Report

Prolonged Pumping Test and New Source Final Report Lynch Site Linebrook Road Ipswich, Massachusetts

Prepared for:

Ipswich Utilities Department
272 High Street
Ipswich, MA 01938

Prepared by:

AECOM Technical Services
250 Apollo Drive
Chelmsford, Massachusetts 01824

J.N. 60567459

December 2018

Enter your transmittal number → X282145
Transmittal Number

Your unique Transmittal Number can be accessed online:
http://www.mass.gov/eea/agencies/massdep/service/approvals/transmittal-form-for-payment.html

Massachusetts Department of Environmental Protection

Transmittal Form for Permit Application and Payment

1. Please type or print. A separate Transmittal Form must be completed for each permit application.

2. Make your check payable to the Commonwealth of Massachusetts and mail it with a copy of this form to: MassDEP, P.O. Box 4062, Boston, MA 02211.

3. Three copies of this form will be needed.

Copy 1 - the original must accompany your permit application. **Copy 2** must accompany your fee payment. **Copy 3** should be retained for your records

4. Both fee-paying and exempt applicants must mail a copy of this transmittal form to:

MassDEP
P.O. Box 4062
Boston, MA
02211

*** Note:**
For BWSC Permits, enter the LSP.

A. Permit Information

BRP WS 19
1. Permit Code: 4 to 7 character code from permit instructions

New Source Approval = or > 70 gpm
2. Name of Permit Category

Pumping Test Report Approval
3. Type of Project or Activity

B. Applicant Information – Firm or Individual

Ipswich Utilities Department
1. Name of Firm - Or, if party needing this approval is an individual enter name below:

2. **Last Name** of Individual
3. **First Name** of Individual
4. MI

272 High Street
5. Street Address

Ipswich	MA	01938	978-356-6635	2108
6. City/Town	7. State	8. Zip Code	9. Telephone #	10. Ext. #

Ms. Vicki Halmen, Director Water & Wastewater
11. Contact Person
12. e-mail address

C. Facility, Site or Individual Requiring Approval

Proposed Well Field, Lynch Site
1. Name of Facility, Site Or Individual

215 Linebrook Road
2. Street Address

Ipswich	MA	01938		
3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #

8. DEP Facility Number (if Known)
9. Federal I.D. Number (if Known)
10. BWSC Tracking # (if Known)

D. Application Prepared by (if different from Section B)*

AECOM
1. Name of Firm Or Individual

250 Apollo Drive
2. Address

Chelsmford	MA	01824	978-905-2180	
3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #

Douglas DeNatale
8. Contact Person
9. LSP Number (BWSC Permits only)

E. Permit - Project Coordination

1. Is this project subject to MEPA review? ☒ yes ☐ no
If yes, enter the project's EOEA file number - assigned when an Environmental Notification Form is submitted to the MEPA unit: TBD
EOEA File Number

F. Amount Due

DEP Use Only

Permit No:

Rec'd Date:

Reviewer:

Special Provisions:

1. ☒ **Fee** Exempt (city, town or municipal housing authority)(state agency if fee is $100 or less).
There are no fee exemptions for BWSC permits, regardless of applicant status.
2. ☐ Hardship Request - payment extensions according to 310 CMR 4.04(3)(c).
3. ☐ Alternative Schedule Project (according to 310 CMR 4.05 and 4.10).
4. ☐ Homeowner (according to 310 CMR 4.02).

Check Number | Dollar Amount | Date

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Drinking Water Program

BRP WS Application

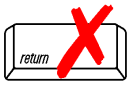
For Drinking Water Program (Water Supply) Permits or Approvals

X282145
Transmittal Number

Facility ID# (if known)

A. Application

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



1. Is this application for ☒ an Original or ☐ a Resubmittal?

2. Applicant:

Name			Address	
Ipswich Utilities Department			272 High Street	
City	**State**	**Zip**	**Contact**	**Telephone**
Ipswich	MA	01938	Ms. Vicki Halmen	978-356-6635

3. Consultant:

Name			Address	
AECOM			250 Apollo Drive	
City	**State**	**Zip**	**Contact**	**Telephone**
Chelmsford	MA	01824	Douglas DeNatale	978-905-2180

B. Permit

Please check the permit or approval for which you are applying:

Zone II Determination for Existing Sources
- ☐ BRP WS 07 Approval to Conduct Pump Test for Zone II Delineation
- ☐ BRP WS 08 Approval of Zone II Delineation

New Technology
- ☐ BRP WS 11 Minor New Technology Approval; where no field test required
  - ☐ Drinking Water Additive
  - ☐ Cross Connection Device
  - ☐ Water Vending Machine
  - ☐ Other (specify):
- ☐ BRP WS 12 Major New Technology Approval: where field testing is required
- ☐ BRP WS 27 New Technology with Third-party Approval
- ☐ BRP WS 28 Vending Site/Source Prototype
- ☐ BRP WS 31 Vending and POU/POE Devices with Third-party Approval

New Source Approvals <70 gpm
- ☐ BRP WS 13 Exploratory Phase, Site Examination, Land Use Survey and Approval to Conduct Pumping Test
- ☐ BRP WS 15 Pumping Test Report Approval and Approval to Construct Source
- ☐ BRP WS 37 Approval of Transient Non-Community Source Less than 7 Gallons per Minute (combines BRP WS 13 and BRP WS 15 submittals)

New Source Approvals = or > 70 gpm
- ☐ BRP WS 17 Exploratory Phase, Site Examination, Land Use Survey, and Conduct Pumping Test
- ☒ BRP WS 19 Pumping Test Report Approval
- ☐ BRP WS 20 To Construct Source

Water Treatment Approvals
- ☐ BRP WS 21A To Conduct Pilot Study < 40,000 gpd
- ☐ BRP WS 21B To Conduct Pilot Study = or > 40,000 gpd and < 200,000 gpd
- ☐ BRP WS 21C To Conduct Pilot Study = or > 200,000 gpd and < 1 mgd
- ☐ BRP WS 21D To Conduct Pilot Study = or > 1 mgd
- ☐ BRP WS 22A Pilot Study Report < 40,000 gpd
- ☐ BRP WS 22B Pilot Study Report = or > 40,000 gpd and < 200,000 gpd
- ☐ BRP WS 22C Pilot Study Report = or > 200,000 gpd and < 1 mgd
- ☐ BRP WS 22D Pilot Study Report = or > 1 mgd
- ☐ BRP WS 23A To Construct Facility <40,000 gpd
- ☐ BRP WS 23B To Construct Facility = or > 40,000 gpd and < 200,000 gpd
- ☐ BRP WS 23C To Construct Facility = or > 200,000 gpd and < 1 mgd
- ☐ BRP WS 24 To Construct Facility = or > 1 mgd
- ☐ BRP WS 25 Treatment Facility Modification
- ☐ BRP WS 29 Water Treatment: Chemical Addition Retrofits of Water Systems > 3,300 people
- ☐ BRP WS 30A Vending Installation Approval
- ☐ BRP WS 30B POU/POE Installation Approval
- ☐ BRP WS 34 Water Treatment: Chemical Addition Retrofits of Water Systems = or < 3,300 people
- ☐ BRP WS 35A Multiple Vending Installation Approval
- ☐ BRP WS 35B Multiple POU/POE Installation Approval

Water Quality Assurance
- ☐ BRP WS 26 Sale or Acquisition of Land for Water Source
- ☐ BRP WS 36 Abandonment of Water Source

Distribution System Modifications
- ☐ BRP WS 32 Systems > 3,300 people
- ☐ BRP WS 33 Systems = or < 3,300 people

C. Certification

"I certify, under penalty of law, that this application and all attachments were prepared under my supervision, in accordance with a system designed to ensure 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 submitted in this application, the information submitted is, to the best of my knowledge and belief, true, accurate and complete."

Authorized Signature

Date

Douglas DeNatale
Print Name

Project Manager/Senior Hydrogeologist
Position/Title

AECOM
250 Apollo Drive
Chelmsford, MA 01824
www.aecom.com

978 905 2100 tel
978 905 2101 fax

December 18, 2018

Ms. Vicki Halmen
Water & Wastewater Director
Ipswich Utilities Department
272 High Street
Ipswich, Massachusetts 01938

Subject: New Source Final Report
Lynch Site, Linebrook Road

Dear Ms. Halmen:

In accordance with our agreement, AECOM has conducted a 15-day pumping test at the Lynch Site to evaluate the suitability of this site for a new source of public water supply.

Based on the pumping test, the Calculated Approvable Yield for a future well field of four gravel-packed wells at the Lynch Site is 510 gallons per minute (gpm). Performance testing of the newly constructed wells and experience with the wells over the first few years of pumping may show that the yield is somewhat different.

Water-quality testing indicates that the water meets primary and secondary Maximum Contaminant Levels (MCLs and SMCLs) established by the US Environmental Protection Agency (EPA) and enforced by the Massachusetts Department of Environmental Protection (DEP). Low levels of coliform bacteria were identified. To meet the requirements of the EPA Ground Water Rule and achieve 4-log (99.99%) inactivation of viruses, the water should be chlorinated before being pumped into the distribution system. Chlorination will have the added benefit of removing potential bacterial contamination. Nearby farming activities may be the source of the bacteria.

Sodium levels were found to be as high as 79.9 milligram per liter (mg/L), which exceeds the Massachusetts Drinking Water Guideline (ORSG) of 20 mg/L. As this standard is a guideline, it is not intended as an enforceable standard. Elevated sodium levels, in all likelihood, originate largely from road-salting of Linebrook Road and perhaps the elementary-school parking lot.

Nitrate levels were found to be elevated, ranging from 4.3 to 5.6 mg/L, though below the MCL of 10 mg/L. Possible sources of nitrate include local farming and nearby septic-system discharges. In addition, chloride levels were found to be as high as 136 mg/L, though still below the SMCL of 250 mg/L. The elevated chloride levels are probably a result of road-salting.

Perfluorinated alkyl acids (PFAAs) were found at levels of up to 23-nanogram per liter (ng/L), which is below the ORSG of 70 ng/L. PFAAs are found in fire-fighting foams, and have been used to make carpets, clothing, fabrics for furniture, paper packaging for food, cookware and many other consumer products.

Levels of iron and manganese were found to be well below the SMCLs of 0.3 mg/L for iron and 0.05 mg/L for manganese. At the end of the pumping test, iron levels generally ranged from about 0.02 to 0.03 mg/L, and manganese levels were found to be no higher than 0.002 mg/L. Provided these levels remain unchanged over the long-term, the water will *not* require treatment to remove iron and manganese.

We recommend that the Town investigate the source(s) of bacteria, and eliminate pathways for their introduction into the groundwater. We also recommend that the Town investigate the sources of nitrate, sodium, chloride and PFAAs, and develop a plan to reduce their levels in groundwater.

Evidence from the pumping test indicates a weak and indirect hydraulic link between Bull Brook and the Lynch wells under pumping conditions. AECOM estimates that a diversion of 0 to 18 gpm of streamflow might occur in August, depending on rainfall conditions and daily well-field pumping cycles. A diversion of 18 gpm is less than 10% of the August median streamflow of 216 gpm. Bull Brook is often without flow in August, which implies a potential diversion of 0 gpm when the weather is dry. The discussion of streamflow diversion due to pumping should be put into its proper perspective. In most cases, any volume of water that is diverted to the wells in dry times is water that would otherwise flow 2,000 feet downstream to recharge Bull Brook Reservoir.

The enclosed report describes the approvable well yield, water quality and the pumping test in detail. The wellhead protection area, known as Zone II, was delineated for the proposed wells and is included in this report. The water-withdrawal permit amendment application (under the Massachusetts Water Management Act) and the Environmental Notification Form (ENF) are being prepared separately, and will be submitted under separate cover. Copies of the New Source Final Report are being forwarded to DEP for review and approval of the proposed wells as drinking water sources, and to the MEPA Office along with the ENF.

Pending DEP approval of the Lynch Site for new water supply, the Town should proceed with the design and construction of four new gravel-packed wells and pumping facilities. The pumping facilities should include chlorination to remove bacteria before the water is introduced into the distribution system. Alternatively, the water could be chlorinated at the existing Water Treatment Plant, if the Town chooses to pump the water there before introducing it into the distribution system.

In closing, it has been our sincere pleasure to assist the Town on this important water-supply development project. We would be pleased to meet with you and other Town representatives to discuss the results of this report.

Very truly yours,
AECOM Technical Services

Douglas DeNatale, PG
Project Manager/Senior Hydrogeologist

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GLOSSARY OF ACRONYMS, ABBREVIATIONS AND SELECTED TECHNICAL TERMS

Acronyms and Abbreviations

BRP WS	Bureau of Resource Protection – Water Supply (DEP permit category)
Col/100ml	colonies per 100 milliliter; unit of concentration of bacteria in water
DEP	Massachusetts Department of Environmental Protection
DO	Dissolved oxygen; chemical measurement of water
DP	Hand driven well point
gpm	US gallons per minute
gpm/ft	gallons per minute per foot of drawdown; an expression of well performance
GW	Groundwater
MEPA	Massachusetts Environmental Policy Act; the MEPA Unit is the clearinghouse for informing the public of upcoming projects that might impact the environment, and ruling on those projects.
mg/L	milligram per liter; unit of concentration of a chemical in water
MMCL	Massachusetts Maximum Contaminant Level; drinking water standard, the maximum permissible level of a contaminant in drinking water
mV	milliVolt
µg/L	microgram per liter; unit of concentration of a chemical in water
µmho/cm	micromho per centimeter; unit of electrical conductance of water
ND	not detected
ng/L	nanogram per liter; unit of concentration of a chemical in water
NSA	New Source Approval; refers to the DEP process for testing and permitting new sources of groundwater supply
NTU	nephelometric turbidity units
ORP	Oxidation-reduction potential; chemical measurement of water

ORSG	Massachusetts Office of Research and Standards Goal, also referred to as a "Drinking Water Guideline"; drinking water standard, the level of a contaminant in drinking water at or below which there is no known or expected risk to health
pCi/L	picoCurie per liter; unit of concentration of a radiological parameter in water
PCS	Potential Contamination Sources
PFAA	Perfluorinated Alkyl Acids
RDA	Request for Determination of Applicability; refers to the process whereby the local Conservation Commission determines whether the Wetlands Protection Act applies to certain activities in wetland resource areas
SMCL	Massachusetts Secondary Maximum Contaminant Level, drinking water standard, requisite to protect public welfare
SOC	Synthetic Organic Compounds
SW	Surface Water
TON	threshold odor number
USGS	United States Geologic Survey
VOC	Volatile Organic Compounds
WMA	Water Management Act; Massachusetts law intended to equitably allocate water resources.

Selected Technical Terms

Aquifer - A natural geologic unit that is capable of storing and delivering a sufficient quantity of water to a well, e.g., a sand-and-gravel aquifer or fractured-bedrock aquifer

Bedrock - The continuous unit of rock that underlies the earth's surface

Confined Aquifer - An aquifer that is covered by a natural geologic layer, such as clay, that does not transmit water readily

Confining Layer - A natural geologic layer, such as clay, that covers a confined aquifer

Glaciofluvial deposits Normally, sand and gravel soils deposited by streams flowing away from melting glaciers

Glaciomarine deposits - Normally, clay, silt and fine-sand soils of glacial origin deposited in the ocean

Groundwater discharge or seepage – Groundwater that discharges naturally from an aquifer to a stream or other surface-water body

Hydraulic conductivity – A measure of the relative ease with which water moves through the ground; soils with higher hydraulic conductivity, such as sand and gravel, transmit water with greater ease than those with lower hydraulic conductivity, such as clay

Hydraulic gradient – The slope of the water-table surface

Induced infiltration – Water that moves from a stream, river or other surface-water body into an aquifer, due to the pumping of a nearby well

Recharge area – Geographic area where rainfall and snowmelt infiltrate the land surface and provide water to a well

Observation well – A well installed primarily for the purpose of observing water-level drawdown and recovery

Pumping Test – A controlled test, involving the pumping of a test well, for the purposes of evaluating sustainable well yield, water quality and impacts to the environment

Test well – A well installed primarily for the purpose of pumping water

Till – A mixture of soils consisting of clay, silt, sand, gravel, cobbles and boulders deposited beneath an advancing glacier or dropped-in-place as the glacier melted away. Also, termed, “hardpan”

Unconfined Aquifer – An aquifer, such as a sand-and-gravel aquifer, that is not covered by a confining layer

Water-level drawdown – The decline in the groundwater level or surface-water level caused by pumping of a nearby well

Water-level recovery – The rise of the groundwater level or surface-water level observed when pumping of a nearby well ceases

Well Yield – The sustainable capacity of a well, measured in gallons per minute

Zone II – The theoretical area of an aquifer that contributes water to a well or well field when pumping at full capacity for 180 days without natural recharge occurring.

Zone III – A secondary recharge area, where groundwater and surface water flow downhill into Zone II. Typically, these are areas underlain by till that shed water into sand-and-gravel aquifers.

