reduce the water's turbidity before it's discharged to the environment. Soluble polymer blocks are tethered along the higher portion of the ditch, and particle collection matting covers the bottom of the ditch along its lower portion (Figure 15). When water is released from the settling

Figure 14. *Sediment basin to be dewatered*

Figure 15. *Lower portion of the treatment ditch*

basin and flows through the upper part of the treatment ditch over and around the blocks, the polymer blocks begin to dissolve, turbulence causes mixing, and the sediment particles suspended in the water bind with polymer molecules to form flocs. When these flocs reach the lower and wider portion of the ditch, the water velocity is reduced and the flocs settle to the bottom and adhere to the soft matting. After this flocculation and particle collection, the clarified water is discharged. A larger above ground treatment ditch with a 3,500 gallons per minute flow was previously shown in Figure 8.

Treatment ditches can also be dug into the ground. A treatment ditch in Figure 16 has checks placed perpendicular to the flow to increase polymer mixing. This flocculation ditch reduced the turbidity of water from a phosphate mining operation from 1,500 NTU to 25 NTU, which meets Florida's turbidity standard.

Figure 16. *Flocculation ditch with checks to increase the polymer mixing*

Figure 17. *HDPE treatment ditch liner*

The treatment ditch used to clarify stormwater runoff from a highway construction site (Figure 17) has deeply corrugated sides that create turbulence which facilitates flocculation by mixing the polymer flocculant with the turbid stormwater. The ditch is made of high density polyethylene (HDPE) sections that can be disassembled and reused on other projects or recycled. These sections eliminate the need for the hay bales and plastic linings, they reduce the amount of construction material taken to municipal landfills for disposal, they will stack tightly for transporting to another job site or storage, and they can also be used to line in-ground treatment ditches (Figure 18). They're a green product made of about 75% recycled material.

Figure 18. *In-ground treatment ditch*

Closed pipes. The construction site for a large number of homes near Disney World was drained because it was originally marsh land. The contractor pumped the water over a quarter of a mile through closed pipes to a natural lake. To prevent the lake from becoming turbid, soluble polymer blocks were inserted through holes that were cut along the top of the pipes and anchored in place (Figure 19). Polymer flocculation within the pipes bound suspended sediment particles in the water together, so they had sufficient mass to settle before discharged into the lake, rather than increase the lake's turbidity. Water leaving this construction site had a turbidity of about 8,000 NTU, but after flocculation the water discharged to the lake measured about 10 NTU.

Figure 19. *Polymer blocks inserted into pipes*

Split pipes. A sediment pond at a construction site was dewatered using split pipe sections joined together. The pipe's upper sections contained soluble polymer blocks (Figure 20) and its lower sections were lined with soft matting to collect the flocs (Figure 21).

Figure 20. *Split pipe with polymer blocks*

Figure 21. *Split pipe with soft matting*

Irrigation furrows. Applying polyacrylamide (PAM) to irrigation furrows improves the irrigation process by providing more water to the crops. As water flows down the furrow it infiltrates through pores in the sides and bottom of the furrow and into the surrounding soil. PAM binds the fine soil particles into aggregates (flocs), which are too large to clog these pores, and this increases the infiltration. Maintaining larger pores provides more water to the crops because infiltration rate increases exponentially with the diameter of the furrow's pores. The water

is then delivered to the crops by a soil water pressure gradient, which is greatest by the wetted furrow and then decreases toward the crop roots as water is taken up by the roots due to the plants' transpiration.

Polymer flocculation also reduces irrigation-induced erosion and sediment transport. The binding of polymers to furrow soils increases the soil aggregate cohesion, prevents aggregates on the bottom of a furrow from breaking up, and helps preserve the furrow's roughness. In addition, PAM flocculates fine soil particles that may become suspended in the furrow stream. The resulting large flocs are less likely to seal soil pores and reduce infiltration. The polymer's combined effects on furrow roughness and infiltration reduce the furrow's erosion and sediment transport. Figure 22 shows a furrow treated with PAM having little erosion and clear water. Figure 23 shows an untreated furrow having erosion and cloudy water. Imhoff cones in Figure 24 compare the turbidity in these two furrows. The cone on the left holds water from the furrow treated with PAM; the cone on the right holds water from the untreated furrow.

Figure 22. *Furrow treated with PAM*

Figure 23. *Untreated furrow with erosion*

Figure 24. *Comparison of water from furrows with and without PAM*

Natural Waterbody (in situ) Applications—4 examples

Salmon spawning habitat. The Anna River in Michigan's Upper Peninsula is good Coho Salmon spawning habitat. An old rusty culvert under a road that crosses over the river was scheduled to be replaced during a fall salmon run. Before this construction project began, water soluble, polymer flocculant blocks were placed in the river 20 to 30 feet downstream of the culvert (Figure 25) to protect the spawning ground from turbidity. Jute matting was placed downstream of the polymer blocks (Figure 26) to collect the flocculated soil particles. Before the old culvert could be removed, a channel had to be dug to divert the flow around the construction site. The diversion channel was lined with plastic and crushed limestone, which was covered with polymer powder to prevent white plumes of lime sediment from drifting downstream. This flocculation successfully clarified the water in the diversion channel and in the river below the construction site. Little salmon smolts (Figure 27) as well as spawning adults could be seen swimming in these waters. To protect the habitat, it was important to have this flocculation system in place before the construction project began.

Figure 25. *Six of the polymer blocks placed downstream*

Figure 26. *One of the in situ jute particle collection mats*

Figure 27. *Salmon smolt swimming in the diversion ditch*

Figure 28. *Three in-stream baskets*

In-stream baskets. The baskets in Figure 28 introduce soluble polymer blocks to turbid water down stream of construction work. This allows the dissolved polymer to mix with the turbid water and facilitates the binding reaction between polymer molecules and suspended particles, which reduces turbidity.

Particle curtains. After suspended sediment particles are bound to the flocculant in flowing waters, if the velocity is too high to allow the flocs to settle to the bottom, then particle curtains of jute or other soft matting can be suspended from floats across the current, to collect the flocculated particles. However, particle curtains are not a stand-alone BMP. They must be placed just downstream of a polymer flocculation system. The particle curtain shown in Figure 29 is being lowered into a canal in central Florida. Three particle curtains in Figure 30 are placed across the inflow to a pond. Each curtain reduces the inflow's turbidity.

Figure 29. *Particle curtain in a canal*

Figure 30. *Particle curtains clarifying the input to a pond*

Waterfall mixing system. A water garden landscape in Atlanta was quite turbid after its construction (Figure 31). Polymer logs were placed in the waterfall (Figure 32), which provided mixing of the dissolved polymer molecules and suspended sediment particles. After 24 hours the turbidity was significantly reduced, and after 48 hours coi (ornamental carp) could inhabit the pond (Figure 33).

Figure 31. *Newly constructed water garden*

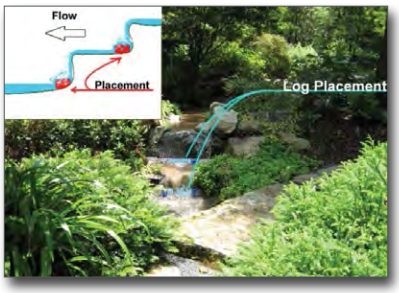


Figure 32. *Polymer flocculant logs placed in the waterfall*

Figure 33. *Coi pond two days later*

Settling Pond Applications—2 examples

Dewatering sediment basins. When settling ponds or basins need to be dewatered, the water can be pumped through a sediment bag, which traps the coarse sediment particles. Jute matting covered with powdered polyacrylamide flocculant placed under the sediment bag and along its discharge ditch (Figure 34) will clarify the discharge water by flocculating the fine sediment particles that pass through the bag and binding them to the soft matting. The discharged water in Figure 35 is much less turbid than the water leaving the sediment bag.