SECTION 1 - INTRODUCTION

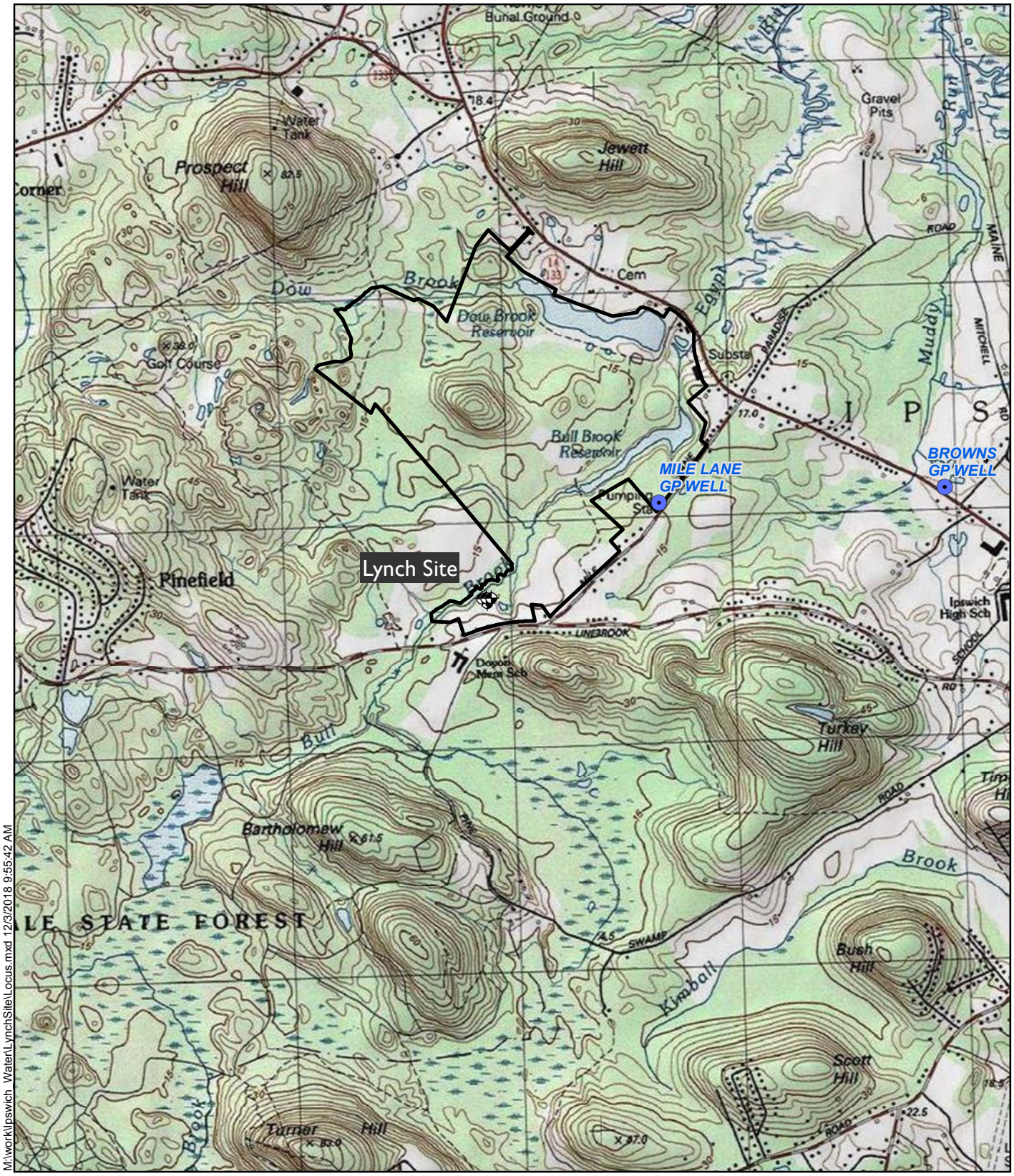
1.1 Site Location and Project Background

The Lynch Well Site is located directly north of Linebrook Road in Ipswich, and occupies the southern corner of approximately 390 acres of Town-owned land, as shown on **Figure 1-1**. The Town has purchased the 390 acres over the years for water-supply protection of its surface-water supplies, namely the Dow Brook and Bull Brook Reservoirs. The Town currently leases the Lynch Site for agricultural use. Bull Brook, which lies directly north of the Lynch Site, drains into Bull Brook Reservoir. Surrounding land uses consist largely of undeveloped land (including State Forest) and farm land. Minor residential development exists along Linebrook Road and Mile Lane. The Doyon Elementary School lies directly across the street to the south of the Lynch Site. The area is un-sewered. Wetlands are present bordering Bull Brook and its tributaries, however, the Lynch Site is largely upland.

The Town installed test wells at the Lynch Site in the summer of 2016 as part of a town-wide search for a new source of water supply. Testing consisted of the installation of 2-inch diameter test-wells at sites TW 13-16, TW 14-16, TW 15-16 and TW 16-16, and later, a preliminary pumping test of 8-hours in duration. Based on the testing, AECOM recommended that the Town pursue the Lynch Site as a new source of water supply. In April 2018, the Town submitted a Request For Site Examination and Prolonged Pumping Test Proposal (BRP WS 17) to the Massachusetts Department of Environmental Protection (DEP) to evaluate the Lynch Site as a new public water supply. Eight-inch diameter test wells were drilled in July 2018 for purposes of conducting a prolonged pumping test. The 8-inch diameter test wells are located in the US Geological Survey's (USGS) Georgetown quadrangle at the following coordinates (Table 1-1).

TABLE 1-1
COORDINATES OF 8-INCH DIAMETER TEST WELLS
LYNCH SITE, IPSWICH, MA

Well ID	UTM Coordinates (X,Y)	Latitude (N)	Longitude (W)
TW 13-16	345951.814932, 4727882.414949	42° 41′ 16.78″	70° 52′ 49.63″
TW 14-16	345936.462837, 4727880.152888	42° 41′ 16.70″	70° 52′ 50.30″
TW 15-16	345968.103492, 4727882.385618	42° 41′ 16.79″	70° 52′ 48.92″
TW 16-16	345954.090315, 4727865.115525	42° 41′ 16.22″	70° 52′ 49.52″



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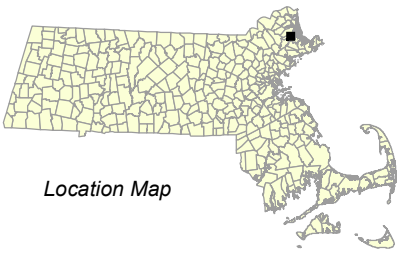
Sources: MassGIS and Esri

Well Locations - Lynch Site

Property Boundary
Town of Ipswich Land

0 1,000 2,000 4,000 Feet



Location Map

Figure 1-1
Locus Map
Lynch Site
Ipswich, MA

November 2018

AECOM

1.2 Scope of Work

As mentioned above, four 8-inch diameter test-pumping wells were installed and developed in July 2018 at the sites of TW 13-16, TW 14-16, TW 15-16 and TW 16-16. In addition, 2-inch diameter PVC observation wells were installed at eight locations in June and July 2018 to complement numerous existing observation wells in the area. Four 1.25-inch diameter galvanized steel well points were hand-driven at various locations in Bull Brook in July 2018, and two seepage meters were installed next to two of the drive points. The locations of these wells are shown on the Site Plan, included as **Figure 1-2**.

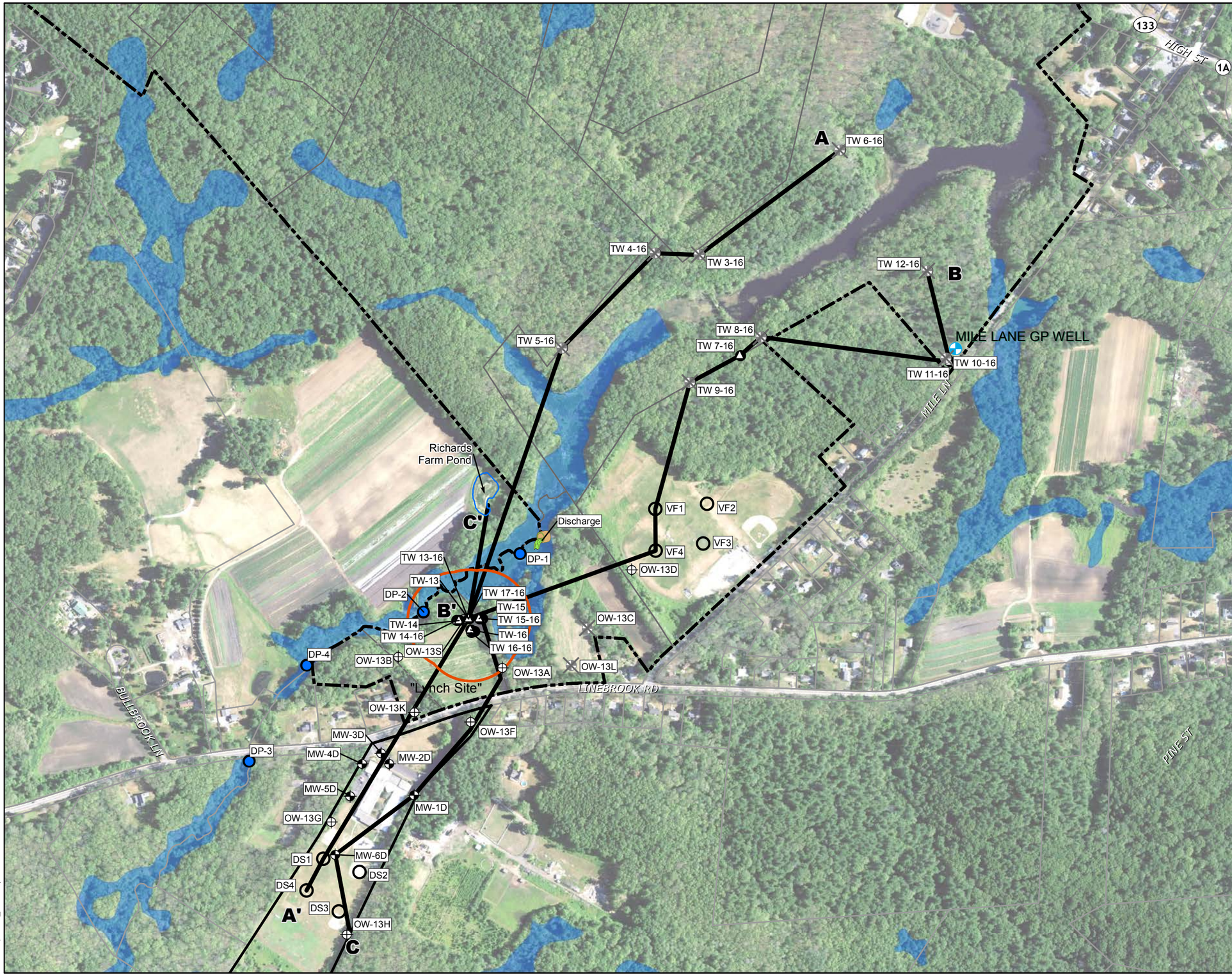
A 15-day pumping test was conducted in August 2018. The overriding goals of the test were to evaluate well yield and water quality, to evaluate the potential impacts of pumping on Bull Brook, and to develop a general sense of how the aquifer-system functions. In addition, the pumping test was designed to obtain hydrogeologic information sufficient to support the delineation of the wellhead protection area, also known as Zone II.

The 15-day pumping test began on Monday, August 13, 2018, with the pumping of only the 8-inch diameter test well at site TW 15-16. Pumping of TW 15-16 was held constant at a rate of 300 gallons per minute (gpm) for a period of 48 hours, after which, the rate was reduced to 75 gpm. At the same time, pumping of the three other 8-inch diameter test wells commenced, each at a rate of 75 gpm. In this way, the aggregate pumping of the four 8-inch diameter test wells was held constant at a rate of 300 gpm throughout the 15-day pumping test. Pumping continued uninterrupted until August 28, 2018. Water-levels were measured in numerous observation wells and the drive points before, during and after the 15-day pumping period. Seepage meters installed in Bull Brook were read frequently, rainfall was measured on-site daily and the flow rate in Bull Brook was estimated visually.

Static water levels measured on August 10, before pumping began, were used to map groundwater flow patterns and measure the groundwater gradient under static (non-pumping) conditions. Water-level measurements made during pumping were used to estimate groundwater flow patterns under pumping conditions. Antecedent and recovery water-level measurements were also made to evaluate long-term water-level trends and the ability of the aquifer to recover.

1.3 Regulatory Requirements

In pursuing approval of these new well supplies, the Town of Ipswich has been careful to consider state, local and federal regulations, and to minimize environmental impacts. First, the pumping well sites were placed outside of wetlands to avoid direct impacts to wetlands. Access to test- and observation-well sites was made generally through existing fields, with a minimum of



AECOM Imagine it. Delivered.

Property Boundary
Town of Ipswich Land

DEP Wetland

Public Water Supply
Groundwater

Soil Boring by Others

Hand-Driven Well Point

Monitoring Well

Observation Well

8-Inch Diameter
Test Well

Pumping Test
Temporary Discharge

Removed Test Well/
Boring

Proposed 250-Ft
Zone I Boundary
(Four Well Sites)

A A' Line of Geologic
Cross-section
(See Figs: 2-3, 2-4, & 2-5)

Base map data provided by MassGIS and USDA.
Date of photo: 2016

November 2018

Figure 1-2

Site Plan

Lynch Site
Ipswich, MA

0 250 500 1,000 Feet

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disturbance to vegetation and the land surface. AECOM, on behalf of the Town, prepared and submitted multiple permit applications, and met with state and local regulators in preparation for the pumping test, summarized as follows:

- Request For Site Examination and Pumping Test Proposal, BRP WS 17, filed with DEP on April 20, 2018;
- Early Notice in the Environmental Monitor, filed with MEPA on April 20, 2018;
- Met with DEP Water Supply and Water Management staff in Wilmington, May 11, 2018;
- Request For Determination of Applicability (RDA) for proposed work in wetlands buffer, filed with Ipswich Conservation Commission, on June 6, 2018;
- Site Exam, held at Lynch Site, June 11, 2018;
- Hearing with the Conservation Commission on the RDA, June 20, 2018. Conservation Commission rendered a Negative Determination; and
- Determination of Threat to Public Water Supplies Due to Beaver and Muskrat, filed with DEP, July 27, 2018, allowing the removal of beaver and beaver dams in Bull Brook.

DEP approved the Site Exam/Prolonged Pumping Test Proposal for the "Lynch Well Field" in a letter dated June 27, 2018. The pumping test was carried out in accordance with AECOM's proposal, as modified in the DEP approval letter. Relevant correspondence is included in Appendix A.

1.4 Project Summary

Based on the pumping test, the Calculated Approvable Yield for a future well field of four gravel-packed wells at the Lynch Site is 510 gpm. Performance testing of the newly constructed wells and experience with the wells over the first few years of pumping may show that the yield is somewhat different. The proposed wells will pump from a five-foot thick, cobble-gravel aquifer, found at a depth of about 50 to 55 feet. Locally, the aquifer is overlain by about 20 feet of clay, which is in turn overlain by a 25- to 30-foot thick sandy aquifer.

The regional aquifer system that provides water to wells at the Lynch Site is complex and not fully understood. The cobble-gravel aquifer is discontinuous; and, its spatial extent and thickness beyond the Lynch Site are uncertain. Numerous lines of evidence indicate that the clay "pinches out", and this may occur as near as about 600 feet north of the Lynch Site at the Richards farm pond (see Figure 1-2, for the location). Where the clay is absent, the cobble-gravel aquifer may be exposed at the ground surface or be directly overlain by the sandy aquifer. Both circumstances would allow direct recharge to the cobble-gravel aquifer from precipitation.

The recharge area contributing water to wells at the Lynch Site is estimated to be 2.49 square miles. The total, theoretical recharge from this 2.49-square-mile area is 1.81-mgd, more than enough to support a withdrawal of 0.73-mgd (510 gpm) from the Lynch Site.

Water-quality testing conducted during the pumping test indicates that the water meets primary and secondary Maximum Contaminant Levels (MCLs and SMCLs) established by the US Environmental Protection Agency (EPA) and enforced by the Massachusetts Department of Environmental Protection (DEP). Low levels of coliform bacteria were identified. All four wells sampled on the 14th day of pumping were positive for either Fecal or Total Coliform bacteria. To meet the requirements of the EPA Ground Water Rule and achieve 4-log (99.99%) inactivation of viruses, the water should be chlorinated before being pumped into the distribution system. Chlorination will have the added benefit of removing potential bacterial contamination. Nearby farming activities on land owned by Richards Realty Trust, specifically the Richards farm pond, may be the source of the bacteria.

Sodium levels were found to be as high as 79.9 milligram per liter (mg/L), which exceeds the Massachusetts Drinking Water Guideline (ORSG) of 20 mg/L. As this standard is a guideline, it is not intended as an enforceable standard. Elevated sodium levels, in all likelihood, originate largely from road-salting of Linebrook Road and perhaps the elementary-school parking lot.

Nitrate levels were found to be elevated, ranging from 4.3 to 5.6 mg/L in the combined-well samples, though below the MCL of 10 mg/L. Possible sources of nitrate include local farming and nearby septic-system discharges, including the elementary school. In addition, chloride levels were found to be as high as 136 mg/L, though still below the SMCL of 250 mg/L. The elevated chloride levels are probably a result of road-salting.

Perfluorinated alkyl acids (PFAAs) were found to range from 8- to 23-nanogram per liter (ng/L) in each of the four 8-inch diameter test-pumping wells. These levels are below the ORSG of 70 ng/L. PFAAs are found in fire-fighting foams, and have been used to make carpets, clothing, fabrics for furniture, paper packaging for food, cookware and many other consumer products.

Levels of iron and manganese were found to be well below the SMCLs of 0.3 mg/L for iron and 0.05 mg/L for manganese. At the end of the pumping test, iron levels generally ranged from about 0.02 to 0.03 mg/L, and manganese levels were found to be no higher than 0.002 mg/L. Provided these levels remain unchanged over the long-term, the water will *not* require treatment to remove iron and manganese.

We recommend that the Town develop a monitoring program to investigate the source(s) of bacteria found in wells at the Lynch Site, and eliminate pathways for their introduction into the groundwater. The program should also be aimed at identifying sources of nitrate, sodium, chloride, and PFAAs with the goal of reducing their levels in groundwater. The Town should work with local farmers to manage fertilizer use, and evaluate nearby septic-system discharges to

reduce nitrate levels. The Town should consider other road-salting strategies to reduce sodium and chloride levels in the drinking water.

Evidence from the pumping test indicates a weak and indirect hydraulic link between Bull Brook and the Lynch wells under pumping conditions. AECOM estimates that a diversion of 0 to 18 gpm of streamflow might occur in August, depending on rainfall conditions and daily well-field pumping cycles. A diversion of 18 gpm is less than 10% of the August median streamflow of 216 gpm. Bull Brook is often without flow in August, which implies a potential diversion of 0 gpm when the weather is dry. The discussion of streamflow diversion due to pumping should be put into its proper perspective. In most cases, any volume of water that is diverted to the wells in dry times is water that would otherwise flow 2,000 feet downstream to recharge Bull Brook Reservoir.

Pending DEP approval of the Lynch Well Site for new water supply, the Town should proceed with the design and construction of four new gravel-packed wells and pumping facilities. The pumping facilities should include chlorination to remove bacteria before the water is introduced into the distribution system. Alternatively, chlorination could be achieved at the existing Water Treatment Plant, if the Town chooses to pump the water there before introducing it into the distribution system. Once the Town receives DEP approval of Zone II, the Town should incorporate the new Zone II into its wellhead protection zoning.

The following outlines the expected permitting steps after submittal of the New Source Final Report:

- Under separate cover, AECOM will submit to DEP a Water Management Act (WMA) Permit Amendment application to add the Lynch well sources to the Town's WMA Permit for the Parker River Basin. DEP water-management staff indicates that DEP will issue an Order-To-Complete (OTC), once the WMA Permit application is received.
- Under separate cover, AECOM will submit an Environmental Notification Form (ENF) to the MEPA Office for review of the proposed wells and pumping facilities. Once MEPA reviews the ENF, it will issue a Certificate on the ENF and may require other actions.
- During design of the proposed wells and pumping facilities, we expect that the local Conservation Commission will require permitting associated with construction activities that may occur within wetland resource areas and riverfront.
- DEP will require a permit to construct the well sources (BRP WS 20) and a separate permit to construct the pumping facilities (BRP WS 23C and perhaps others), prior to construction.
- WMA Permit renewals in the Parker River Basin are scheduled for the year 2023, at which time DEP will ask the Town to address issues related to the Sustainable Water Management Initiative (SWMI).

SECTION 2 - GEOLOGY AND HYDROGEOLOGY

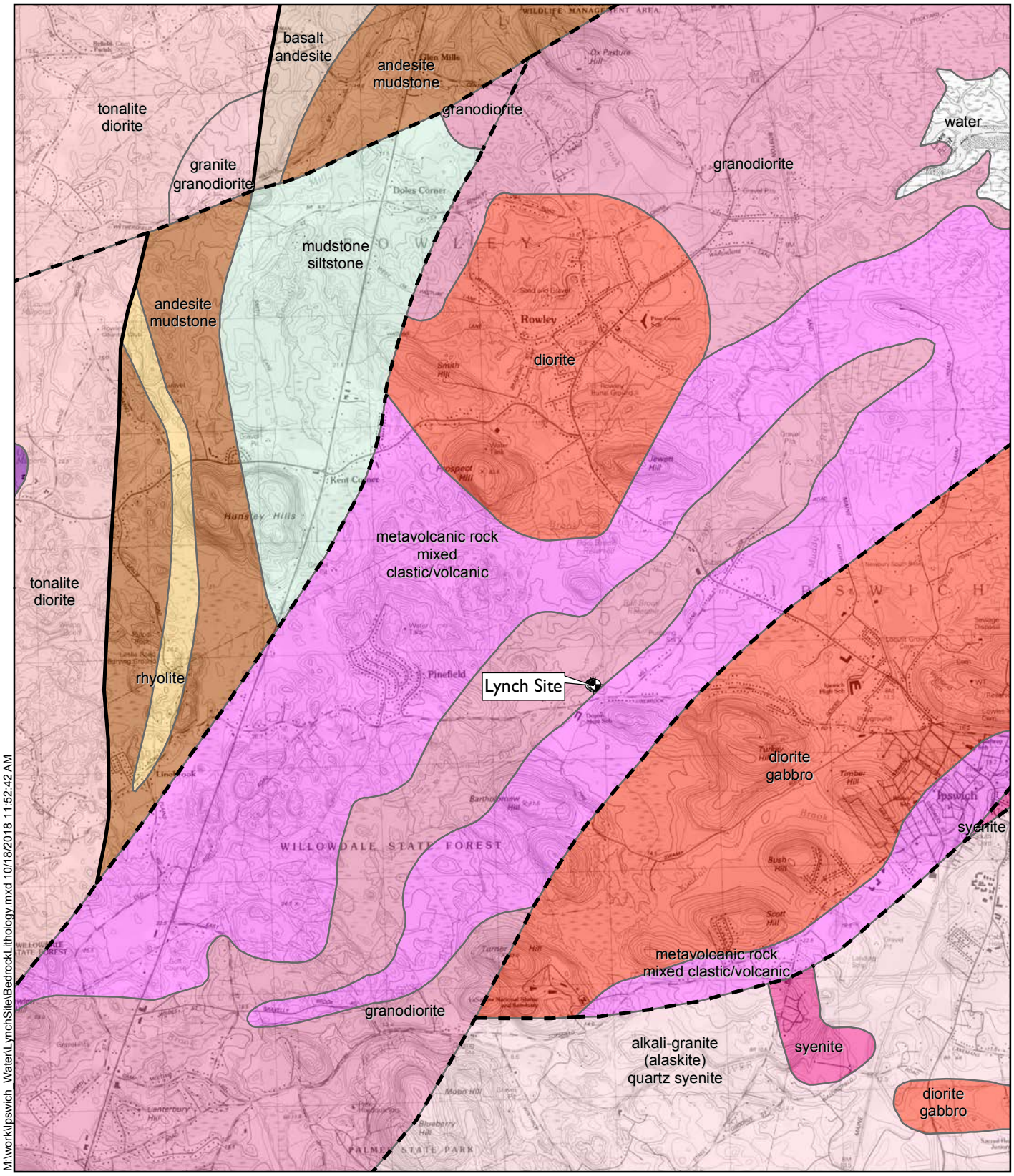
2.1 Physical Setting

Ipswich is situated in what is termed the "Seaboard Lowland Section" of the New England Physiographic Province. As such, Ipswich is part of a broad area that slopes gently toward the coast, with low hills dissected by streams. Ground-surface elevations in the Town range from about 270 feet above sea level at Turner Hill on Topsfield Road to sea-level at the coast.

The Lynch Site is flat, sloping gently north toward Bull Brook. The elevation ranges from approximately 54 feet along Linebrook Road to about 44 feet along the northern edge of the cultivated field to 35 feet in the wetlands that border Bull Brook (see Figures 1-1 and 1-2). The land was used for residential and agricultural purposes until the Town purchased the property for water-supply protection about 10 years ago. The Lynch Site is currently leased for agricultural purposes. A mixture of deciduous and evergreen trees lines the edge of the property, separating the Lynch Site from residential and other agricultural uses. Bull Brook drains northeasterly into Bull Brook Reservoir.

2.2 Bedrock Geology

According to the Bedrock Geology of Massachusetts (Wones and Goldsmith, in Hatch, 1991), the bedrock in Ipswich consists largely of northeast-trending bands of intrusive igneous rocks (granite, granodiorite, diorite and gabbro), with lesser amounts of low-grade metamorphic volcanic rocks (see **Figure 2-1**). The rocks range in age from Silurian to Proterozoic, meaning that they are 400 to more than 600 million years old. The bedrock is cut by northeast-trending faults, the most prominent of which may be related to the Bloody Bluff Fault, a regional fault-system that extends continuously southwest into Connecticut. The Bloody Bluff Fault has not been active for tens of millions of years. The ancient faulting appears to play a role in controlling local drainage patterns, most notably, along certain reaches of the Ipswich River. It is noteworthy that Bull Brook also drains northeasterly, suggesting that its course may be controlled by regional faulting, fracturing or bedrock fabric. Despite their age, ancient fault and fracture systems can transmit water readily and, in some cases, are capable of producing a considerable amount of water to wells. For example, moderately high-capacity well supplies have been found at Turner Hill in Ipswich. The bedrock is covered almost entirely by glacial and post-glacial soils, and is exposed only in isolated outcrops, for example, along the Ipswich River in the downtown area. The degree to which groundwater in the bedrock interacts with the overlying soils is largely unknown.



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Proposed Wells - Lynch Site
Fault
Fault Inferred

alkali-granite (alaskite)
amphibolite
andesite
basalt

diorite
granite
granodiorite
metavolcanic rock

mudstone
rhyolite
syenite
tonalite

Figure 2-1

Bedrock Geology

Lynch Site
Ipswich, MA

Sources: MassGIS and USGS.

0 2,000 4,000 8,000 Feet

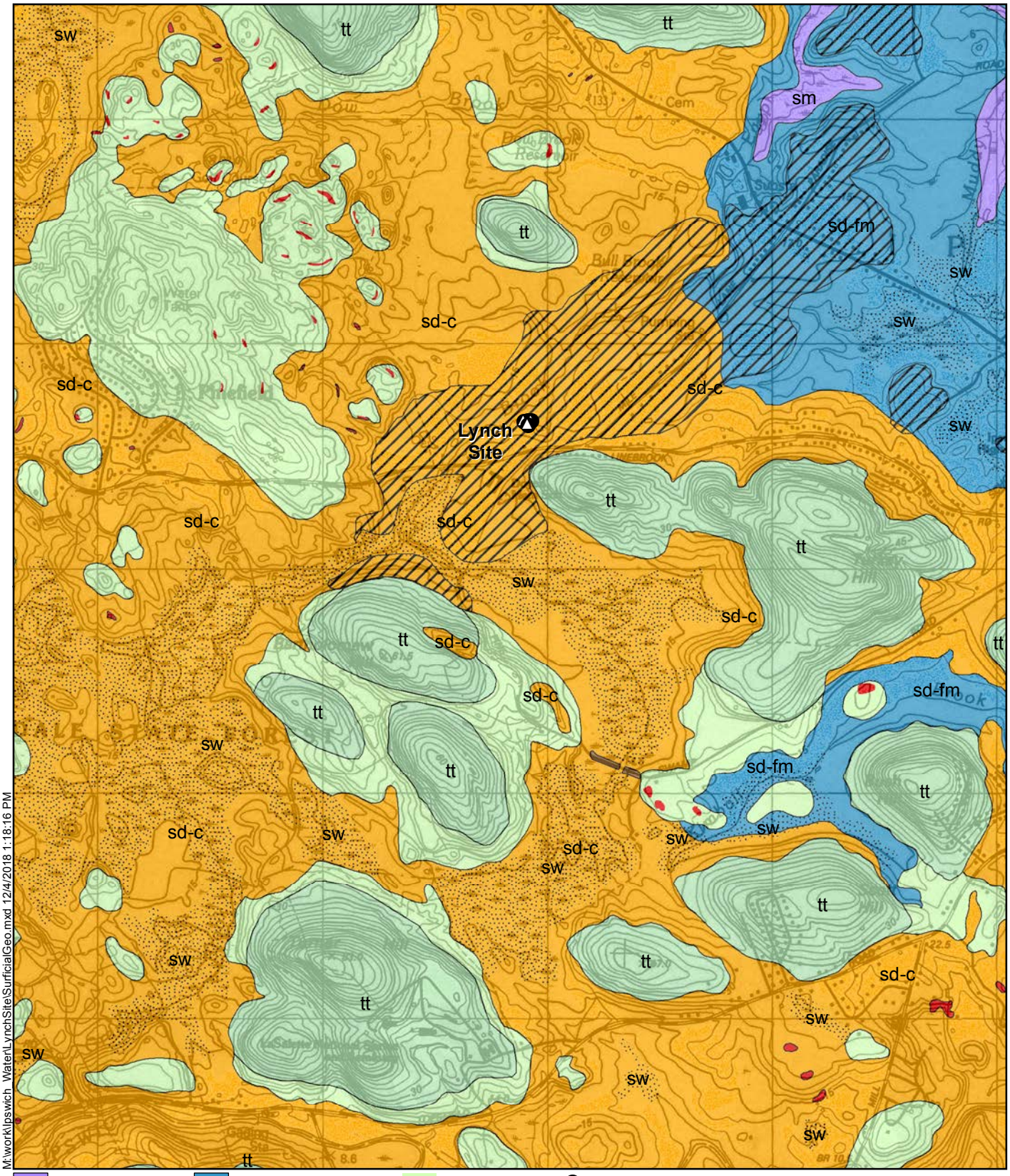
November 2018

AECOM

2.3 Surficial Geology

In contrast with the bedrock, the soils overlying the bedrock are much younger, consisting of both glacial and post-glacial deposits. The glacially derived soils include three general types: glacial till; glaciofluvial deposits; and glaciomarine deposits. Swamp deposits, which are widespread, are considered post-glacial. **Figure 2-2** depicts local surficial geologic conditions, based on US Geological Survey mapping (Stone et al. 2006). It should be noted that Figure 2-2 represents the deposits found at the surface only.

1. Glacial Till is the oldest of the glacial soils, consisting of a heterogeneous mixture of sand, gravel, clay, silt and sometimes cobbles. Mapping completed by the Massachusetts Geological Survey (Hein, et al., 2013) suggest that the till is more than 17,000 years old. Till was deposited directly on top of the bedrock, either beneath the continental ice sheet as it advanced south ("lodgement till"), or later as the glacial ice melted away and dropped its bedload ("ablation till" or "ground moraine"). Till generally does not transmit groundwater rapidly, and is not considered suitable for municipal water supply. In the test wells AECOM has drilled in Ipswich, only a thin layer of till, no more than about eight-feet thick, has been encountered. Till was not encountered in borings at the Lynch Site. AECOM's drilling has been limited to the lowlands and in pre-glacial valleys, where the till may have been partially or completely scoured from the bedrock surface by glacial meltwater streams. Thicker till is present in the hills of Ipswich, e.g., at Turner Hill, Turkey Hill, Scott Hill and Bush Hill, among other places.
2. Glaciofluvial Deposits were laid down on top of till or bedrock by streams flowing from the ice sheet as it melted away. As the streams flowed, they carried a mixture of "dirty" soils, some originating as till and some from the base of or within the ice sheet. The action of flowing water washed much of the "dirt" (clay and silt) from the soils, leaving behind mostly the coarse-grained soils, i.e., sand, gravel and cobbles. These soils commonly have interconnected pore spaces and transmit groundwater rapidly. Where these soils are widespread, they constitute aquifers that are suitable for municipal water supply. All of the Town's existing groundwater supplies are built in aquifers consisting of glaciofluvial deposits. The glaciofluvial-aquifer deposits identified at the Lynch Site are extremely coarse-grained, though thin, consisting largely of gravel and cobbles. The coarseness of the soils implies deposition by very rapidly flowing meltwater. Clay of glaciomarine origin directly overlies the cobble-gravel aquifer at the Lynch Site. Mapping by Hein et al. (2013) suggests that the glaciofluvial deposits could range from about 16,000 to 24,000 years old.
3. Glaciomarine Deposits were deposited by ocean water that flooded the land in late glacial times. These soils consist of soft, un-layered clay, normally overlain by 5 to 30 feet of



Salt Marsh Deposits
Swamp Deposits (sw)
Marine Regressive
Glaciomarine Fine (sd-fm)
Glaciofluvial Coarse (sd-c)
Thin Till
Thick Till (tt)
Bedrock Outcrop
Test Well

0 1,000 2,000 4,000 Feet

Source: MassGIS. Original data: Stone, B.D., Stone, J.R., and DiGiacomo-Cohen, M.L., 2006, *Surficial Geologic Map of the Salem-Newburyport East-Wilmington-Rockport 16 Quadrangle Area in Northeast Massachusetts: U.S. Geological Survey Open-File Report 2006-1260-B.*

Figure 2-2

Surficial Geology

Lynch Site
Ipswich, MA

November 2018

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uniform, fine-to-medium sand and silty sand. For the most part, the glaciomarine deposits were laid down directly on top of the glacial till, or on top of the glaciofluvial deposits. Clay is widespread in Ipswich and has been exploited for brick-making at several locales, including the former clay pit directly north of the Browns Well. At the Browns Well, approximately 40 feet of glaciomarine clay overlies a 15-foot thick glaciofluvial aquifer consisting of sand, gravel and cobbles. At the Lynch Site, approximately 45 to 50 feet of glaciomarine soils (25 feet of uniform sand and silty sand layers, above a 20-foot thick clay layer), overlie the glaciofluvial aquifer. The marine-regressive unit shown on Figure 2-2 may represent the approximate limit of glaciomarine deposits around the Lynch Site. Mapping by Hein et al. (2013) suggests that the glaciomarine soils were deposited over a relatively short timeframe, extending from 16,000 to 17,000 years ago.

The pumping test strongly suggests that glaciomarine clay is absent from beneath the Richards farm pond, about 600 feet north of the Lynch Site. While borings have not been done at this location, pond levels recovered more than three feet when pumping ceased. The absence of clay at this location may be natural or due to excavation, and suggests that pond water may be in direct contact with the confined aquifer that supplies the Lynch Well Site.

4. Swamp deposits, developed after the glacial era and up to the present day, are presumed to be relatively thin. They directly overlie the glaciofluvial and glaciomarine soils, and are widespread in the watershed of the Lynch Site. Cuppels (1969) describes the swamp deposits as "dark-brown to black, spongy organic material with some peat and silt….less than five feet thick at most places." This matches the description of the sediments found by AECOM in the streambed of Bull Brook.

Test- and observation-wells drilled recently on and around the Lynch Site have improved our understanding of the surficial geology. However, a more complete understanding would require additional drilling and geophysical investigations. AECOM has developed three geologic cross-sections, depicted on **Figures 2-3, 2-4 and 2-5**. Section A-A' (Figure 2-3) extends from the Doyon School northeasterly to the Lynch Site and beyond. Section B-B' (Figure 2-4) extends from the Mile Lane Well southwest to the Lynch Site. Section C-C' (Figure 2-5) extends from the Richards farm pond north of the Lynch Site to the Doyon School south of the Lynch Site. Geologic logs of borings used to construct the cross-sections are in Appendix B.