Figure 34. *Sediment bag and its treatment ditch*

Figure 35. *Clarified discharge water near the end of the treatment ditch*

Sediment removal. The highly saturated sediment remaining in a sediment basin after it has been dewatered is often difficult to remove. Mixing the granular form of PAM into this sediment will bind the particles together and stiffen it, making it easier to remove (Figure 36). This is done by spreading the granular PAM flocculant evenly over the sediment surface and then mixing it into the top three feet of sediment using the excavator equipment's bucket. Do not dump the flocculant in a pile. If the sediment is deeper than three feet, this mixing and removal can be repeated for each successive three-foot layer of sediment. The sediments removed may be recycled as topsoil (Figure 37).

Figure 36. *Removing stiffened sediment from a sediment basin*

Figure 37. *Recycling sediment along a highway*

Polymer Flocculation Systems Composed of Multiple BMPs Working Together—1 example

At an office construction site in Tennessee, a powdered polymer was applied directly to stabilize the soil surface in gullies (Figure 38) draining to a sediment pond at the lower portion of the site. Soluble polymer blocks were tethered inside a closed pipe (culvert) running under a construction road (Figure 39) that also drained to the pond. Before these BMPs were installed, the sediment pond was quite turbid (Figure 40). Two weeks after their installation and several significant rain events, the pond was clear, and only the sediment deltas remained (Figure 41). Designing polymer flocculation systems often involves using multiple BMPs and having them work well together.

Figure 38. *Eroding gully on a construction site*

Figure 39. *Polymer block in a construction site culvert*

Figure 40. *Sediment pond before BMPs were installed*

Figure 41. *Same pond after BMPs were installed*

Site-Specific Performance Testing

The effectiveness of polymer flocculation depends on the site-specific soil characteristics and the particular polymer used. There are hundreds of anionic polymers, and they're not all an effective flocculant for a particular soil. Sometimes a blend of polymers provides the most effective flocculation. A performance ratio of 95% (the amount of polymer attaching to soil particles) is considered a very effective flocculant. Increasing the flocculant application rate will not necessarily result in better performance. Site-specific soil sampling and analysis are recommended to determine the reaction time and most effective polymer blend.

References

Applied Polymer Systems Inc. 2011. Polymer Enhanced Best Management Practice (PEBMP) Application Guide. Woodstock, GA. www.siltstop.com/pdf/PEBMPJune2013.pdf

Meager, Justin 2006. Turbidity and Fish Behavior List of References. www.justin-meager.com/turbidity_references.htm

Meager, Justin 2013. Turbidity and Fish Behavior. www.justin-meager.com/turbid.htm

Toronto and Regional Conservation Authority 2013. Anionic Polyacrylamide Application Guide for Urban Construction in Ontario.

USDA, Natural Resources Conservation Service 2002. Conservation Practice Standard: Anionic Polyacrylamide Application, Code 450. http://efotg.sc.egov.usda.gov/references/public/NM/450STD-2011June.pdf

Photograph Credits

Figures 1, 2. King Boynton, U. S. EPA, Office of Water

Figures 3 – 10. Steve Iwinski, Applied Polymer Systems, Inc.

Figures 11 – 13. Eddie Snell, Reedy Creek Improvement District, Lake Buena Vista, Florida

Figures 14 – 16. Steve Iwinski, Applied Polymer Systems, Inc.

Figure 17. Eddie Snell, Reedy Creek Improvement District, Lake Buena Vista, Florida

Figures 18. Mark Maederer, Penda Corporation

Figures 19. Eddie Snell, Reedy Creek Improvement District, Lake Buena Vista, Florida

Figures 20 – 21. Steve Iwinski, Applied Polymer Systems, Inc.

Figures 22 – 24. Website, USDA, Agricultural Research Service

Figures 25 – 28. Steve Iwinski, Applied Polymer Systems, Inc.

Figure 29. Eddie Snell, Reedy Creek Improvement District, Lake Buena Vista, Florida

Figures 30 – 41. Steve Iwinski, Applied Polymer Systems, Inc.

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: July 14, 2017
Consultation Code: 05E1NE00-2017-SLI-2211
Event Code: 05E1NE00-2017-E-04809
Project Name: AMPET- Chelmsford

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: 05E1NE00-2017-SLI-2211

Event Code: 05E1NE00-2017-E-04809

Project Name: AMPET- Chelmsford

Project Type: ** OTHER **

Project Description: Excavation dewatering and treatment at 100 Chelmsford Street with discharge to storm drain

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/42.603404689494035N71.34740586460732W

Counties: Middlesex, MA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on your 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. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
Northern Long-eared Bat *(Myotis septentrionalis)*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9045

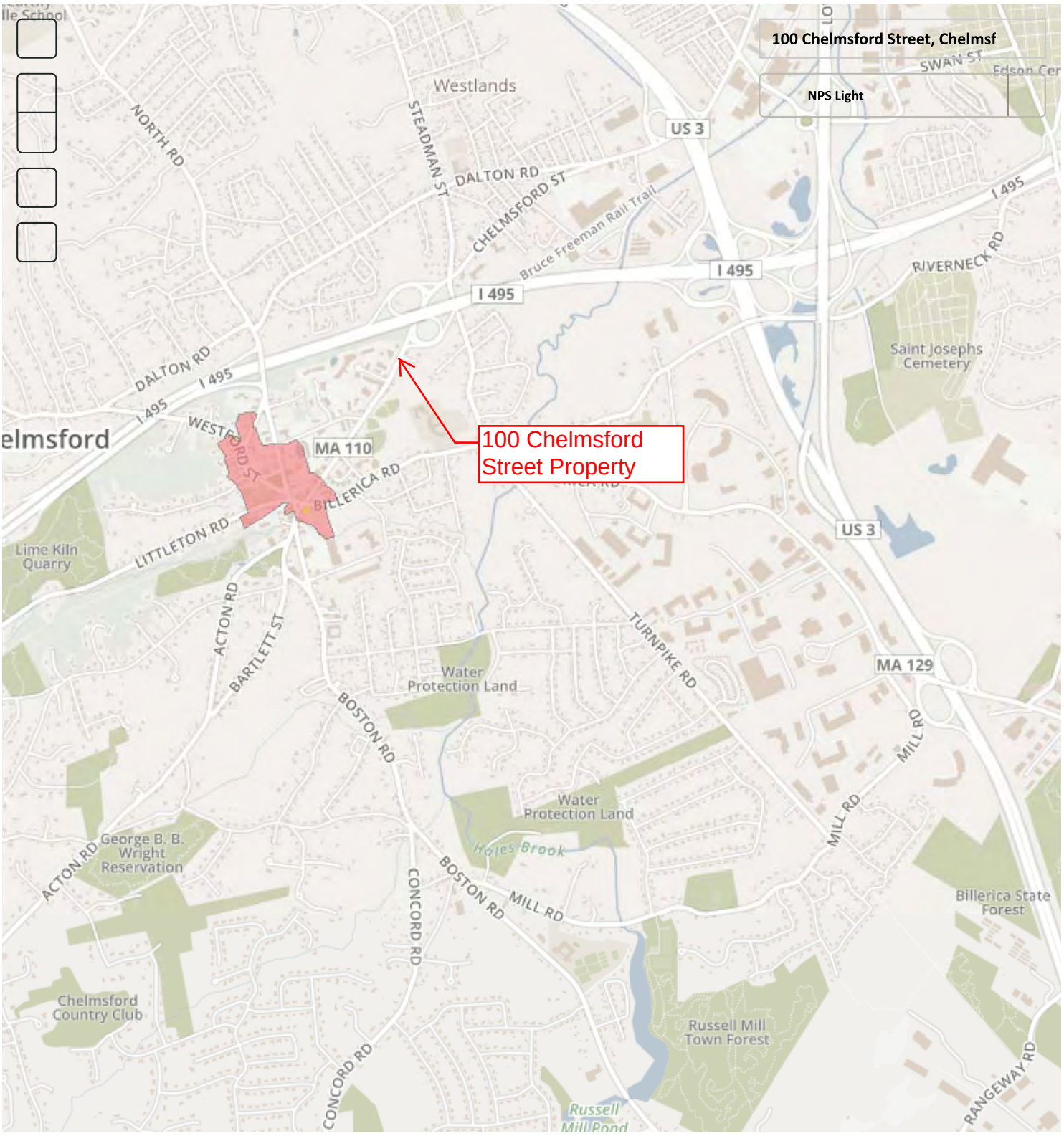
Critical habitats

There are no critical habitats within your project area.

National Register of Histori...

National Park Service
U.S. Department of the Interior

Public, non-restricted data depicting National Register spatial data proce...



CERTIFICATE OF ANALYSIS

Brian Moore
Carriage House Consulting, Inc.
8A Pleasant Street
South Natick, MA 01760

RE: AMPET - Chelmsford - RGP (MA140501)
ESS Laboratory Work Order Number: 1707058

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:19 pm, Jul 13, 2017

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

SAMPLE RECEIPT

The following samples were received on July 06, 2017 for the analyses specified on the enclosed Chain of Custody Record.

The samples and analyses listed below were analyzed in accordance with the 2017 Remediation General Permit under the National Pollutant Discharge Elimination System (NPDES).

ESS Laboratory is unable to achieve the required detection limit of 0.4 mg/L for Ethanol for the RGP permit. We have also been unable to procure a subcontract laboatory that is able to achieve this limit. The data for Ethanol has been reported using our current method reporting limit.

Lab Number	Sample Name	Matrix	Analysis
1707058-01	CEA-3	Ground Water	1664A, 200.7, 245.1, 2540D, 300.0, 3113B, 350.1, 3500Cr B-2009, 420.1, 4500 CN CE, 504.1, 524.2, 625 SIM, ASTM D3695

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

PROJECT NARRATIVE

524.2 Volatile Organic Compounds

C7G0178-CCV1	**Continuing Calibration %Diff/Drift is above control limit (CD+).**
	1,1-Dichloroethene (55% @ 30%), Tertiary-butyl Alcohol (43% @ 30%)
CG71330-BS1	**Blank Spike recovery is above upper control limit (B+).**
	1,1-Dichloroethene (202% @ 70-130%), Tertiary-butyl Alcohol (166% @ 70-130%)
CG71330-BSD1	**Blank Spike recovery is above upper control limit (B+).**
	1,1-Dichloroethene (198% @ 70-130%), Tertiary-butyl Alcohol (156% @ 70-130%)

625(SIM) Semi-Volatile Organic Compounds

1707058-01	**Elevated Method Reporting Limits due to sample matrix (EL).**
	Pentachlorophenol
1707058-01	**Present in Method Blank (B).**
	bis(2-Ethylhexyl)phthalate
1707058-01	**Surrogate recovery(ies) below lower control limit (S-).**
	1,2-Dichlorobenzene-d4 (24% @ 30-130%)
C7G0155-CCV1	**Calibration required quadratic regression (Q).**
	Pentachlorophenol (83% @ 80-120%)
C7G0176-CCV1	**Calibration required quadratic regression (Q).**
	Pentachlorophenol (88% @ 80-120%)
CG71221-BS1	**Blank Spike recovery is above upper control limit (B+).**
	bis(2-Ethylhexyl)phthalate (144% @ 40-140%)
CG71221-BSD1	**Blank Spike recovery is above upper control limit (B+).**
	bis(2-Ethylhexyl)phthalate (147% @ 40-140%)

Alcohol Scan by GC/FID

1707058-01	**Elevated Method Reporting Limits due to sample matrix (EL).**
	Ethanol

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP
Client Sample ID: CEA-3
Date Sampled: 07/06/17 12:00
Percent Solids: N/A

ESS Laboratory Work Order: 1707058
ESS Laboratory Sample ID: 1707058-01
Sample Matrix: Ground Water
Units: ug/L

Extraction Method: 3005A

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (10.0)		200.7		1	BJV	07/10/17 14:48	100	20	CG70732
Arsenic	**14.6** (5.0)		3113B		5	KJK	07/12/17 6:06	100	20	CG70732
Cadmium	ND (0.05)		3113B		1	KJK	07/11/17 20:12	100	20	CG70732
Chromium	ND (4.0)		200.7		1	BJV	07/10/17 14:48	100	20	CG70732
Chromium III	ND (10.0)		200.7		1	JLK	07/10/17 14:48	1	1	[CALC]
Copper	**8.8** (4.0)		200.7		1	BJV	07/10/17 14:48	100	20	CG70732
Hardness	**200000** (165)		200.7		1	BJV	07/10/17 14:48	1	1	[CALC]
Iron	**19000** (20.0)		200.7		1	BJV	07/10/17 14:48	100	20	CG70732
Lead	ND (1.0)		3113B		1	KJK	07/11/17 17:23	100	20	CG70732
Mercury	ND (0.200)		245.1		1	MJV	07/11/17 12:09	20	40	CG70621
Nickel	ND (10.0)		200.7		1	BJV	07/10/17 14:48	100	20	CG70732
Selenium	ND (2.0)		3113B		1	KJK	07/12/17 1:12	100	20	CG70732
Silver	ND (1.0)		200.7		1	BJV	07/10/17 14:48	100	20	CG70732
Zinc	**22.0** (10.0)		200.7		1	BJV	07/10/17 14:48	100	20	CG70732

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP
Client Sample ID: CEA-3
Date Sampled: 07/06/17 12:00
Percent Solids: N/A
Initial Volume: 25
Final Volume: 25
Extraction Method: 524.2

ESS Laboratory Work Order: 1707058
ESS Laboratory Sample ID: 1707058-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: GEM

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1-Trichloroethane	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
1,1,2-Trichloroethane	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
1,1-Dichloroethane	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
1,1-Dichloroethene	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
1,2-Dichlorobenzene	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
1,2-Dichloroethane	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
1,3-Dichlorobenzene	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
1,4-Dichlorobenzene	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Acetone	ND (5.0)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Benzene	**22.1** (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Carbon Tetrachloride	ND (0.3)		524.2		1	07/13/17 14:04	C7G0178	CG71330
cis-1,2-Dichloroethene	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Ethylbenzene	**45.2** (5.0)		524.2		10	07/13/17 13:30	C7G0178	CG71330
Methyl tert-Butyl Ether	**53.6** (5.0)		524.2		10	07/13/17 13:30	C7G0178	CG71330
Methylene Chloride	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Naphthalene	**3.1** (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Tertiary-amyl methyl ether	**10.2** (1.0)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Tertiary-butyl Alcohol	ND (25.0)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Tetrachloroethene	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Toluene	**2.0** (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Trichloroethene	ND (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Vinyl Chloride	ND (0.2)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Xylene O	**7.3** (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330
Xylene P,M	**58.3** (0.5)		524.2		1	07/13/17 14:04	C7G0178	CG71330