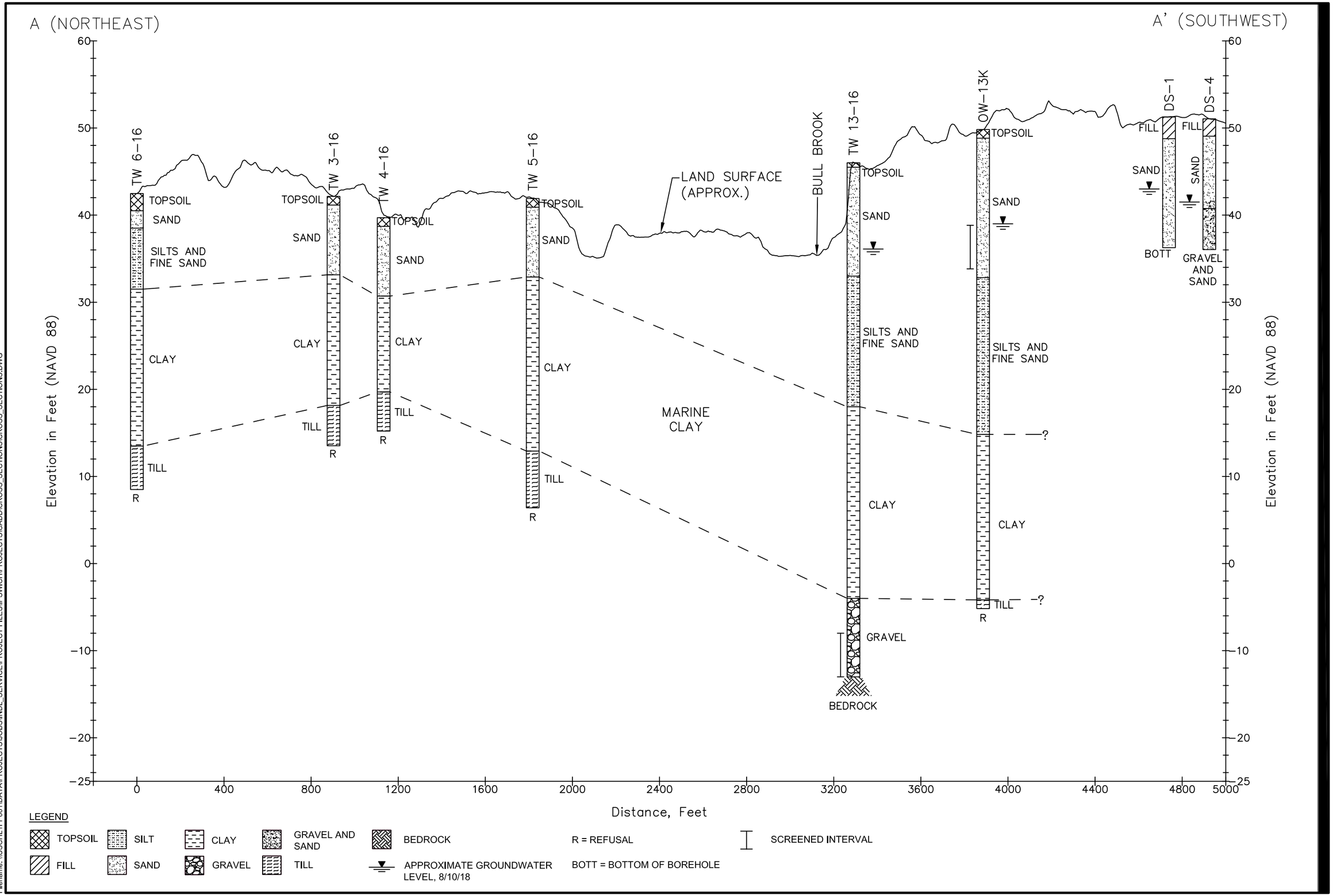

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Figure: 2-3

GEOLOGIC CROSS SECTION A-A'
LYNCH SITE
IPSWICH, MA
Project No.: 60567459 Date: 2018-12-11

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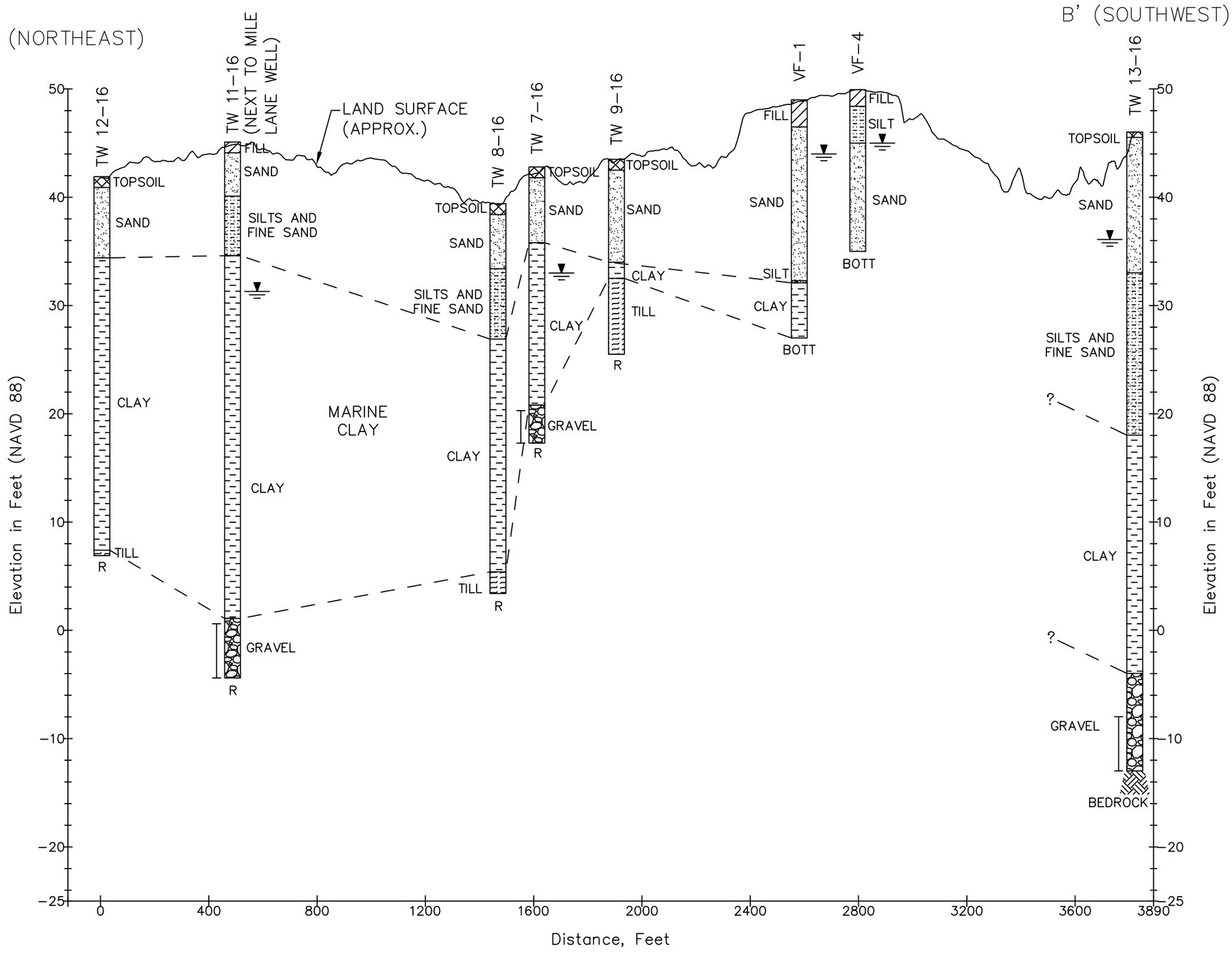

LEGEND

TOPSOIL	SILT	CLAY	GRAVEL AND SAND	BEDROCK	R = REFUSAL	SCREENED INTERVAL
FILL	SAND	GRAVEL	TILL	APPROXIMATE GROUNDWATER LEVEL, 8/10/18	BOTT = BOTTOM OF BOREHOLE	

GEOLOGIC CROSS SECTION B-B'
LYNCH SITE
IPSWICH, MA
Project No.: 60567459 Date: 2018-12-11

AECOM
Figure: 2-4

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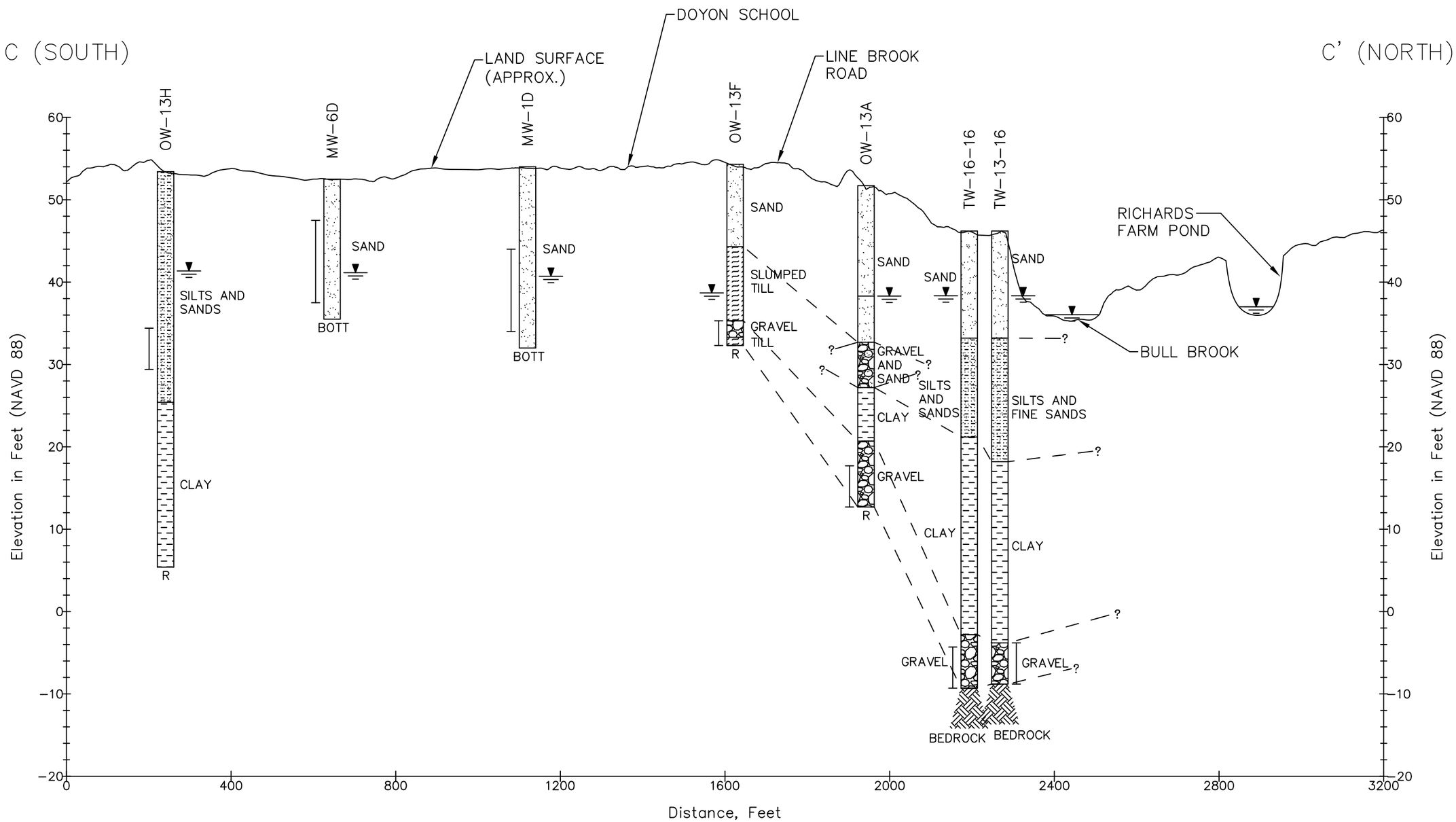

LEGEND

TOPSOIL | SILT | CLAY | GRAVEL AND SAND | BEDROCK | R = REFUSAL | SCREENED INTERVAL

FILL | SAND | GRAVEL | TILL | APPROXIMATE GROUNDWATER LEVEL, 8/10/18 | BOTT = BOTTOM OF BOREHOLE

AECOM

Figure: 2-5

GEOLOGIC CROSS SECTION C-C'
LYNCH SITE
IPSWICH, MA
Project No.: 60567459 Date: 2018-12-11

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2.4 Groundwater Flow

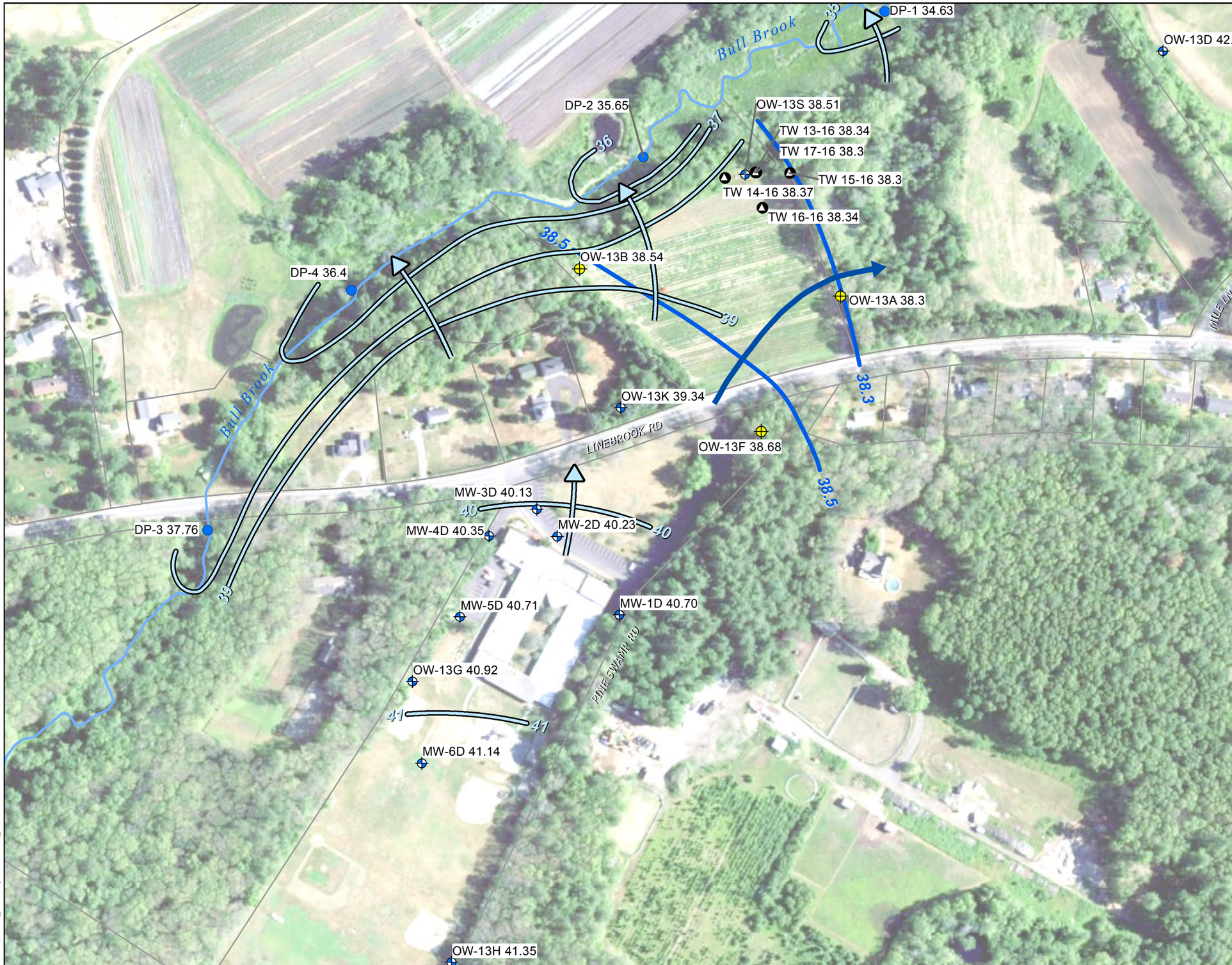
Groundwater flow patterns, both regionally and locally, are complicated by the presence of the glaciomarine clay unit, and the uneven distribution of the confined aquifer. Under static conditions of August 10, 2018, groundwater in the sandy aquifer above the clay flows from the Doyon School northeasterly towards the Lynch Site, though near Bull Brook, it flows northwesterly and discharges into the brook (**Figure 2-6**). Beneath the clay, in the confined aquifer, groundwater also flows northeasterly, more or less parallel to Bull Brook. It is unclear how groundwater in the confined-aquifer flows east of the Lynch Site. Many borings drilled east of the Lynch Site did not encounter the confined aquifer. TW 7-16, nearly 2,000 feet northeast (See Figures 1-2 and 2-4) is the nearest boring east of the Lynch Site where the confined aquifer has been found.

Under pumping conditions of August 27, 2018, 14 days after pumping began, groundwater flow in the sandy aquifer above the clay appears unchanged from the static condition (**Figure 2-7**). Confined-aquifer flow under pumping conditions is radial towards the pumping wells, as would be expected. The only evidence into groundwater flow north of Bull Brook comes from the Richards farm pond, 600 feet north of the test-pumping wells. The pond recovered more than three feet once pumping ceased, and is likely in the capture zone of the pumping wells.

2.5 Aquifer Recharge

Recharge to the confined aquifer is not fully understood due to the complex nature of the surficial deposits, specifically the extent of the buried glaciomarine clay layer. As mentioned above, the marine-regressive unit depicted on Figure 2-2 may represent the approximate outer limit of the glaciomarine clay. If that were the case, then recharge would originate largely outside the limits of the marine-regressive unit in both glaciofluvial deposits (orange-colored, “sd-c” deposits on Figure 2-2) and as groundwater and surface-water runoff from glacial till (colored green on Figure 2-2). The recharge area would extend from the Lynch Site uphill to the watershed divides.

We suspect that aquifer recharge occurs at the base of the till hills, where glaciofluvial deposits are in contact with till and the subsurface clay thins or is absent. The geologic conditions observed at OW-13F, which is positioned near the base of a till hill (see Figures 1-2 and 2-5), are perhaps representative of this type of recharge. Here, only a foot or so of clay is present, which is overlain by a silty sand-and-gravel (perhaps a “flow till”) and underlain by gravel and cobbles of the confined aquifer. The Richards farm pond appears to be situated above a window in the clay, or at the outer limit of the subsurface clay layer. In either case, water-level recovery observed at the Richards farm pond indicates that recharge to the confined aquifer occurs at the farm pond.



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Drive Point

Shallow Aquifer Observation Well (2-Inch Diameter)

Confined-Aquifer Observation Well (2-Inch Diameter)

Confined-Aquifer Test Well (8-Inch Diameter)

Groundwater Elevation Contour Confined Aquifer

Groundwater Elevation Contour Shallow Aquifer

Groundwater Flow Direction (Confined Aquifer)

Groundwater Flow Direction (Shallow Aquifer)

Base map data provided by MassGIS and USDA.
Date of photo: 2016

November 2018

Figure 2-6

Groundwater Elevation Contours

Static Conditions (8/10/2018)

Lynch Site
Ipswich, MA

0 100 200 400 Feet

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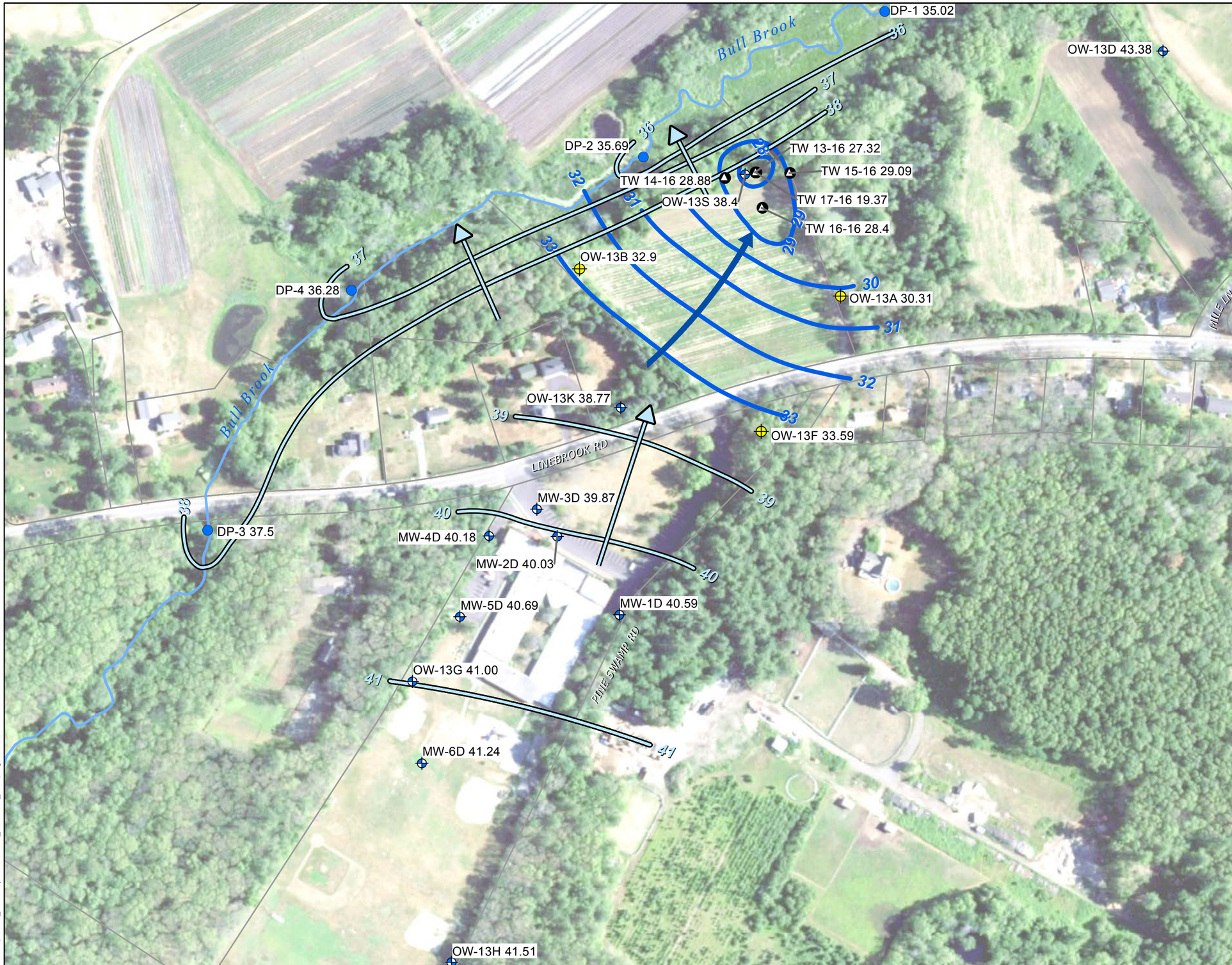

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- Drive Point
- Shallow Aquifer Observation Well (2-Inch Diameter)
- Confined-Aquifer Observation Well (2-Inch Diameter)
- Confined-Aquifer Test Well (8-Inch Diameter)
- Groundwater Elevation Contour Confined Aquifer
- Groundwater Elevation Contour Shallow Aquifer
- Groundwater Flow Direction (Confined Aquifer)
- Groundwater Flow Direction (Shallow Aquifer)

Base map data provided by MassGIS and USDA.
Date of photo: 2016

November 2018

Figure 2-7

Groundwater Elevation Contours

Stabilized Pumping Conditions (8/27/2018)

Lynch Site
Ipswich, MA

0 100 200 400 Feet

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Drawdown analysis (presented below) confirms hydraulically that the aquifer becomes unconfined beyond the Lynch Site. At no time during the 15-day pumping test, however, did the seepage meters at DP-2 and DP-3 indicate induced infiltration of Bull Brook. Pumping slightly influenced groundwater levels at both DP-1 and DP-3 (see Figure 1-2), indicating a remote hydraulic connection between the Lynch Site and the brook. This suggests that a minor volume of groundwater, which would otherwise discharge to Bull Brook, was diverted from the brook due to pumping. (See additional discussion below in Section 2.7.)