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*93 %*		*80-120*
Surrogate: 4-Bromofluorobenzene	*98 %*		*80-120*

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP
Client Sample ID: CEA-3
Date Sampled: 07/06/17 12:00
Percent Solids: N/A
Initial Volume: 1030
Final Volume: 0.25
Extraction Method: 3510C

ESS Laboratory Work Order: 1707058
ESS Laboratory Sample ID: 1707058-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: IBM
Prepared: 7/12/17 15:51

625(SIM) Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Acenaphthene	ND (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Acenaphthylene	ND (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Anthracene	ND (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Benzo(a)anthracene	**0.89** (0.10)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Benzo(a)pyrene	**1.38** (0.10)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Benzo(b)fluoranthene	**2.37** (0.10)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Benzo(g,h,i)perylene	**1.67** (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Benzo(k)fluoranthene	**0.70** (0.10)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
bis(2-Ethylhexyl)phthalate	**B 6.43** (1.94)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Butylbenzylphthalate	ND (12.1)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Chrysene	**1.75** (0.10)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Dibenzo(a,h)Anthracene	**0.31** (0.10)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Diethylphthalate	ND (12.1)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Dimethylphthalate	ND (12.1)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Di-n-butylphthalate	ND (12.1)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Di-n-octylphthalate	ND (12.1)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Fluoranthene	**3.00** (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Fluorene	ND (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Indeno(1,2,3-cd)Pyrene	**1.68** (0.10)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Naphthalene	**3.23** (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Pentachlorophenol	**EL** ND (4.37)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Phenanthrene	**1.18** (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221
Pyrene	**2.48** (0.97)		625 SIM		5	07/13/17 15:03	C7G0176	CG71221

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*24 %*	*S-*	*30-130*
Surrogate: 2,4,6-Tribromophenol	*104 %*		*15-110*
Surrogate: 2-Fluorobiphenyl	*50 %*		*30-130*
Surrogate: Nitrobenzene-d5	*53 %*		*30-130*
Surrogate: p-Terphenyl-d14	*62 %*		*30-130*

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP
Client Sample ID: CEA-3
Date Sampled: 07/06/17 12:00
Percent Solids: N/A

ESS Laboratory Work Order: 1707058
ESS Laboratory Sample ID: 1707058-01
Sample Matrix: Ground Water

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Ammonia as N	**1.27** (0.10)		350.1		1	JLK	07/12/17 17:45	mg/L	CG71117
Chloride	**778** (100)		300.0		200	JLK	07/11/17 21:41	mg/L	CG71137
Hexavalent Chromium	ND (10.0)		3500Cr B-2009		1	JLK	07/06/17 20:21	ug/L	CG70642
Phenols	ND (100)		420.1		1	JLK	07/11/17 17:36	ug/L	CG71138
Total Cyanide (LL)	ND (5.00)		4500 CN CE		1	EEM	07/11/17 11:40	ug/L	CG71119
Total Petroleum Hydrocarbon	ND (5)		1664A		1	CRR	07/11/17 15:15	mg/L	CG70727
Total Suspended Solids	**236** (5)		2540D		1	JLK	07/10/17 20:22	mg/L	CG71037

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP
Client Sample ID: CEA-3
Date Sampled: 07/06/17 12:00
Percent Solids: N/A
Initial Volume: 35
Final Volume: 2
Extraction Method: 504/8011

ESS Laboratory Work Order: 1707058
ESS Laboratory Sample ID: 1707058-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: JXS
Prepared: 7/12/17 12:00

504.1 1,2-Dibromoethane / 1,2-Dibromo-3-chloropropane

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,2-Dibromoethane	ND (0.015)		504.1		1	07/12/17 15:26		CG71223

	%Recovery	Qualifier	Limits
Surrogate: Pentachloroethane	*146 %*		*30-150*
Surrogate: Pentachloroethane [2C]	*121 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP
Client Sample ID: CEA-3
Date Sampled: 07/06/17 12:00
Percent Solids: N/A
Initial Volume: 1
Final Volume: 1
Extraction Method: No Prep

ESS Laboratory Work Order: 1707058
ESS Laboratory Sample ID: 1707058-01
Sample Matrix: Ground Water
Units: mg/L
Analyst: ZLC
Prepared: 7/12/17 11:30

Alcohol Scan by GC/FID

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Ethanol	**EL** ND (10)		ASTM D3695		1	ZLC	07/12/17 12:49		CG71214

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Quality Control Data

Total Metals

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CG70621 - 245.1/7470A										
Blank										
Mercury	ND	0.200	ug/L							
Blank										
Mercury	ND	0.200	ug/L							
LCS										
Mercury	5.91	0.200	ug/L	6.000		99	85-115			
LCS Dup										
Mercury	5.89	0.200	ug/L	6.000		98	85-115	0.4	20	
Batch CG70642 - [CALC]										
Blank										
Chromium III	ND	10.0	ug/L							
LCS										
Chromium III	ND		ug/L							
LCS Dup										
Chromium III	ND		ug/L							
Batch CG70732 - 3005A										
Blank										
Antimony	ND	10.0	ug/L							
Arsenic	ND	1.0	ug/L							
Cadmium	ND	0.05	ug/L							
Chromium	ND	4.0	ug/L							
Chromium III	ND	4.00	ug/L							
Copper	ND	4.0	ug/L							
Hardness	ND	165	ug/L							
Iron	ND	20.0	ug/L							
Lead	ND	1.0	ug/L							
Nickel	ND	10.0	ug/L							
Selenium	ND	2.0	ug/L							
Silver	ND	1.0	ug/L							
Zinc	ND	10.0	ug/L							
LCS										
Antimony	104	10.0	ug/L	100.0		104	85-115			
Arsenic	94.6	25.0	ug/L	100.0		95	85-115			
Cadmium	54.5	25.0	ug/L	50.00		109	85-115			
Chromium	103	4.0	ug/L	100.0		103	85-115			
Chromium III	103	4.00	ug/L							
Copper	104	4.0	ug/L	100.0		104	85-115			
Hardness	7020	165	ug/L							
Iron	511	20.0	ug/L	500.0		102	85-115			
Lead	106	25.0	ug/L	100.0		106	85-115			
Nickel	108	10.0	ug/L	100.0		108	85-115			
Selenium	206	50.0	ug/L	200.0		103	85-115			
Silver	45.9	1.0	ug/L	50.00		92	85-115			