In her study of the Assabet River basin, DeSimone (2004) discusses rainfall-recharge estimates for glacial aquifers of southern New England. These recharge estimates, ranging from 17.5 to 25.5 inches per year, were developed by a number of USGS authors over the years. We have selected 20 inches-per-year of rainfall recharge for Ipswich. Olimpio and de Lima (1984), in their study of the Mattapoisett River valley, estimate that groundwater runoff from till provides an additional 6.9 inches of recharge (equivalent to 0.34-mgd per-square-mile) to the aquifer. We have assumed that this till recharge-rate applies to Ipswich. Septic-system return flows contribute a relatively small percentage of aquifer recharge, since this part of Town is un-sewered.

2.6 Aquifer Characteristics

Aquifer transmissivity (T), hydraulic conductivity (K) and storage coefficient (S) were computed by conventional aquifer-analysis methods using water-level drawdown data collected manually and electronically during the 48-hour pumping test of 8-inch diameter test well, TW 15-16. Drawdown data from the 48-hour constant-rate pumping test (August 13 to 15, 2018) were analyzed using the Theis (1935) drawdown method and the distance-drawdown method (Sterrett, 2007). All data, except for distance-drawdown data, was analyzed with the aid of software titled AQTESOLV. The distance-drawdown data was evaluated manually. Aquifer analysis results are tabulated on **Table 2-1**.

Using the Theis method, transmissivity was found to range from 3,700 to 6,300 ft^2/day, or 27,700 to 47,100 gpd/ft. If we assume a uniform aquifer thickness of 5 feet, the hydraulic conductivity is computed to range from 740 to 1,260 ft/day, or 5,500 to 9,400 gpd/ft^2. These values are within the range expected for soils that consist largely of unconsolidated gravel (Freeze and Cherry, 1979). The computed storage coefficients range from 0.00003 to 0.0008, and represent the confined-aquifer response, which occurs in the earliest stages of pumping. Lowman (1979) reports that storage coefficient for confined aquifers can be estimated by multiplying the aquifer thickness by 10^{-6}. The computed storage coefficients are, therefore, 10 to 100 times higher than the theoretical range predicted by Lowman, but still indicative of a confined-aquifer response.

TABLE 2-1
COMPUTED AQUIFER CHARACTERISTICS
48-HOUR CONSTANT-RATE PUMPING TEST
TW 15-16, LYNCH SITE
AUGUST 13 – 15, 2018

Method	Units	TW15-16	TW16-16	TW14-16	OW-13A	OW-13B	Distance-Drawdown
Well Diam.		2-inch	2-inch	2-inch	2-inch	2-inch	
Theis Drawdown,	T, ft^2/day	4,330	4,330	4,940	3,700	6,300	
Early Data	T, gpd/ft	32,400	32,400	36,950	27,700	47,100	
	b, feet	5	5	5	5	5	
	K, ft/day	870	870	990	740	1,260	
	K, gpd/ft^2	6,500	6,500	7,400	5,500	9,400	
	S	0.0008	0.00015	0.0001	0.00003	0.00004	
	r, feet	15	82	123	280	462	
Distance Drawdown,	T, ft^2/day						5,470
48-hours	T, gpd/ft						40,900
	K, ft/day						1,090
	b, feet						5
	S						0.0013

T = Transmissivity, K = Hydraulic Conductivity, b = aquifer thickness, S = storage coefficient, r = distance from pumping well

In using the Theis method, we employed only the early time-drawdown data for curve-matching. In each case, the curves of observed drawdown (Appendix C) diverge from the Theis-type curve after about 1,000 seconds (15 minutes) of pumping, and the rate of drawdown begins to decline. This observation suggests a source of recharge beyond the limits of the confined-aquifer, probably in areas where the aquifer is unconfined. Because of the limited subsurface geologic information, we can only speculate where those conditions might exist. As mentioned above, the marine-regressive unit depicted on Figure 2-2 may represent the approximate outer limit of the buried clay. If this were the case, unconfined aquifer conditions would exist outside the limit.

Using distance-drawdown data obtained from the end of the 48-hour pumping test at TW 15-16, we computed a transmissivity value of 5,470 ft^2/d, or 40,900 gpd/ft. If we assume a uniform aquifer thickness of 5 feet, the hydraulic conductivity is computed to be 1,090 ft/day. The storage coefficient was computed to be 0.0013, a value which is lower than that of a water-table aquifer, but higher than a confined aquifer of five feet in thickness. Perhaps this value reflects a blend of confined and water-table aquifer conditions. The transmissivity and hydraulic conductivity values are in the range expected for an unconsolidated aquifer consisting of gravel, and are consistent with results from the time-drawdown analysis. The distance-drawdown curve is presented in Appendix C.

2.7 Impact of Pumping on Bull Brook

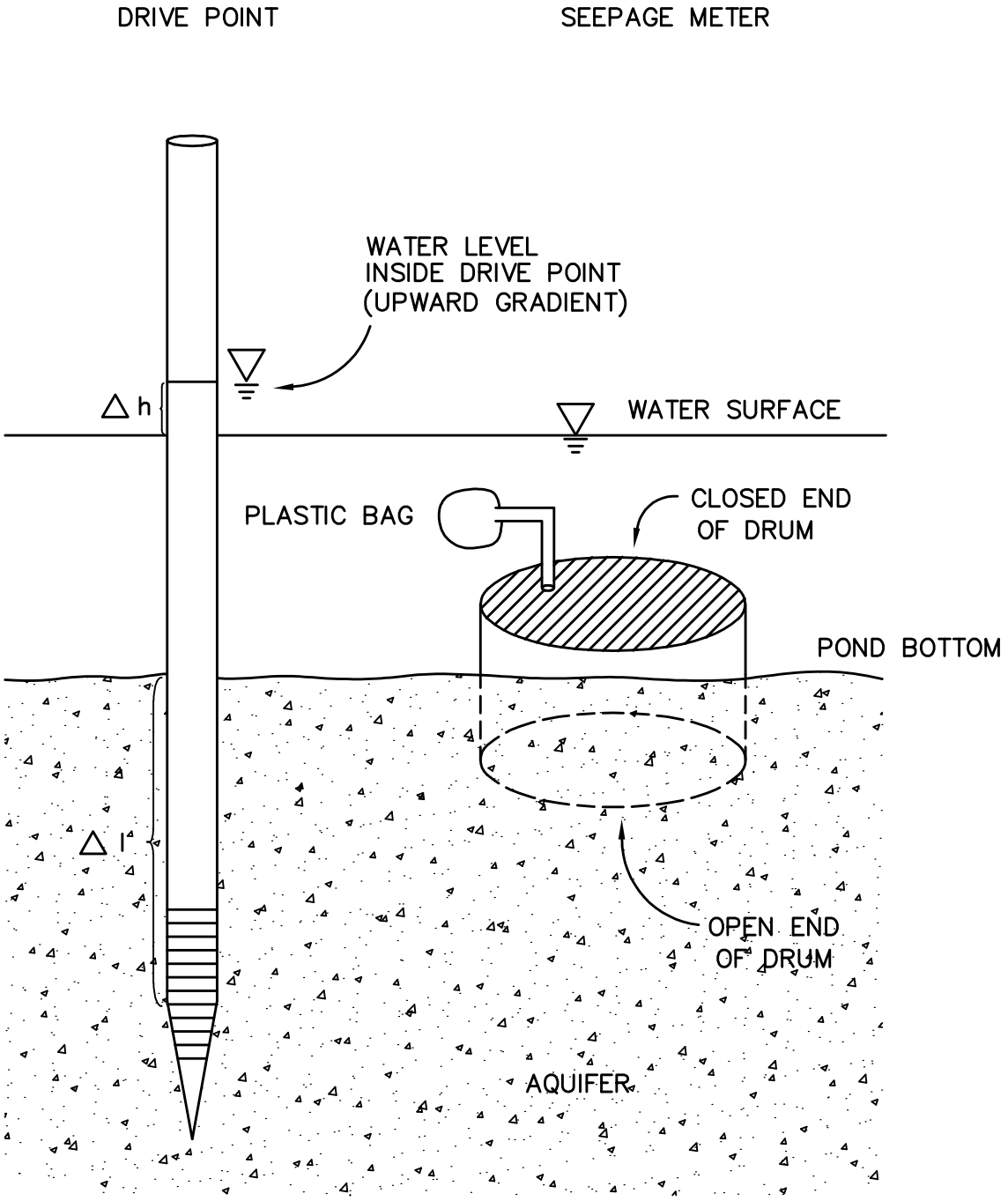
AECOM installed four shallow hand-driven well points (DP-1, DP-2, DP-3, and DP-4) in Bull Brook to observe the relationship between groundwater and the brook under pumping and non-pumping conditions. More specifically, we were interested in observing whether pumping induces infiltration from the brook; whether pumping diverts groundwater from the brook; or whether no hydraulic connection exists at all. Figure 1-2 shows the locations of these drive points. Each of these points was placed near the riverbank in about one to two feet of standing water. Drive point characteristics are summarized in **Table 2-2.**

Each drive point consists of a 1.25-inch diameter by 1-foot-long, stainless-steel well screen threaded and coupled to 8 to 10 feet of 1.25-inch diameter galvanized steel drive pipe. The drive points were driven to a total depth of four to seven feet below the streambed. In general, the streambed soils were found to consist of one to two feet of soft, black, organic soil-muck underlain by black and/or gray silty sand. A seepage meter was installed adjacent to DP-3 and DP-2. Each seepage meter/drive point pair was used to evaluate the degree of hydraulic communication between the stream and aquifer, to evaluate the direction of this communication (either induced infiltration or groundwater discharge), to compute the vertical hydraulic conductivity of the stream bottom, and to compute the rate of seepage. A diagram of a typical drive point/seepage meter installation is shown on **Figure 2-8.**

TABLE 2-2
DRIVE-POINT CHARACTERISTICS
LYNCH SITE

Drive Point ID	Well Screen Depth, ft, Below Streambed	Stick-up, ft, Above Streambed	Soils Encountered in Streambed
DP-1	6 - 7	4	2-ft black organic muck, 1-ft black silty sand, gray silty sand below
DP-2	5 - 6	4	2-ft black organic muck, gray silty sand below
DP-3	3 - 4	5	2-ft black organic muck, gray silty sand below
DP-4	3.5 – 4.5	4.5	1-ft black organic muck, gray silty sand below

Figure 2-9 graphically depicts the response of groundwater and surface-water levels in Bull Brook to the influences of rainfall and pumping at the Lynch Site. The uppermost graph is a record of the pumping schedule:

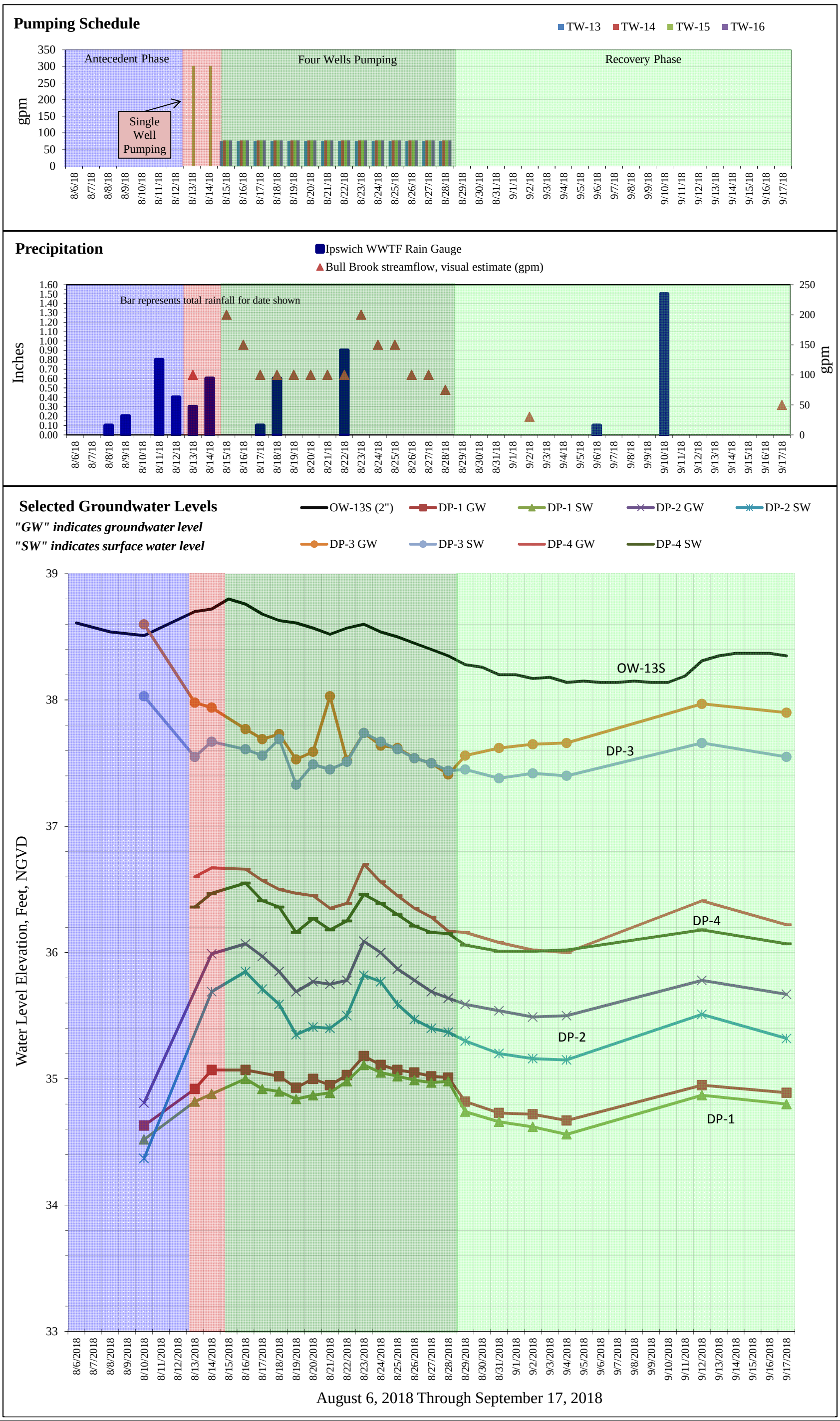


W-SM-1

FIGURE 2-8

TYPICAL SEEPAGE METER AND DRIVE POINT
NOT TO SCALE

AECOM



AECOM

FIGURE 2-9
Graphical Summary of Pumping Test - Impacts to Bull Brook
Lynch Site
Ipswich, Massachusetts

- Between August 13 and 15, TW 15-16 was pumped continuously for 48-hours at a rate of 300 gpm;
- Between August 15 and 28, the four wells were pumped continuously at a combined rate of 300 gpm (75 gpm each).

The middle graph is a record of precipitation and the visually-estimated streamflow in Bull Brook observed near the culvert at Linebrook Road.

The lower graph represents water-level fluctuations at:

- OW-13S, a well installed in the sandy soils above the clay layer at the Lynch Site, considered to represent ambient conditions.
- All four drive points. Water-levels labeled "GW", such as "DP-1 GW", represent the groundwater levels measured inside each drive point; those labeled "SW", such as "DP-1 SW", represent surface-water levels in Bull Brook, measured on the outside of the drive point.

Over the period of observation, the actual rise and fall of groundwater and surface-water levels at the drive points were dictated largely by the timing of rainfall events. We note, for comparison, that groundwater fluctuations in OW-13S, the ambient well, were in rough harmony with groundwater and brook levels at the drive points.

At **DP-1**, approximately 400-feet northeast of 8-inch TW 15-16, groundwater elevations were found to be slightly higher (0.11-foot) than Bull Brook before pumping began, indicating discharge of groundwater into Bull Brook (Figure 2-9). By the mid-point to end of the pumping period, groundwater and surface-water levels had converged, indicating that the rate of groundwater discharge to the brook declined due to pumping. At the nadir, on August 26, after 13 days of pumping, the groundwater levels remained 0.02-foot above the brook level. At no time, did we observe groundwater levels that dropped below the brook, suggesting that induced infiltration of brook water did not occur at DP-1. It is possible that pumping influences observed at DP-1 are related to its proximity to the Richards farm pond, where the clay layer appears to be absent. The farm pond is 250 feet from DP-1. After pumping ceased, the groundwater and surface-water elevations in DP-1 diverged, indicating a resumption of the pre-pumped rate of groundwater-discharge to the brook.

At **DP-2**, which is approximately 290 feet north of 8-inch TW 15-16, groundwater elevations were found to be 0.14- to 0.38-foot higher than Bull Brook throughout the period of observation (Figure 2-9). This indicates continuous discharge of groundwater into Bull Brook at DP-2. By the end of pumping, we observed a slight convergence of groundwater and surface-water levels, indicating a slight decline in the rate of groundwater discharge to the brook. Seepage meter, **SM-2**, adjacent to DP-2, indicated discharge of groundwater into the brook as high as 4.44

milliliter per minute (ml/min) (see **Figure 2-10** and **Table 2-3**). On other occasions during and after the pumping period, SM-2 recorded no discharge of groundwater. The rate of discharge to the brook appears to coincide, more or less, with rainfall. Soon after rain events, groundwater discharge occurs; when it does not rain for a few days, groundwater discharge declines or ceases.