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CG70732 - 3005A										
Zinc	108	10.0	ug/L	100.0		108	85-115			
LCS Dup										
Antimony	108	10.0	ug/L	100.0		108	85-115	4	20	
Arsenic	92.6	25.0	ug/L	100.0		93	85-115	2	20	
Cadmium	53.3	25.0	ug/L	50.00		107	85-115	2	20	
Chromium	106	4.0	ug/L	100.0		106	85-115	3	20	
Chromium III	106	4.00	ug/L							
Copper	107	4.0	ug/L	100.0		107	85-115	3	20	
Hardness	7220	165	ug/L							
Iron	519	20.0	ug/L	500.0		104	85-115	2	20	
Lead	105	25.0	ug/L	100.0		105	85-115	0.5	20	
Nickel	111	10.0	ug/L	100.0		111	85-115	3	20	
Selenium	201	50.0	ug/L	200.0		101	85-115	2	20	
Silver	41.5	1.0	ug/L	50.00		83	85-115	10	20	
Zinc	110	10.0	ug/L	100.0		110	85-115	3	20	
524.2 Volatile Organic Compounds										
Batch CG71330 - 524.2										
Blank										
1,1,1-Trichloroethane	ND	0.5	ug/L							
1,1,2-Trichloroethane	ND	0.5	ug/L							
1,1-Dichloroethane	ND	0.5	ug/L							
1,1-Dichloroethene	ND	0.5	ug/L							
1,2-Dichlorobenzene	ND	0.5	ug/L							
1,2-Dichloroethane	ND	0.5	ug/L							
1,3-Dichlorobenzene	ND	0.5	ug/L							
1,4-Dichlorobenzene	ND	0.5	ug/L							
Acetone	ND	5.0	ug/L							
Benzene	ND	0.5	ug/L							
Carbon Tetrachloride	ND	0.3	ug/L							
cis-1,2-Dichloroethene	ND	0.5	ug/L							
Ethylbenzene	ND	0.5	ug/L							
Methyl tert-Butyl Ether	ND	0.5	ug/L							
Methylene Chloride	ND	0.5	ug/L							
Naphthalene	ND	0.5	ug/L							
Tertiary-amyl methyl ether	ND	1.0	ug/L							
Tertiary-butyl Alcohol	ND	25.0	ug/L							
Tetrachloroethene	ND	0.5	ug/L							
Toluene	ND	0.5	ug/L							
Trichloroethene	ND	0.5	ug/L							
Vinyl Chloride	ND	0.2	ug/L							
Xylene O	ND	0.5	ug/L							
Xylene P,M	ND	0.5	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*4.91*		ug/L	*5.000*		*98*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*5.13*		ug/L	*5.000*		*103*	*80-120*			

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
524.2 Volatile Organic Compounds										
Batch CG71330 - 524.2										
LCS										
1,1,1-Trichloroethane	9.8		ug/L	10.00		98	70-130			
1,1,2-Trichloroethane	10.3		ug/L	10.00		103	70-130			
1,1-Dichloroethane	10.1		ug/L	10.00		101	70-130			
1,1-Dichloroethene	20.2		ug/L	10.00		202	70-130			B+
1,2-Dichlorobenzene	9.6		ug/L	10.00		96	70-130			
1,2-Dichloroethane	9.9		ug/L	10.00		99	70-130			
1,3-Dichlorobenzene	9.5		ug/L	10.00		95	70-130			
1,4-Dichlorobenzene	9.8		ug/L	10.00		98	70-130			
Acetone	51.2		ug/L	50.00		102	70-130			
Benzene	9.9		ug/L	10.00		99	70-130			
Carbon Tetrachloride	9.7		ug/L	10.00		97	70-130			
cis-1,2-Dichloroethene	10.2		ug/L	10.00		102	70-130			
Ethylbenzene	10.1		ug/L	10.00		101	70-130			
Methyl tert-Butyl Ether	10.1		ug/L	10.00		101	70-130			
Methylene Chloride	10.5		ug/L	10.00		105	70-130			
Naphthalene	9.8		ug/L	10.00		98	70-130			
Tertiary-amyl methyl ether	9.4		ug/L	10.00		94	70-130			
Tertiary-butyl Alcohol	82.9		ug/L	50.00		166	70-130			B+
Tetrachloroethene	10.3		ug/L	10.00		103	70-130			
Toluene	9.9		ug/L	10.00		99	70-130			
Trichloroethene	10.6		ug/L	10.00		106	70-130			
Vinyl Chloride	10.5		ug/L	10.00		105	70-130			
Xylene O	9.6		ug/L	10.00		96	70-130			
Xylene P,M	18.6		ug/L	20.00		93	70-130			
Surrogate: 1,2-Dichlorobenzene-d4	*4.73*		ug/L	*5.000*		*95*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.98*		ug/L	*5.000*		*100*	*80-120*			
LCS Dup										
1,1,1-Trichloroethane	9.9		ug/L	10.00		99	70-130	1	20	
1,1,2-Trichloroethane	10.0		ug/L	10.00		100	70-130	3	20	
1,1-Dichloroethane	10.2		ug/L	10.00		102	70-130	1	20	
1,1-Dichloroethene	19.8		ug/L	10.00		198	70-130	2	20	B+
1,2-Dichlorobenzene	9.6		ug/L	10.00		96	70-130	0.1	20	
1,2-Dichloroethane	10.3		ug/L	10.00		103	70-130	3	20	
1,3-Dichlorobenzene	9.6		ug/L	10.00		96	70-130	1	20	
1,4-Dichlorobenzene	9.7		ug/L	10.00		97	70-130	0.5	20	
Acetone	50.3		ug/L	50.00		101	70-130	2	20	
Benzene	10.2		ug/L	10.00		102	70-130	3	20	
Carbon Tetrachloride	9.6		ug/L	10.00		96	70-130	1	20	
cis-1,2-Dichloroethene	9.9		ug/L	10.00		99	70-130	3	20	
Ethylbenzene	10.1		ug/L	10.00		101	70-130	0.3	20	
Methyl tert-Butyl Ether	9.6		ug/L	10.00		96	70-130	5	20	
Methylene Chloride	10.3		ug/L	10.00		103	70-130	2	20	
Naphthalene	9.5		ug/L	10.00		95	70-130	3	20	
Tertiary-amyl methyl ether	9.1		ug/L	10.00		91	70-130	3	20	

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
524.2 Volatile Organic Compounds										
Batch CG71330 - 524.2										
Tertiary-butyl Alcohol	77.8		ug/L	50.00		156	70-130	6	25	B+
Tetrachloroethene	9.9		ug/L	10.00		99	70-130	4	20	
Toluene	10.2		ug/L	10.00		102	70-130	2	20	
Trichloroethene	10.6		ug/L	10.00		106	70-130	0.2	20	
Vinyl Chloride	9.9		ug/L	10.00		99	70-130	5	20	
Xylene O	9.3		ug/L	10.00		93	70-130	3	20	
Xylene P,M	18.1		ug/L	20.00		91	70-130	3	20	
Surrogate: 1,2-Dichlorobenzene-d4	*4.65*		ug/L	*5.000*		*93*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.99*		ug/L	*5.000*		*100*	*80-120*			
625(SIM) Semi-Volatile Organic Compounds										
Batch CG71221 - 3510C										
Blank										
Acenaphthene	ND	0.20	ug/L							
Acenaphthylene	ND	0.20	ug/L							
Anthracene	ND	0.20	ug/L							
Benzo(a)anthracene	ND	0.02	ug/L							
Benzo(a)pyrene	ND	0.02	ug/L							
Benzo(b)fluoranthene	ND	0.02	ug/L							
Benzo(g,h,i)perylene	ND	0.20	ug/L							
Benzo(k)fluoranthene	ND	0.02	ug/L							
bis(2-Ethylhexyl)phthalate	1.97	0.40	ug/L							
Butylbenzylphthalate	ND	2.50	ug/L							
Chrysene	ND	0.02	ug/L							
Dibenzo(a,h)Anthracene	ND	0.02	ug/L							
Diethylphthalate	ND	2.50	ug/L							
Dimethylphthalate	ND	2.50	ug/L							
Di-n-butylphthalate	ND	2.50	ug/L							
Di-n-octylphthalate	ND	2.50	ug/L							
Fluoranthene	ND	0.20	ug/L							
Fluorene	ND	0.20	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	0.02	ug/L							
Naphthalene	ND	0.20	ug/L							
Pentachlorophenol	ND	0.90	ug/L							
Phenanthrene	ND	0.20	ug/L							
Pyrene	ND	0.20	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*0.963*		ug/L	*2.500*		*39*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*2.63*		ug/L	*3.750*		*70*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.31*		ug/L	*2.500*		*52*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.30*		ug/L	*2.500*		*52*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.56*		ug/L	*2.500*		*63*	*30-130*			
LCS										
Acenaphthene	3.15	0.20	ug/L	4.000		79	40-140			
Acenaphthylene	3.07	0.20	ug/L	4.000		77	40-140			
Anthracene	3.33	0.20	ug/L	4.000		83	40-140			

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
625(SIM) Semi-Volatile Organic Compounds										
Batch CG71221 - 3510C										
Benzo(a)anthracene	3.16	0.02	ug/L	4.000		79	40-140			
Benzo(a)pyrene	3.69	0.02	ug/L	4.000		92	40-140			
Benzo(b)fluoranthene	3.66	0.02	ug/L	4.000		92	40-140			
Benzo(g,h,i)perylene	3.49	0.20	ug/L	4.000		87	40-140			
Benzo(k)fluoranthene	3.78	0.02	ug/L	4.000		94	40-140			
bis(2-Ethylhexyl)phthalate	5.75	0.40	ug/L	4.000		144	40-140			B+
Butylbenzylphthalate	3.52	2.50	ug/L	4.000		88	40-140			
Chrysene	3.35	0.02	ug/L	4.000		84	40-140			
Dibenzo(a,h)Anthracene	3.67	0.02	ug/L	4.000		92	40-140			
Diethylphthalate	3.39	2.50	ug/L	4.000		85	40-140			
Dimethylphthalate	3.75	2.50	ug/L	4.000		94	40-140			
Di-n-butylphthalate	3.67	2.50	ug/L	4.000		92	40-140			
Di-n-octylphthalate	3.53	2.50	ug/L	4.000		88	40-140			
Fluoranthene	3.37	0.20	ug/L	4.000		84	40-140			
Fluorene	3.50	0.20	ug/L	4.000		88	40-140			
Indeno(1,2,3-cd)Pyrene	3.73	0.02	ug/L	4.000		93	40-140			
Naphthalene	2.67	0.20	ug/L	4.000		67	40-140			
Pentachlorophenol	2.72	0.90	ug/L	4.000		68	30-130			
Phenanthrene	3.28	0.20	ug/L	4.000		82	40-140			
Pyrene	3.89	0.20	ug/L	4.000		97	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	*1.19*		ug/L	*2.500*		*47*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*3.85*		ug/L	*3.750*		*103*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.73*		ug/L	*2.500*		*69*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.64*		ug/L	*2.500*		*66*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.94*		ug/L	*2.500*		*78*	*30-130*			
LCS Dup										
Acenaphthene	3.47	0.20	ug/L	4.000		87	40-140	10	20	
Acenaphthylene	3.41	0.20	ug/L	4.000		85	40-140	10	20	
Anthracene	3.56	0.20	ug/L	4.000		89	40-140	7	20	
Benzo(a)anthracene	3.42	0.02	ug/L	4.000		86	40-140	8	20	
Benzo(a)pyrene	4.21	0.02	ug/L	4.000		105	40-140	13	20	
Benzo(b)fluoranthene	4.02	0.02	ug/L	4.000		100	40-140	9	20	
Benzo(g,h,i)perylene	4.08	0.20	ug/L	4.000		102	40-140	16	20	
Benzo(k)fluoranthene	4.24	0.02	ug/L	4.000		106	40-140	11	20	
bis(2-Ethylhexyl)phthalate	5.89	0.40	ug/L	4.000		147	40-140	2	20	B+
Butylbenzylphthalate	3.88	2.50	ug/L	4.000		97	40-140	10	20	
Chrysene	3.64	0.05	ug/L	4.000		91	40-140	8	20	
Dibenzo(a,h)Anthracene	4.26	0.02	ug/L	4.000		106	40-140	15	20	
Diethylphthalate	3.69	2.50	ug/L	4.000		92	40-140	8	20	
Dimethylphthalate	4.14	2.50	ug/L	4.000		103	40-140	10	20	
Di-n-butylphthalate	3.92	2.50	ug/L	4.000		98	40-140	7	20	
Di-n-octylphthalate	3.97	2.50	ug/L	4.000		99	40-140	12	20	
Fluoranthene	3.60	0.20	ug/L	4.000		90	40-140	7	20	
Fluorene	3.81	0.20	ug/L	4.000		95	40-140	9	20	
Indeno(1,2,3-cd)Pyrene	4.30	0.02	ug/L	4.000		107	40-140	14	20	

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
625(SIM) Semi-Volatile Organic Compounds										
Batch CG71221 - 3510C										
Naphthalene	2.99	0.20	ug/L	4.000		75	40-140	11	20	
Pentachlorophenol	3.22	0.90	ug/L	4.000		81	30-130	17	20	
Phenanthrene	3.52	0.20	ug/L	4.000		88	40-140	7	20	
Pyrene	4.14	0.20	ug/L	4.000		104	40-140	6	20	
Surrogate: 1,2-Dichlorobenzene-d4	*1.18*		ug/L	*2.500*		*47*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*3.74*		ug/L	*3.750*		*100*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.68*		ug/L	*2.500*		*67*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.68*		ug/L	*2.500*		*67*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.83*		ug/L	*2.500*		*73*	*30-130*			
Classical Chemistry										
Batch CG70642 - General Preparation										
Blank										
Hexavalent Chromium	ND	10.0	ug/L							
LCS										
Hexavalent Chromium	0.493		mg/L	0.4998		99	90-110			
LCS Dup										
Hexavalent Chromium	0.492		mg/L	0.4998		98	90-110	0.3	20	
Batch CG70727 - General Preparation										
Blank										
Total Petroleum Hydrocarbon	ND	5	mg/L							
LCS										
Total Petroleum Hydrocarbon	13	5	mg/L	19.38		69	66-114			
Batch CG71037 - General Preparation										
Blank										
Total Suspended Solids	ND	5	mg/L							
LCS										
Total Suspended Solids	42		mg/L	43.50		97	80-120			
Batch CG71117 - NH4 Prep										
Blank										
Ammonia as N	ND	0.10	mg/L							
LCS										
Ammonia as N	0.09	0.10	mg/L	0.09994		93	80-120			
LCS										
Ammonia as N	0.99	0.10	mg/L	0.9994		99	80-120			
Batch CG71119 - TCN Prep										
Blank										
Total Cyanide (LL)	ND	5.00	ug/L							
LCS										
Total Cyanide (LL)	20.2	5.00	ug/L	20.06		101	90-110			
LCS										