The rise in surface-water and groundwater levels recorded between August 10 and 14 (one-day after pumping began) was due to the breaching of beaver dams in the week before the pumping test. For this reason, we exclude from consideration the August 10 measurements of both SM-2 and DP-2.

At **DP-3**, nearly 1,400 southwest of 8-inch TW 15-16 and directly upstream of Linebrook Road, groundwater and surface-water levels converged over the first ten days of pumping (Figure 2-9). This observation indicates a decline in the rate of groundwater-discharge to the brook due to pumping. Between August 23 and August 28, 10 to 15 days into the pumping period, groundwater levels were found to range from 0.00- to 0.06-foot below the brook level. This observation suggests the possibility of localized, periodic, induced infiltration of brook water into the aquifer during pumping. Based on these observations, the glaciomarine clay layer separating the confined from the unconfined aquifers appears to be absent near DP-3, though it is not known where this occurs. At no time during pumping, did the nearby seepage meter, SM-3, indicate induced infiltration of brook water (Figure 2-10 and Table 2-3), which conflicts with observations at DP-3. After pumping ceased, the groundwater and surface-water elevations diverged, indicating a return to the pre-pumped condition of groundwater-discharge to the brook. The abrupt decline in surface-water and groundwater levels recorded one-day after pumping began was due to the breaching of beaver dams downstream of DP-3 in the week before the pumping test.

Seepage meter, **SM-3**, adjacent to DP-3, indicated a variable rate of groundwater-discharge into the brook. During pumping, discharge ranged from 0.00 to 4.00 ml/min; after pumping ceased, discharge ranged from 0.00 to 4.67 ml/min (see Figure 2-10 and Table 2-3).

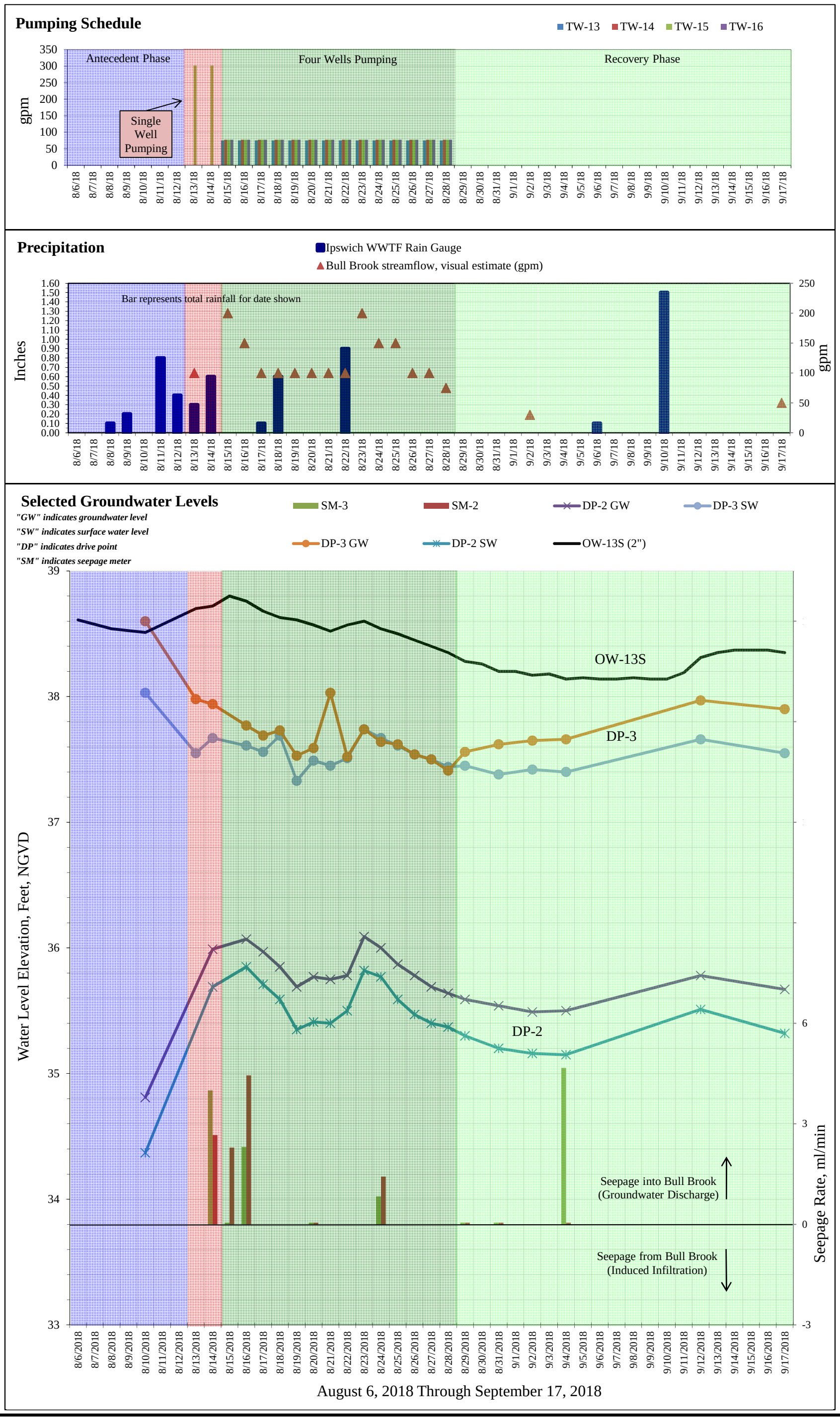


FIGURE 2-10
Graphical Summary of Pumping Test - Seepage To/From Bull Brook
Lynch Site
Ipswich, Massachusetts

AECOM

TABLE 2-3
SEEPAGE METER COMPUTATIONS

Location	[1]Well Depth, dl	Time of Installation	Time of Final Measurement	Elapsed Time	Initial Volume	Final Volume	Depth to Groundwater Inside Drive Point	Depth to Brook Surface	Change in Hydraulic Head, dh	Seepage Rate, Q		dh/dl	K
	(ft)			(min)	(ml)	(ml)	(ft)	(ft)	(ft)	(ml/min)	(ft^3/day)	(ft/ft)	(ft/day)
DP-2	3	8/10/2018 10:45	8/10/2018 12:15	90	500	500	1.78	2.35	0.57	0.00	0.0000	0.10	0.00
DP-3	3	8/10/2018 11:15	8/10/2018 12:25	70	500	300	2.62	3.06	0.44	2.86	0.1453	0.13	0.42
PUMP STARTED[2], (8/13/16 11:00)													
DP-2	3	8/14/2018 8:00	8/14/2018 10:30	150	500	900	1.44	1.74	0.30	2.67	0.1356	0.05	0.90
DP-3	3	8/14/2018 8:15	8/14/2018 10:45	150	500	1100	2.44	2.71	0.27	4.00	0.2034	0.08	0.96
PUMP STARTED[3], (8/15/18 11:00)													
DP-2	3	8/15/2018 8:30	8/15/2018 10:30	120	500	775	1.27	1.53	0.26	2.29	0.1165	0.05	0.90
DP-3	3	8/15/2018 8:00	8/15/2018 10:00	120	500	500	2.51	2.69	0.18	0.00	0.0000	0.05	0.00
DP-2	3	8/16/2018 8:15	8/16/2018 10:30	135	500	1100	1.36	1.58	0.22	4.44	0.2260	0.04	2.05
DP-3	3	8/16/2018 8:30	8/16/2018 10:40	130	500	800	2.61	2.77	NA	2.31	0.1174	0.05	0.93
DP-2	3	8/20/2018 7:30	8/20/2018 9:30	120	500	500	1.66	2.02	0.36	0.00	0.0000	0.07	0.00
DP-3	3	8/20/2018 7:45	8/20/2018 9:45	120	500	500	2.79	2.89	0.10	0.00	0.0000	0.03	0.00
DP-2	3	8/24/2018 7:30	8/24/2018 14:30	420	500	1100	1.43	1.66	0.23	1.43	0.0726	0.04	0.63
DP-3	3	8/24/2018 7:45	8/24/2018 14:45	420	500	850	2.74	2.71	0.03	0.83	0.0424	0.01	1.80
BEGIN RECOVERY, (8/28/18 11:00)													
DP-2	3	8/29/2018 6:30	8/29/2018 8:00	90	500	500	1.84	2.13	0.29	0.00	0.0000	0.05	0.00
DP-3	3	8/29/2018 6:40	8/29/2018 8:10	90	500	500	2.82	2.93	0.11	0.00	0.0000	0.03	0.00
DP-2	3	8/31/2018 7:15	8/31/2018 9:00	105	500	500	1.89	2.23	0.34	0.00	0.0000	0.06	0.00
DP-3	3	8/31/2018 7:30	8/31/2018 9:10	100	500	500	2.76	3.00	0.24	0.00	0.0000	0.07	0.00
DP-2	3	9/7/2018 7:15	9/7/2018 9:45	150	500	500	1.93	2.31	0.38	0.00	0.0000	0.07	0.00
DP-3	3	9/7/2018 7:30	9/7/2018 10:00	150	500	1200	2.69	2.99	0.30	4.67	0.2373	0.09	1.01

Notes:

1. Depth to center of the screen from stream bottom
2. 48 hour test of TW-15
3. 6-day test of four wells (TW-13, TW-14, TW-15, TW-16)

At **DP-4**, 900 feet west of 8-inch TW 15-16, groundwater elevations were found to be higher than Bull Brook throughout the period of pumping, indicating continuous discharge of groundwater into Bull Brook (Figure 2-9). By the end of pumping, we observed a slight convergence of groundwater and surface-water levels, suggesting a decline in the rate of groundwater discharge to the brook by the end of pumping. However, a similar convergence was observed seven days after pumping ceased. Therefore, the DP-4 measurements cannot be considered reliable with respect to pumping influences on the brook due to pumping.

2.8 Potential August Diversion of Streamflow Due To Pumping

Using the seepage meter data, we can make a gross, conservative estimate of the maximum volume of groundwater that might have been diverted from the brook due to pumping in August 2018. Note that "diverted groundwater" is not the same as "induced infiltration", which is water that passes from the brook into the aquifer due to pumping. "Diverted groundwater" is water that would otherwise have discharged to the brook, if not for pumping.

Simplifying Conservative Assumptions:

1. The highest rate of recorded groundwater discharge ("seepage") into the brook was 4.67 ml/min, observed at SM-3 (see Table 2-3); the lowest seepage rate was 0.00 ml/min, recorded multiple times at both SM-2 and SM-3. The difference between these figures, 4.67 ml/min, represents the maximum rate of diverted groundwater that could have occurred.
2. The 4.67 ml/min seepage rate converts to 0.24 ft^3/day, (R_{gd});
3. We assume that induced infiltration, as defined above, did not occur.
4. Seepage was measured through the open end of the seepage meter, which is 2.75 ft^2 in area (A_{sm});
5. Seepage occurs uniformly over a length (L_{bb}) of 2,000 feet of Bull Brook, which is 20 feet wide (W_{bb}) on average.

Potential Maximum Groundwater Diversion (GD):

$$GD = (R_{gd}/A_{sm}) \times L_{bb} \times W_{bb}$$

$$GD = (0.24\ ft^3/day)/(2.75\ ft^2) \times 2{,}000\ ft \times 20\ ft$$

$$GD = 3{,}490\ ft^3/day$$

$$GD = 18\ gpm$$

Note that we have assumed conservatively high figures for each variable. Many of the measured seepage rates were much lower than 4.67 ml/min. The drive points indicate that the pumping influence does not extend uniformly along the brook, and perhaps not over a distance of 2,000 feet. Therefore, it is likely that groundwater diversion would be less than 18 gpm.

Furthermore, the estimated diversion of 18 gpm occurred during a wet summer. The Town reports that, when the summer is dry, Bull Brook is often without flow in August, which implies a potential diversion of 0 gpm in August. The Town's observations are supported by Figure 2-10, which illustrates that August streamflow appears to be largely dependent on rainfall. The rain event on August 22, 2018 boosted streamflow to about 200 gpm, but by September 2, eleven days later and without rain, streamflow had declined to about 30 gpm.

Based on the seepage meter/drive point data, the vertical hydraulic conductivity of the streambed sediments in Bull Brook is estimated to range from about 0.5 to 2 ft/day. These values, reported in the right-hand column of Table 2-3, are consistent with those reported by the US Geological Survey (de Lima, 1991) for other Massachusetts streams. This means that the streambed sediments are roughly 1,000-times less conductive than the confined aquifer at the Lynch Site. The low conductivity of the streambed, by itself, severely limits hydraulic communication. And, if the subsurface clay layer extends beneath much of Bull Brook, as we suspect, the pathways for communication between the brook and the pumping wells at the Lynch Site are indirect.

In conclusion, evidence from the August 2018 pumping test indicates a weak and indirect hydraulic link between Bull Brook and the Lynch wells under pumping conditions. AECOM estimates that a diversion of 0 to 18 gpm of streamflow might occur in August, depending on rainfall conditions and daily well-field pumping cycles. A diversion of 18 gpm is equivalent to 26,000 gallons on a 24-hour basis, and less than 10% of the August median streamflow of 216 gpm, estimated through the US Geological Survey Streamstats computer application (see Appendix D). Bull Brook is often without flow in August, which implies a potential diversion of 0 gpm when the weather is dry. The discussion of streamflow diversion due to pumping should be put into its proper perspective. In most cases, any volume of water that is diverted to the wells in dry times is water that would otherwise flow 2,000 feet downstream to recharge Bull Brook Reservoir.

SECTION 3 - SITE CHARACTERIZATION

3.1 Zone I

The applicable Zone-I radius for each of the four proposed wells, TW 13-16, TW 14-16, TW 15-16 and TW 16-16, is 250 feet because the wells collectively represent a well field, as defined by DEP. The Town of Ipswich owns approximately 5.87 acres of the 6.49 acres, or about 90% of the land required for Zone I. Zone I consists primarily of the open agricultural field, with lesser amounts of wetland and minor woodlands. The portion of Zone I not owned by the Town is largely wetland. The Site Plan, Figure 1-2, shows Zone I.

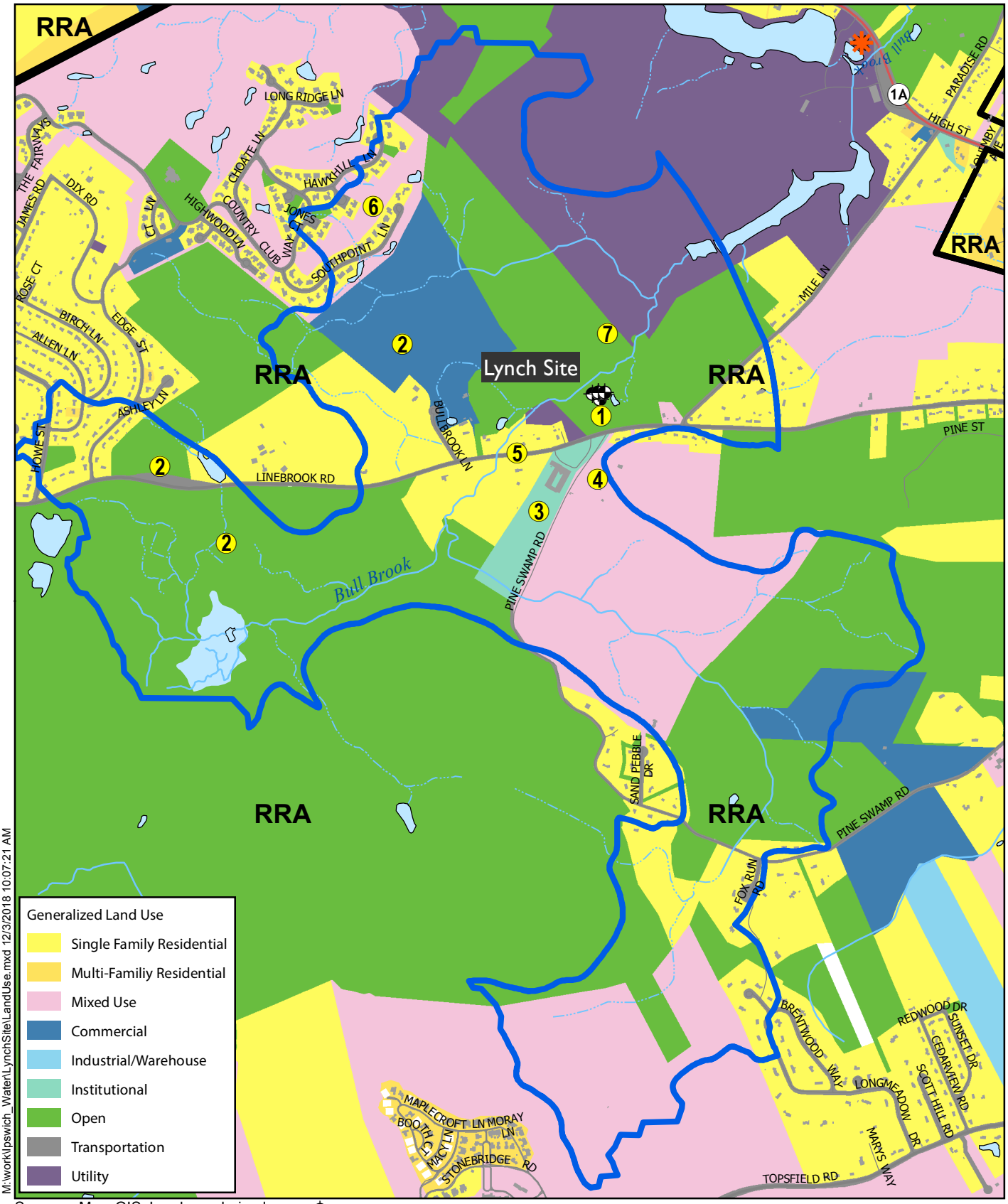
3.2 Land Use, Zoning, Potential Contamination Sources, Ecological Features

Land use, zoning, potential contamination sources, ecological features and water withdrawals within the proposed Zone II were determined from MassGIS databases, the Ipswich Water Department, AECOM's knowledge of the area and Google Maps. Land use (see **Figure 3-1**) consists of open space (largely wooded, but also including Town recreation fields), utility (undeveloped, wooded land controlled by the Town for water-supply protection), mixed use (largely undeveloped and wooded, with lesser amounts of commercial and agricultural uses), residential, commercial (in agricultural use) and institutional (school). The Lynch Site itself is currently used for agriculture. All land within the proposed Zone II is zoned residential (RRA). Potential contamination source (PCS) locations are shown on Figure 3-1, and PCS characteristics are summarized on **Table 3-1**. Wetlands associated with Bull Brook and its tributaries are common in Zone II (see **Figure 3-2**). Five Certified Vernal Pools have been identified in Zone II. Massachusetts Natural Heritage and Endangered Species Program (NHESP) Habitats for Rare Species and Rare Wildlife are present in the western-most part of Zone II.