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CG71119 - TCN Prep										
Total Cyanide (LL)	149	5.00	ug/L	150.4		99	90-110			
LCS Dup										
Total Cyanide (LL)	148	5.00	ug/L	150.4		98	90-110	0.7	20	
Batch CG71137 - General Preparation										
Blank										
Chloride	ND	0.5	mg/L							
LCS										
Chloride	2.5		mg/L	2.500		99	90-110			
Batch CG71138 - General Preparation										
Blank										
Phenols	ND	100	ug/L							
LCS										
Phenols	94	100	ug/L	100.0		94	80-120			
LCS										
Phenols	1000	100	ug/L	1000		100	80-120			
504.1 1,2-Dibromoethane / 1,2-Dibromo-3-chloropropane										
Batch CG71223 - 504/8011										
Blank										
1,2-Dibromoethane	ND	0.015	ug/L							
1,2-Dibromoethane [2C]	ND	0.015	ug/L							
Surrogate: Pentachloroethane	*0.247*		ug/L	*0.2000*		*123*	*30-150*			
Surrogate: Pentachloroethane [2C]	*0.219*		ug/L	*0.2000*		*109*	*30-150*			
LCS										
1,2-Dibromoethane	0.193	0.015	ug/L	0.2000		96	70-130			
1,2-Dibromoethane [2C]	0.196	0.015	ug/L	0.2000		98	70-130			
Surrogate: Pentachloroethane	*0.233*		ug/L	*0.2000*		*117*	*30-150*			
Surrogate: Pentachloroethane [2C]	*0.188*		ug/L	*0.2000*		*94*	*30-150*			
LCS										
1,2-Dibromoethane	0.070	0.015	ug/L	0.08000		88	70-130			
1,2-Dibromoethane [2C]	0.074	0.015	ug/L	0.08000		92	70-130			
Surrogate: Pentachloroethane	*0.0601*		ug/L	*0.2000*		*30*	*30-150*			
Surrogate: Pentachloroethane [2C]	*0.0634*		ug/L	*0.2000*		*32*	*30-150*			
Alcohol Scan by GC/FID										
Batch CG71214 - No Prep										
Blank										
Ethanol	ND	10	mg/L							
LCS										

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Alcohol Scan by GC/FID										
Batch CG71214 - No Prep										
Ethanol	1080	10	mg/L	1000		108	60-140			
LCS Dup										
Ethanol	1110	10	mg/L	1000		111	60-140	3	30	

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

Notes and Definitions

U	Analyte included in the analysis, but not detected
S-	Surrogate recovery(ies) below lower control limit (S-).
Q	Calibration required quadratic regression (Q).
EL	Elevated Method Reporting Limits due to sample matrix (EL).
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
B+	Blank Spike recovery is above upper control limit (B+).
B	Present in Method Blank (B).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707058

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 1707058

Turn Time: X Standard Rush_____ Approved By: _____

Reporting Limits - NPDES RGP

State where samples were collected: **MA**

Is this project for: **RGP**

Electonic Deliverable Yes ✓ No____
Format: Excel___ Access___ PDF___ Other_____

Project Manager: Jason Wiggin
Company: CarriageHouse Consulting, Inc.
Address: 8A Pleasant Street, First Floor
South Natick, MA 01760
jwiggin@carriagehouseinfo.com

Project #

Project Name: AMPET- Chelmsford

PO # MA140501

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	RGP Metals (Total)	Hardness (Calculation)	Ethanol ASTM D3695	Chloride 300.0*	Total Cyanide 4500 LL	TPH 1664	TSS 2540D*	Ammonia 350.1	Tri Cr (Calc. MUST run T. Cr)	Hex Cr 7196A	Phenol 420.1	RGP VOC Long List 624	Acetone 524.2 / EDB 504.1	RGP SVOC Log List 625-SIM		1,4-Dioxane 8270-SIM	TRC 4500-CL E*	PCB 608	Comment #
1	7/6/17	1200	Grab	GW	CEA-3	21	X	X	X	X	X	X	X	X	X	X	X	X	X	X		H	H	H	1,2 3
~~2~~	~~7/6/17~~	~~1300~~	~~Grab~~	~~SW~~	SW-1	3	X	X						X											3
					hdm 7/10/17																					
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							4	4	1	1	5	3	1	3	-	1	3	2	2	1		1	1	1	
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							P	P	V	P	P	AG	P	P	-	P	AG	V	V	AG		AG	P	AG	

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ___Yes ___No
Seals Intact ___ Yes ___No NA: X
Cooler Temperature: 1.6 ice

Sampled by : Jason Wiggin

Comments: 1) RGP Metals include Sb, As, Cd, Cu, Fe, Pb, Ni, Se, Ag and Zn by 200.7/200.9 and Hg by 245.1
2) Parameters in **BOLD** have Short hold-time 3) **H = HOLD pending results**
* **TSS, TRC and Cl taken from the same container** **PERMIT ATTACHED**

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	7/6/17 15:30	[signature] 7/6/17 1530	[signature]	7/6/17 1705	[signature] 7/6/17 1801
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing

Page ____ of ____

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 170058

Turn Time: X Standard Rush_____ Approved By: _____

Reporting Limits - NPDES RGP

State where samples were collected: **MA**

Is this project for: **RGP**

Electonic Deliverable Yes ✓ No____
Format: Excel___ Access___ PDF___ Other_____

Project Manager: Jason Wiggin
Company: CarriageHouse Consulting, Inc.
Address: 8A Pleasant Street, First Floor
South Natick, MA 01760
jwiggin@carriagehouseinfo.com

Project #

Project Name: AMPET- Chelmsford

PO # MA140501

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	RGP Metals (Total)	Hardness (Calculation)	Ethanol ASTM D3695	Chloride 300.0*	Total Cyanide 4500 LL	TPH 1664	TSS 2540D*	Ammonia 350.1	Tri Cr (Calc. MUST run T. Cr)	Hex Cr 7196A	Phenol 420.1	RGP VOC Long List 624	Acetone 524.2 / EDB 504.1	RGP SVOC Log List 625-SIM		1,4-Dioxane 8270-SIM	TRC 4500-CL E*	PCB 608	Comment #
						Analysis																			
1	7/6/17	1200	Grab	GW	CEA-3	21	X	X	X	X	X	X	X	X	X	X	X	X	X	X		H	H	H	1,2 3
2	7/6/17	1300	Grab	SW	SW-1	3	X	X						X											3
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							4	4	1	1	5	3	1	3	-	1	3	2	2	1		1	1	1	
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							P	P	V	P	P	AG	P	P	-	P	AG	V	V	AG		AG	P	AG	

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ___Yes ____No
Seals Intact ___ Yes ___No NA: X
Cooler Temperature: 1.6 ice

Sampled by : Jason Wiggin

Comments: 1) RGP Metals include Sb, As, Cd, Cu, Fe, Pb, Ni, Se, Ag and Zn by 200.7/200.9 and Hg by 245.1
2) Parameters in **BOLD** have Short hold-time 3) **H = HOLD pending results**
* **TSS, TRC and Cl taken from the same container** **PERMIT ATTACHED**

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Jason Wiggin	7/6/17 15:30			7/6/17 1705	1801
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing

Page ____ of ____

CERTIFICATE OF ANALYSIS

Brian Moore
Carriage House Consulting, Inc.
8A Pleasant Street
South Natick, MA 01760

RE: AMPET - Chelmsford - RGP (MA140501)
ESS Laboratory Work Order Number: 1707149

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:08 pm, Jul 18, 2017

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707149

SAMPLE RECEIPT

The following samples were received on July 11, 2017 for the analyses specified on the enclosed Chain of Custody Record.

The samples and analyses listed below were analyzed in accordance with the 2017 Remediation General Permit under the National Pollutant Discharge Elimination System (NPDES).

ESS Laboratory is unable to achieve the required detection limit of 0.4 mg/L for Ethanol for the RGP permit. We have also been unable to procure a subcontract laboatory that is able to achieve this limit. The data for Ethanol has been reported using our current method reporting limit.

Lab Number	Sample Name	Matrix	Analysis
1707149-01	SW-1	Surface Water	200.7, 245.1, 3113B, 350.1, 3500Cr B-2009

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707149

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707149

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP
Client Sample ID: SW-1
Date Sampled: 07/10/17 18:15
Percent Solids: N/A

ESS Laboratory Work Order: 1707149
ESS Laboratory Sample ID: 1707149-01
Sample Matrix: Surface Water
Units: ug/L

Extraction Method: 3005A

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (10.0)		200.7		1	KJK	07/13/17 4:17	100	20	CG71230
Arsenic	**2.8** (1.0)		3113B		1	MJV	07/17/17 21:45	100	20	CG71230
Cadmium	**0.09** (0.05)		3113B		1	KJK	07/13/17 13:58	100	20	CG71230
Copper	ND (4.0)		200.7		1	KJK	07/13/17 4:17	100	20	CG71230
Hardness	**151000** (165)		200.7		1	KJK	07/13/17 4:17	1	1	[CALC]
Iron	**1570** (20.0)		200.7		1	KJK	07/13/17 4:17	100	20	CG71230
Lead	ND (1.0)		3113B		1	KJK	07/13/17 18:47	100	20	CG71230
Mercury	ND (0.200)		245.1		1	MJV	07/13/17 12:18	20	40	CG71227
Nickel	ND (10.0)		200.7		1	KJK	07/13/17 4:17	100	20	CG71230
Selenium	ND (2.0)		3113B		1	KJK	07/13/17 21:03	100	20	CG71230
Silver	ND (1.0)		200.7		1	KJK	07/13/17 15:25	100	20	CG71230
Zinc	**19.5** (10.0)		200.7		1	KJK	07/13/17 4:17	100	20	CG71230

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP
Client Sample ID: SW-1
Date Sampled: 07/10/17 18:15
Percent Solids: N/A

ESS Laboratory Work Order: 1707149
ESS Laboratory Sample ID: 1707149-01
Sample Matrix: Surface Water

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Ammonia as N	**0.21** (0.10)		350.1		1	JLK	07/14/17 18:51	mg/L	CG71323
Hexavalent Chromium	ND (10.0)		3500Cr B-2009		1	JLK	07/11/17 16:56	ug/L	CG71139

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707149

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CG71227 - 245.1/7470A										
Blank										
Mercury	ND	0.200	ug/L							
LCS										
Mercury	5.92	0.200	ug/L	6.000		99	85-115			
LCS Dup										
Mercury	6.09	0.200	ug/L	6.000		101	85-115	3	20	
Batch CG71230 - 3005A										
Blank										
Antimony	ND	10.0	ug/L							
Arsenic	ND	1.0	ug/L							
Cadmium	ND	0.05	ug/L							
Copper	ND	4.0	ug/L							
Hardness	ND	165	ug/L							
Iron	ND	20.0	ug/L							
Lead	ND	1.0	ug/L							
Nickel	ND	10.0	ug/L							
Selenium	ND	2.0	ug/L							
Silver	ND	1.0	ug/L							
Zinc	ND	10.0	ug/L							
LCS										
Arsenic	110	25.0	ug/L	100.0		110	85-115			
Cadmium	46.0	25.0	ug/L	50.00		92	85-115			
Hardness	5850	165	ug/L							
Lead	95.3	25.0	ug/L	100.0		95	85-115			
Selenium	180	50.0	ug/L	200.0		90	85-115			
LCS Dup										
Antimony	98.2	10.0	ug/L	100.0		98	85-115	4	20	
Arsenic	108	25.0	ug/L	100.0		108	85-115	2	20	
Cadmium	47.3	25.0	ug/L	50.00		95	85-115	3	20	
Copper	101	4.0	ug/L	100.0		101	85-115	2	20	
Hardness	6000	165	ug/L							
Iron	449	20.0	ug/L	500.0		90	85-115	6	20	
Lead	96.8	25.0	ug/L	100.0		97	85-115	2	20	
Nickel	96.7	10.0	ug/L	100.0		97	85-115	3	20	
Selenium	184	50.0	ug/L	200.0		92	85-115	2	20	
Silver	45.6	1.0	ug/L	50.00		91	85-115	3	20	
Zinc	94.3	10.0	ug/L	100.0		94	85-115	2	20	
Classical Chemistry										
Batch CG71139 - General Preparation										
Blank										
Hexavalent Chromium	ND	10.0	ug/L							
LCS										

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707149

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CG71139 - General Preparation										
Hexavalent Chromium	0.492		mg/L	0.4998		98	90-110			
LCS Dup										
Hexavalent Chromium	0.490		mg/L	0.4998		98	90-110	0.3	20	
Batch CG71323 - General Preparation										
Blank										
Ammonia as N	ND	0.10	mg/L							
LCS										
Ammonia as N	0.11	0.10	mg/L	0.09994		114	80-120			
LCS										
Ammonia as N	0.90	0.10	mg/L	0.9994		90	80-120			

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707149

Notes and Definitions

U	Analyte included in the analysis, but not detected
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Carriage House Consulting, Inc.
Client Project ID: AMPET - Chelmsford - RGP

ESS Laboratory Work Order: 1707149

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Carriage House Consulting, Inc. - TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1707149
Date Received: 7/11/2017
Project Due Date: 7/18/2017
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 2.4 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / (No)
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	147047	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
01	147048	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
01	147049	Yes	NA	Yes	500 mL Poly - H2SO4	H2SO4	
01	147050	Yes	NA	Yes	Other	NP	

2nd Review
Are barcode labels on correct containers? (Yes) / No

Completed By: Date & Time: 7/11/17 1348
Reviewed By: Date & Time: 7/11/17 1511
Delivered By: 7/11/17 1511

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 1707149

Turn Time: X Standard Rush _____ Approved By: _____

Reporting Limits - NPDES RGP 2017

State where samples were collected: **MA**

Is this project for: **NPDES RGP**

Electonic Deliverable Yes X No ____
Format: Excel X Access __ PDF X Other ____

Project Manager: Brian Moore
Company: CarriageHouse Consulting, Inc.
Address: 8A Pleasant Street, First Floor
South Natick, MA 01760

Project # MA140501
Project Name: AMPET-Chelmsford
PO # MA140501

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	RGP Metals (Total)	Hardness (Calculation)	Ethanol ASTM D3695	Chloride 300.0*	Total Cyanide 4500 LL	TPH 1664	TSS 2540D*	Ammonia 350.1	Tri Cr (Calc. MUST run T. Cr)	Hex Cr 7196A	Phenol 420.1	RGP VOC Long List 624	Acetone 524.2 / EDB 504.1	RGP SVOC Log List 625-SIM		1,4-Dioxane 8270-SIM	TRC 4500-CL E*	PCB 608	Comment #
																									1,2 3
1	7/10/2017	18:15	Grab	SW	SW-1	4	X	X						X		X									1,2
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							4	4	1	1	5	3	1	3	-	1	3	2	2	1		1	1	1	
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							P	P	V	P	P	AG	P	P	-	P	AG	V	V	AG		AG	P	AG	

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ✓ Yes ____ No
Seals Intact ___ Yes ___ No NA: ___
Cooler Temperature: Ice chem 2.4 c 13722

Sampled by : Jason Wiggin

Comments: 1) RGP Metals include Sb, As, Cd, Cu, Fe, Pb, Ni, Se, Ag and Zn by 200.7/200.9 and Hg by 245.1
2) Parameters in **BOLD** have Short hold-time 3) **H = HOLD pending results**
* **TSS, TRC and Cl taken from the same container PERMIT ATTACHED**

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
7/11/17	1020	7-11-17 1030		7/11/17	
7/11/17	13:22	7/11/17 1344			

Please E-mail all changes to Chain of Custody in writing

Page ____ of ____