TABLE 3-1
POTENTIAL CONTAMINATION SOURCES
ZONE II OF LYNCH SITE, IPSWICH, MA

Site Number[1]	Location	Description	DEP Risk Category[2]
1	Lynch Site	Agricultural	M-H
2	Richards Realty Trust	Agricultural	M-H
3	Doyon School	Septic system discharge	M
4	204 Linebrook Road	Mixed commercial/agricultural	M
5	Linebrook Road	Transportation Corridor	M
6	Southpoint Lane	Ipswich Country Club - Golf Course	M
7	Richards Realty Trust	Farm pond	H

Notes:
1 Locations shown on Figure 3-1
2 High (H), Medium (M), or Low (L) threat to groundwater based on DEP Source Water Assessment Program, Land Use Pollution Potential Matrix, January 1999



Sources: MassGIS. Land use derived from statewide Level 3 parcel data.

Proposed Wells - Lynch Site

MassDEP Site With Activity and Use Limtations

MassDEP Underground Storage Tanks

Mass DEP Large Quantity Generator/User

Zoning District RRA (Rural Residence A)

Zone II Boundary

Potential Contamination Source (See Table 3-1)

0 750 1,500 3,000 Feet

Figure 3-1

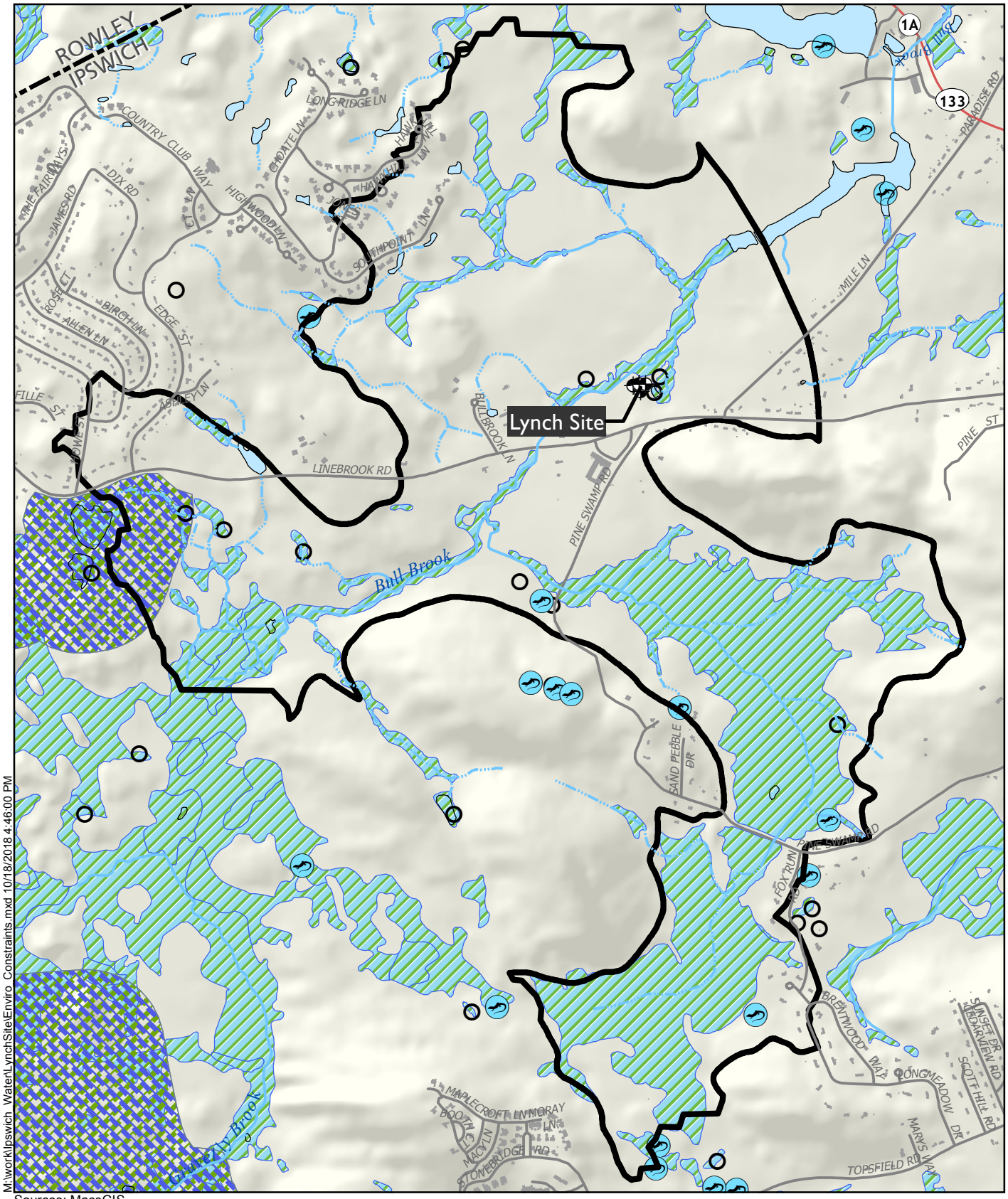
Land Use and Potential Contamination Sources in Zone II

Lynch Site

Ipswich, MA

November 2018

AECOM



M:\work\Ipswich_Water\LynchSite\Enviro_Constraints.mxd 10/18/2018 4:46:00 PM

Sources: MassGIS.

Proposed Wells - Lynch Site

Zone II Boundary

NHESP Certified Vernal Pools

NHESP Potential Vernal Pools: NOT equivalent to Certified Vernal Pools

NHESP Estimated Habitats for Rare Wildlife

NHESP Priority Habitats for Rare Species

DEP Wetland

0 750 1,500 3,000 Feet

Figure 3-2

Wetlands and Habitat In Zone II

Lynch Site
Ipswich, MA

November 2018

AECOM

3.3 Other Water Withdrawals

The nearest, existing public water-supply withdrawals are Ipswich's Mile Lane Well and the Bull Brook/Dow Brook reservoir system, as shown on Figure 1-1. Other withdrawals are made for local agricultural purposes. One of these is the Richards farm pond about 600 feet north of the proposed Lynch Well Site (location shown on Figures 1-2 and 3-1). As stated earlier in this report, the recovery-phase of the pumping test strongly indicates that the pond is hydraulically connected to the confined aquifer at the Lynch Well Site. About three feet of water-level recovery was observed in the pond between August 28, 2018, the date the pumping test ended, and September 12. The Richards farm pond represents the most likely source of bacteria found in well water at the end of the pumping test at the Lynch Site.

Local farmers withdraw water from the Bull Brook watershed for irrigation purposes via:

- The Richards farm pond,
- Direct withdrawals from Bull Brook through river intakes,
- Direct diversion of water from the brook to a farm pond,
- Withdrawals from smaller farm ponds or beaver impoundments.

The volume of agricultural withdrawals depends on rainfall, and therefore varies from year to year. Based on a report completed recently for DEP, agricultural withdrawals in both the Parker and Ipswich River Basins of Ipswich, amount to about 34,000 gallons per day (gpd) in a wet year, 64,000 gpd in an average year and 93,000 gpd during a dry year. The threshold for registration or permitting under WMA is 100,000 gpd over a 90-day period. About 110 acres of farmland is present in the Bull Brook watershed.

SECTION 4 – PUMPING TEST OPERATIONS

4.1 Introduction

This section describes in detail the design and operation of the 15-day pumping test conducted to evaluate the suitability of the Lynch Site as a new source of water supply. A 48-hour pumping test was conducted at 8-inch diameter TW 15-16 between August 13 and 15, 2018. The primary goal of the 48-hour test was to obtain drawdown data sufficient to evaluate aquifer hydraulic characteristics. This test was followed by an additional 13 days of pumping of all four 8-inch diameter test wells, TW 13-16, TW 14-16, TW 15-16 and TW 16-16. The goals of the extended pumping test were primarily to evaluate well yield, water quality and environmental impacts due to pumping. Of equal interest was evaluating how the groundwater system functions under pumping and non-pumping conditions. The pumping rate was held constant at about 300 gpm for the entire 15 days of pumping. The reader should refer to Figure 1-2 for well locations discussed below.

4.2 8-inch Diameter Test Wells

Four 8-inch diameter test wells were installed for pumping test purposes in July 2018. The 8-inch diameter test wells were installed in the confined aquifer to depths ranging from 53 to 56 feet. Each well was installed using dual-rotary drilling equipment by rotating 8-inch diameter steel well casing into the ground and excavating the soils with compressed air. The soils generally consist of sands and silty sands from ground surface to a depth of about 25 feet; gray clay from about 25 to 50 feet; gravel and cobbles with lesser amounts of sand below the clay, ranging from four to six feet thick. Refusal on bedrock was encountered directly beneath the confined gravel-and-cobble aquifer.

A section of 250-slot (.250-inch) 8-inch diameter telescoping, stainless-steel, wire-wrapped well screen, ranging from 3- to 5-feet long, was installed at the bottom of each test well. The casing was then retracted to expose the screen to the formation, and to allow the formation to collapse around the well screen. Each well was then developed by pumping and surging until the water was free of sand and color. At TW 14-16, TW 15-16 and TW 16-16, a combined total of less than five gallons of sand was removed during development. Over 50 gallons of sand was removed at TW 13-16 during development. Each 8-inch diameter test well was chlorinated for disinfection purposes upon installation of the test pumps in advance of the pumping tests.

Well construction details are summarized in **Table 4-1.** Well construction logs of the 8-inch diameter pumping wells are provided in Appendix B.

TABLE 4-1
8-INCH DIAMETER WELL CONSTRUCTION AND WATER-LEVEL SUMMARY

Well ID	Distance (ft) from TW 15	Elevation Top Casing (ft, NAVD 88)	Depth Screened Interval (ft bgs)	Slot-Size, Stainless Steel Screen, inch	Pumping Rate, gpm, Well Development	Specific Capacity, gpm/ft, Well Development	SWL Depth August 13, 2018 (ft, bgs)	Drawdown (ft) August 28, 2018
TW 13	53	48.13	52 - 56	.250	130	9	9.43	20.01
TW 14	104	47.80	51.5 - 54.5	.250	223	21	9.04	10.56
TW 15	0	47.97	50 - 53	.250	243	31	9.38	10.05
TW 16	73	47.67	51 - 56	.250	230	21	8.98	10.75

Abbreviations: ft = feet; bgs = below ground surface; gpm = gallons per minute; SWL = static water level.

4.3 Observation Wells

Water levels were measured at frequent and regular intervals before, during, and after the pumping test in the four 8-inch diameter pumping wells, four hand-driven well points and 38 conventional observation/test wells, mostly of 2-inch diameter. These 38 wells include the following:

- Five test wells (TW 13-16, TW 14-16, TW 15-16, TW 16-16 and TW 17-16) installed in 2016 as part of the initial groundwater exploration at the Lynch Site;
- Two test wells installed in 2016 in an effort to find additional water supply (TW 7-16) and a replacement well location for the Mile Lane Well (TW 11-16);
- Six shallow monitoring wells (MW-1 through MW-6) installed at the Doyon School in 2017 as part of the Town's plans to replace the school;
- Eight observation wells installed around the Lynch Site in 2018 in both the confined aquifer (OW-13A, OW-13B, and OW-13F) and unconfined aquifer (OW-13D, OW-13G, OW-13H, OW-13K and OW-13S) as part of the New Source Approval process;
- Seven observation wells (MW-1, MW-2, MW-3, MW-5, MW-6, MW-7 and OW-3) installed near the Browns Well in 1982 and 1991 as part of wellhead-protection investigations;
- Four test wells (TW1-16, TW 1A, TW 2-16, and TW 2B-16) installed in 2016 in an effort to identify a replacement-well location for the Browns Well; and
- Six test wells installed near the high school (Project Adventure Site) in 2017 in an effort to identify a new source of water supply (TW 21-17, TW 21A, TW 23-17, TW 25-17, TW 26-17 and TW 26A).

Table 4-2 summarizes construction details for the observation wells. Detailed logs are included in Appendix B. Observation wells were used to measure water-level drawdown and recovery due to pumping. Drawdown data was used to compute aquifer hydraulic characteristics. AECOM also monitored water-levels in two observation wells maintained by USGS, one in Wenham and the other in Newbury, for long-term ambient groundwater fluctuations.

4.4 Drive Points

In July 2018, four shallow hand-driven well points ("drive points") were installed in Bull Brook to evaluate impacts to the brook due to pumping. DP-1, DP-2, and DP-4 were installed downstream of Linebrook Road and DP-3 was installed 20 feet upstream of the culvert on Linebrook Road. Each drive point was installed to a depth of four to seven feet beneath the stream bed. Drive points consist of 1.25-inch diameter galvanized steel drive pipe, pipe couplings and a 1-foot length of 20-slot wire-wound stainless steel well screen. The soils in Bull Brook appear to consist generally of organic-rich muck in the upper one to two feet, with black and/or gray silty sands beneath. All drive points were developed with a hand pump for 10

TABLE 4-2
OBSERVATION WELL CONSTRUCTION AND WATER-LEVEL SUMMARY

Observation Well	Diameter (Inches)	Distance (ft) 8" TW 15	Elevation Top of Casing (ft MSL[1, 2])	Depth of Screened Interval (ft bgs)	S.W.L. Elevation[1] August 10, 2018	Drawdown Elevation[1] August 27, 2018	Drawdown (ft) August 27, 2018
TW 13-16	2	55	49.11	50-55	38.34	27.32	11.02
TW 14-16	2	120	46.52	46-51	38.37	28.88	9.49
TW 15-16	2	16	49.61	45-50	38.30	29.09	9.21
TW 16-16	2	82	49.49	50-55	38.34	28.40	9.94
TW 17-16	2	53	46.79	52-57	38.30	19.37	18.93
OW-13A	2	280	54.50	34-39	38.30	30.31	7.99
OW-13B	2	460	49.13	55-60	38.54	32.90	5.64
OW-13D	2	825	50.30	9-14	42.76	43.38	-0.62
OW-13F	2	530	57.12	19-22	38.68	33.59	5.09
OW-13G	2	1,295	50.85	11-16	40.92	41.00	-0.08
OW-13H	2	1,760	54.53	19-24	41.35	41.51	-0.16
OW-13K	2	590	51.71	11-16	39.34	38.77	0.57
OW-13S	2	76	48.83	15-20	38.51	38.40	0.11
TW 7-16	2	1,910	45.77	20.5-23.5	33.43	34.54	-1.11
TW 11-16	2	2,760	48.67	44-49	33.02	33.97	-0.95
TW 21-17	2	6,640	23.04	40-45	14.54	14.68	-0.14
TW 21A	2	6,640	22.98	40-45	14.56	14.69	-0.13
TW 23-17	2	6,620	20.95	40-45	14.53	14.57	-0.04
TW 25-17	2	6,675	20.93	37-42	14.57	14.65	-0.08
TW 26-17	2	6,585	18.71	40-45	14.50	14.56	-0.06
TW 26A	2	6,585	18.56	40-45	NA	14.53	NA
Browns, MW-1	2	7,715	25.22	33.3-38.3	13.20	12.67	0.53
Browns, MW-2	2	6,350	16.54	7.2-17.2	12.80	12.78	0.02
Browns, MW-3	2	7,170	22.02	23.7-28.7	NA	11.62	NA
Browns, MW-5	2	8,030	38.49	45-55	12.30	12.03	0.27
Browns, MW-6	2	8,100	20.32	20-30	11.37	11.72	-0.35
Browns, MW-7	2	7,470	27.82	59.8-64.8	6.50	1.08	5.42
Browns, OW-3	1.5	6,720	24.65	38.6-42.6	12.83	11.74	1.09
TW 1-16	2	6,825	24.47	50-55	12.87	11.68	1.19
TW 1A	2	6,825	24.34	50-55	12.84	11.68	1.16
TW 2-16	2	6,780	24.80	43-48	12.89	11.43	1.46
TW 2B	2	6,780	24.59	43-48	12.83	11.44	1.39

TABLE 4-2 (cont.)
OBSERVATION WELL CONSTRUCTION AND WATER-LEVEL SUMMARY

Observation Well	Diameter (Inches)	Distance (ft) 8" TW 15	Elevation Top of Casing (ft MSL1[1, 2])	Depth of Screened Interval (ft bgs)	S.W.L. Elevation[1] August 10, 2018	Drawdown Elevation[1] August 27, 2018	Drawdown (ft) August 27, 2018
Doyon, MW-1D	2	970	53.67	10-20	40.70	40.59	0.11
Doyon, MW-2D	2	880	52.28	10-20	40.23	40.03	0.2
Doyon, MW-3D	2	855	51.47	10-20	40.13	39.87	0.26
Doyon, MW-4D	2	960	50.86	10-20	40.35	40.18	0.17
Doyon, MW-5D	2	1,130	48.72	5-15	40.71	40.69	0.02
Doyon, MW-6D	2	1,425	52.25	5-15	41.14	41.24	-0.1
DP-1	1.25	396	36.92	6-7	34.63	35.02	-0.39
DP-2	1.25	288	37.43	5-6	35.65	35.69	-0.04
DP-3	1.25	1,394	40.38	3-4	37.76	37.50	0.26
DP-4	1.25	920	39.06	3.5-4.5	36.40	36.28	0.12

[1]All elevations based on NAVD 88; [2] Elevation top of PVC casing unless otherwise indicated; ft = feet; bgs = below ground surface; S.W.L. = Static water level; NM = elevation not measured; Drive point elevations for groundwater.

minutes, until they were capable of pumping water and water levels freely recovered. (See Table 2-2 and Figure 2-8 above.)

4.5 Precipitation

Precipitation was measured using a rain gauge installed in an open area at the Lynch Site, approximately 100 feet south of TW 16-16, and recorded on the pumping test record (see Appendix E). Precipitation data were also obtained from the Town's Wastewater Treatment Facility, approximately 2 miles directly east of the Lynch Site (see Appendix E).

4.6 Pumping Test Discharge

Water was pumped from the 8-inch diameter pumping wells using electrical submersible pumps. The Town provided a temporary electrical service to power the pumps. Water was conveyed from the 8-inch diameter test wells through temporary, 4-inch diameter hosing and discharged to the edge of Bull Brook, a distance of 500 feet northeast (downstream) of TW 15-16 (see Figure 1-2). From the discharge point, the water flowed into Bull Brook, then downstream into Bull Brook Reservoir. The rate of flow from the four 8-inch diameter pumping wells was measured with an individual orifice weir fitted to the end of each discharge line. The flow from 8-inch test well TW 15-16 was also measured using a magnetic flow meter, and mechanical flow meters were used for the other three 8-inch test pumping wells.

4.7 Pumping Test Operation

The 8-inch diameter test well at TW 15-16 was selected for the 48-hour pumping test because it was the highest yielding of the four 8-inch diameter test wells. At the conclusion of well development, the specific capacity of 8-inch TW 15-16 was around 30 gpm per foot of drawdown. TW 15-16 was pumped at a constant rate of 302 gpm for 48 consecutive hours from 11 a.m., Monday, August 13, 2018 to 11 a.m., Wednesday, August 15, 2018. A graphical summary of pumping, rainfall and water-level fluctuations is shown below on **Figure 4-1**. The primary goal of the constant-rate test was to obtain drawdown data sufficient to evaluate aquifer hydraulic characteristics. Prior to the startup of the constant-rate pumping test, antecedent water levels were measured in selected observation wells and drive points on August 6, 8 and 10, 2018. Ipswich's existing Mile Lane Well, 2,800 feet from the Lynch Site, was taken out of service on August 6, 2018 to avoid interference with the pumping test, and did not resume pumping until August 30. Static water levels were measured in all wells and drive points on August 10, 2018 prior to pumping test startup. Water level records for the antecedent, pumping and recovery periods are in Appendix E.

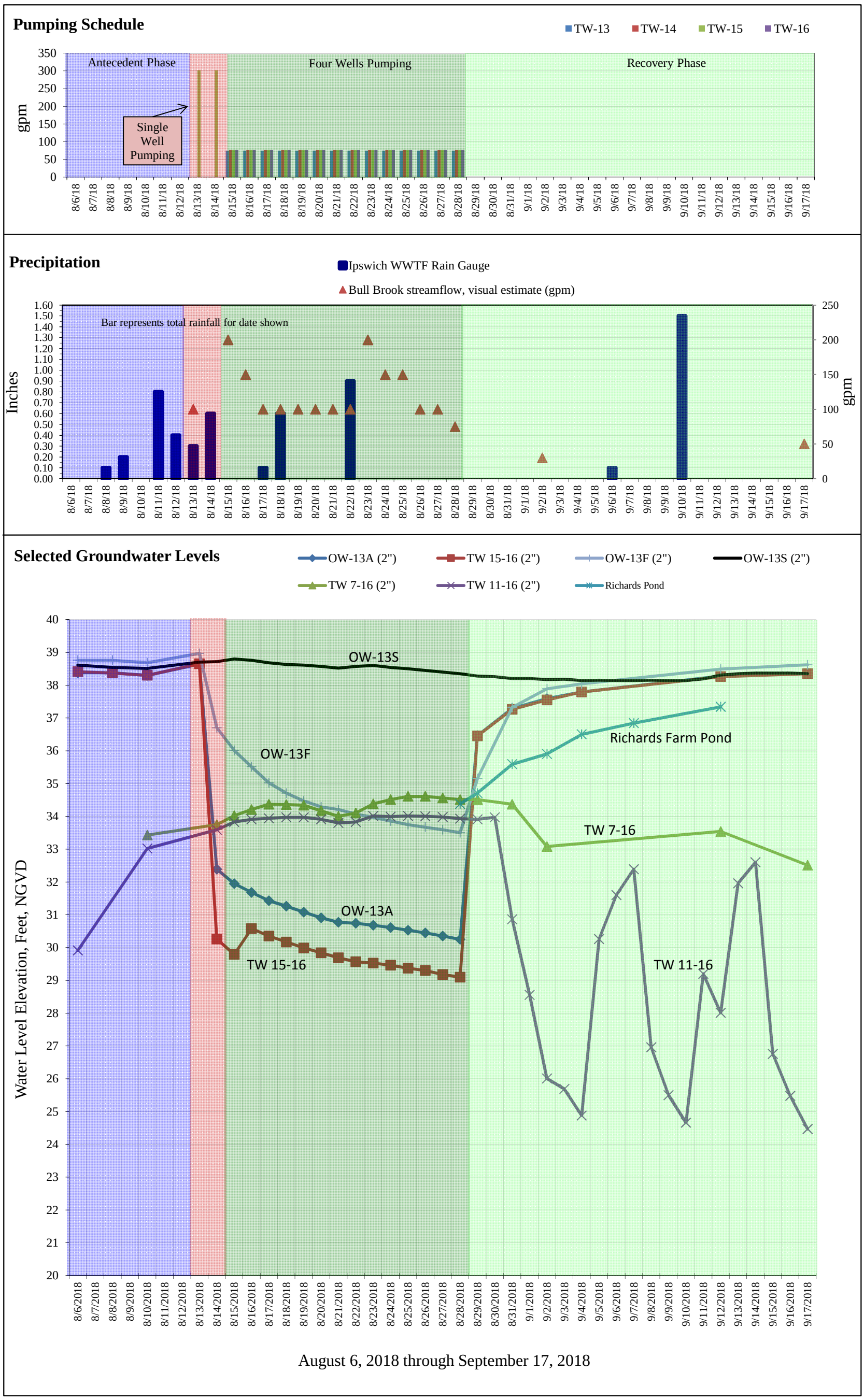


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FIGURE 4-1
Graphical Summary of Pumping Test - Selected Observation Wells
Lynch Site
Ipswich, Massachusetts

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Water levels were measured manually at frequent and regular intervals at the 8-inch pumping wells, selected observation wells and the four drive points throughout the 48-hour constant-rate pumping period. Water levels were also measured in 2-inch diameter observation/test wells OW-13A, OW-13B, TW 14-16, TW 15-16 and TW 16-16 using individual In Situ Level Troll 700 electronic data loggers. Water-level data was converted to drawdown for aquifer analysis.

At the conclusion of the 48-hour test, the pumping rate at 8-inch diameter test pumping well TW 15-16 was reduced to 75 gpm and the three 8-inch diameter test pumping wells at TW 13-16, TW 14-16 and TW 16-16 were each started up at a pumping rate of 75 gpm. The four-well pumping test continued for an additional 13 days, with each well pumping between 75 and 77 gpm until shutdown at 11:20 a.m. on Tuesday, August 28, 2018.

The aim of the simultaneous pumping test was to obtain data sufficient to: 1) establish water-level stabilization in order to evaluate the long-term combined potential well yield of the four well sites, 2) to evaluate water quality, 3) to understand conceptually how the aquifer functions under pumping and non-pumping conditions, 4) to collect technical data necessary to support a Zone II delineation, and 5) to evaluate potential impacts to Bull Brook and surrounding wetlands.

Water-level stabilization (less than or equal to 0.08-ft of drawdown in a 24-hour period) was achieved between August 22 and August 23, 2018, approximately ten days after pumping commenced, as shown on **Table 4-3**. Stabilization was also observed in the last 24 hours of pumping, as shown on **Table 4-4**. Note that, on both occasions, numerous wells in the pumped (confined) aquifer met the stabilization criterion of 0.08-inch in the 24-hour period, including pumping wells, observation wells 15 feet from pumping wells, and OW-13A and OW-13B, several hundred feet from the pumping wells. If the ambient water-level decline were deducted, the 24-hour change would be 0.04-foot or less. AECOM considered both the USGS well in Wenham, and OW-13S in the shallow sandy aquifer 25 feet from TW 13-16 to represent ambient conditions. AECOM communicated the stabilized condition to DEP on both occasions (see correspondence in Appendix A). Pumping was terminated at 11:20 a.m. on Tuesday, August 28, 2018, at which time recovery water-level readings commenced.

TABLE 4-3
WATER-LEVEL STABILIZATION
DAY 10 OF PUMPING
AUGUST 22 – 23, 2018

Well ID	Type of Well	Water Level Depth, August 22	Water Level Depth, August 23	24-hour Water-Level Change, feet
TW 13-16	8” Pumping Well	29.06	29.05	-0.01
TW 13-16	2” Obs Well	21.32	21.36	0.04
TW 17-16	2” Obs Well	26.61	26.59	-0.02
OW-13S	2” Obs Well (Ambient)	10.22	10.24	0.02
TW 14-16	8” Pumping Well	19.55	19.58	0.03
TW 15-16	8” Pumping Well	19.25	19.30	0.05
TW 15-16	2” Obs Well	20.02	20.07	0.05
TW 16-16	8” Pumping Well	19.60	19.65	0.05
TW 16-16	2” Obs Well	20.59	20.63	0.04
OW-13A	2” Obs Well	23.76	23.80	0.04
OW-13B	2” Obs Well	15.87	15.88	0.01

All water-level depths in feet below top of well casing

TABLE 4-4
WATER-LEVEL STABILIZATION
LAST 24 HOURS OF PUMPING
AUGUST 27 – 28, 2018

Well ID	Type of Well	Water Level Depth, August 27	Water Level Depth, August 28	24-hour Water-Level Change, feet
Wenham	USGS, Ambient Well	3.10	3.14	0.04
TW 13-16	2” Obs Well	21.67	21.75	0.08
TW 17-16	2” Obs Well	27.18	27.26	0.08
OW-13S	2” Obs Well (Ambient)	10.43	10.48	0.05
TW 14-16	8” Pumping Well	19.90	19.98	0.08
TW 15-16	8” Pumping Well	19.72	19.75	0.03
TW 15-16	2” Obs Well	20.52	20.52	0.00
TW 16-16	8” Pumping Well	20.10	20.08	-0.02
TW 16-16	2” Obs Well	20.97	21.04	0.07
OW-13A	2” Obs Well	24.19	24.25	0.06
OW-13B	2” Obs Well	16.18	16.26	0.08

All water-level depths in feet below top of well casing

Recovery water-levels were measured frequently between August 28 and September 17, 2018. **Table 4-5** outlines the progress of recovery. By September 12 (15 days after pumping ended), water levels had recovered to within 0.35- to 0.40-foot of the static water levels observed on August 13. Therefore, by September 12, water levels had recovered 96 to 97%.

TABLE 4-5
PROGRESS OF WATER-LEVEL RECOVERY, IN PERCENT
AUGUST 28 – SEPTEMBER 12, 2018

Well ID	Well Type	August 29, 1-day	August 31, 3-days	September 4, 7-days	September 12, 15-days
TW 13-16	2" Obs Well	80.5	88.0	92.5	96.9
TW 14-16	2" Obs Well	77.8	86.0	91.0	96.3
TW 15-16	2" Obs Well	77.0	85.5	91.0	95.9
TW 16-16	2" Obs Well	78.8	86.8	91.4	96.2

A few other observations regarding aquifer performance and pumping influences can be made from Figure 4-1:

- OW-13S is representative of ambient groundwater fluctuations. It is clear that water levels here were affected neither by pumping at the Lynch Site, nor when pumping ceased. Water levels rose slightly after rain events, and declined slowly between rain events.
- Water levels in TW 11-16, a confined-aquifer observation well next to the Mile Lane Well and nearly 2,800 feet from the Lynch test-pumping wells, were not influenced by pumping at the Lynch Site. Once the Mile Lane Well was returned to service on August 30, water levels in TW 11-16 declined and recovered consistent with pumping of the Mile Lane Well.
- Water levels in TW 7-16, a confined-aquifer observation well 1,900 feet from the Lynch test-pumping wells, were not influenced by pumping at the Lynch Site. TW 7-16 appears to be in a recovery phase from early- to mid-August after the Mile Lane Well was taken out of service on August 6. Once the Mile Lane Well was returned to service, water levels in TW 7-16 declined in response to pumping of the Mile Lane Well.
- Shutdown of the Mile Lane Well on August 6 did not appear to affect water levels at the Lynch Site (TW 15-16, OW-13A and OW-13F) in the antecedent phase. When pumping of the Mile Lane Well resumed on August 30, water levels at the Lynch Site continued to recover steadily.
- Water levels in the Richards farm pond recovered about three feet between August 28 and September 12. This observation indicates a hydraulic connection between the pond and the pumping wells. It further suggests that clay is absent from beneath the pond and the pond is in contact with the pumped aquifer.

SECTION 5 – APPROVABLE WELL YIELD

The approvable yield for the proposed wells at the Lynch Site was computed using the well-field formula found in DEP's Guidelines for Public Water Supply Systems, Chapter 4, Groundwater Supply Development, (March 2008), page 4-31, as follows:

Approvable Yield = Available Water (ft) x Average Specific Capacity (gpm/ft) x Number of Pumped Wells, where:

Available Water = 26 feet – static water level (ft)

Specific Capacity = (pumping rate at stabilization, in gpm) / (drawdown at stabilization, in feet)

Number of Pumped Wells = 4

In each case, the static water level is about 8 feet below ground; therefore,

Available water = 26 – 8 = 18 feet.

Specific capacity values were based on:

- The stabilized drawdown observed over the period August 22 to 23, 2018, ten days into pumping (See Table 4-3, above);
- The stabilized individual pumping rates, in each case, 75 gpm;
- For TW 14-16, TW 15-16 and TW 16-16, the specific-capacity values were based on drawdown observed in the 8-inch diameter test wells;
- For TW 13-16, specific capacity was based on the drawdown in the 2-foot observation well, TW 13-16;
- Mutual well interference amongst the four test pumping wells;
- The average of the four individual specific capacities.

For TW 13-16:

Specific capacity = 75 gpm/10.93 feet drawdown = 6.9 gpm/ft

For TW 14-16:

Specific capacity = 75 gpm/10.52 feet drawdown = 7.1 gpm/ft

For TW 15-16:

Specific capacity = 75 gpm/9.93 feet drawdown = 7.6 gpm/ft

For TW 16-16:

Specific capacity = 75 gpm/10.7 feet drawdown = 7.0 gpm/ft

Note that, given the well-interference conditions, the specific-capacity figures referenced above are not "true" specific capacities. The "true" or "individual" specific capacities are higher. For example, for TW 15-16, the 48-hour pumping test indicates that, with no well interference, the specific capacity of the 8-inch diameter test well is:

Specific Capacity = 300 gpm/(12.58 ft drawdown) = 23.8 gpm/ft

Under interference conditions, this same well showed a specific capacity of 7.6 gpm/ft.

From the DEP formula:

Approvable Yield = Available Water (ft) x Average Specific Capacity (gpm/ft) x Number of Wells

= 18 ft x 7.1 gpm/ft x 4

= 510 gpm

SECTION 6 – ZONE II DELINEATION

Zone II refers to the area that contributes water to a well or well field under the most severe recharge and pumping conditions that can be realistically anticipated, i.e., pumping the well or well field at its full capacity for 180 days without natural recharge occurring. The concept of Zone II was developed by DEP in the 1980s as the basis for wellhead protection. Zone II for the proposed wells at the Lynch Site was delineated using conceptual modeling methods.

Conceptual Zone II modeling generally relies on:

- a generalized knowledge of the aquifer system: its thickness, stratigraphy, boundaries, and groundwater flow patterns;
- pumping-test observations;
- the aquifer hydraulic characteristics: hydraulic conductivity, hydraulic gradient and transmissivity; and
- well pumping rates.

6.1 Conceptual Model of Aquifer System

The conceptual model of the aquifer system underlying the Lynch Site was developed from published surficial geologic mapping (especially, Stone et al., 2006), plus recent test-well investigations and pumping tests. In the following discussion, the reader may also refer to the Site Plan on Figure 1-2, the Surficial Geologic Map in Figure 2-2, geologic cross sections on Figures 2-3, 2-4 and 2-5, and Section 2, Geology and Hydrogeology.

Due to the depositional history of the glacial soils, the aquifer system that provides water to wells at the Lynch Site is complex and not fully understood. The following summarizes our current understanding of the aquifer:

- The test wells at the Lynch Site penetrate a thin, confined aquifer that is discontinuous and of uncertain spatial extent. The confined aquifer rests directly on top of the bedrock surface. While the confined aquifer is found elsewhere in Ipswich, it is not present everywhere and its whereabouts are unpredictable. The aquifer may exist throughout Town as discontinuous segments, or may be connected to other aquifer segments by narrow or thin passageways. The aquifer may have been deposited as a series of sub-glacial alluvial fans.
- The confined aquifer at the Lynch Site consists of extremely coarse-grained soils, mainly cobbles, gravel and lesser amounts of sand. These coarse-grained deposits are similar in nature to those found in confined aquifers elsewhere in Ipswich, i.e., at the Mile Lane and Browns Wells, at Project Adventure (near the High School) and at Pony Express.
- The confined aquifer soils at the Lynch Site are about five feet thick, with a hydraulic conductivity of about 1,000 feet per day. The aquifer is overlain by a layer of glaciomarine clay, 20 feet thick, that is largely buried beneath a sandy aquifer, also of glaciomarine origin. Buried clay is widespread in Ipswich in the lower elevations (about 50 to 60 feet above sea level).

- A sandy aquifer of about 30 feet in thickness overlies the clay at the Lynch Site. The sand tends to become silty at depth, where it is in contact with the clay. Numerous lines of evidence indicate that the clay pinches out beyond the Lynch Site, and as a result, the confined aquifer is in contact with the sandy unconfined aquifer. This may occur as near as about 600 feet from the pumping wells at the Richards farm pond.
- Pumping at the Lynch Site has a minor influence on Bull Brook, though the influence is not uniform nor felt everywhere. A diversion of 0 to 18 gallons per minute (gpm) of streamflow might occur in August, depending on rainfall conditions and daily well-field pumping cycles. A diversion of 18 gpm is less than 10% of the August median streamflow of 216 gpm.
- Groundwater chemistry data, specifically the levels of bacteria, chloride, sodium and nitrate found in the Lynch test wells, indicate that the subsurface clay confining layer is absent in certain areas. The known or suspected areas include the Richards farm pond, along Linebrook Road and near the Doyon Elementary School.
- The groundwater gradient in the confined aquifer is about 0.001 foot per foot, which is consistent with the stream gradient in Bull Brook. Groundwater flows generally parallel to Bull Brook, or northeasterly. In the unconfined sandy aquifer, groundwater flows subparallel to the brook, though near the brook, groundwater flows directly into the brook.
- Aquifer recharge originates from direct precipitation largely onto the glaciofluvial deposits (orange-colored, "sd-c" deposits on Figure 2-2) that lay outside the limits of the marine-regressive unit. The approximate rate of recharge to these areas is 20 inches per year. Recharge also occurs as groundwater and surface-water runoff from areas underlain by glacial till (colored green on Figure 2-2) at an annual rate of 6.9 inches-per-year (equivalent to 0.34-mgd per-square-mile).

6.2 Upgradient and Lateral Zone II Boundaries

The lateral and upgradient Zone II boundaries extend to the boundary between the glacial till and glaciofluvial deposits. Between the hills of glacial till, the boundaries are represented by the surface-water divide. We assume that the surface-water and groundwater divides are the same.

6.3 Downgradient Zone II Boundary

AECOM used the stagnation-point analysis to evaluate the down-gradient Zone II boundary. The stagnation-point analysis (boundary flow line equation of Bear, 1979) is expressed as follows:

$L = Q/2\pi Ti$,

Where:

L = down-gradient stagnation point, in feet

Q = well yield, in cubic feet per day (ft^3/day)

T = Transmissivity, in feet squared per day (ft^2/day)

i = hydraulic gradient, ft/ft

Given:

Q = 510 gpm (98,200 ft^3/day),

T = Hydraulic conductivity x aquifer thickness = 1,000 ft/day x 5 feet,

T = 5,000 ft^2/day, and

i = 0.001 ft/ft,

the down-gradient stagnation point is computed to be 3,125 feet.

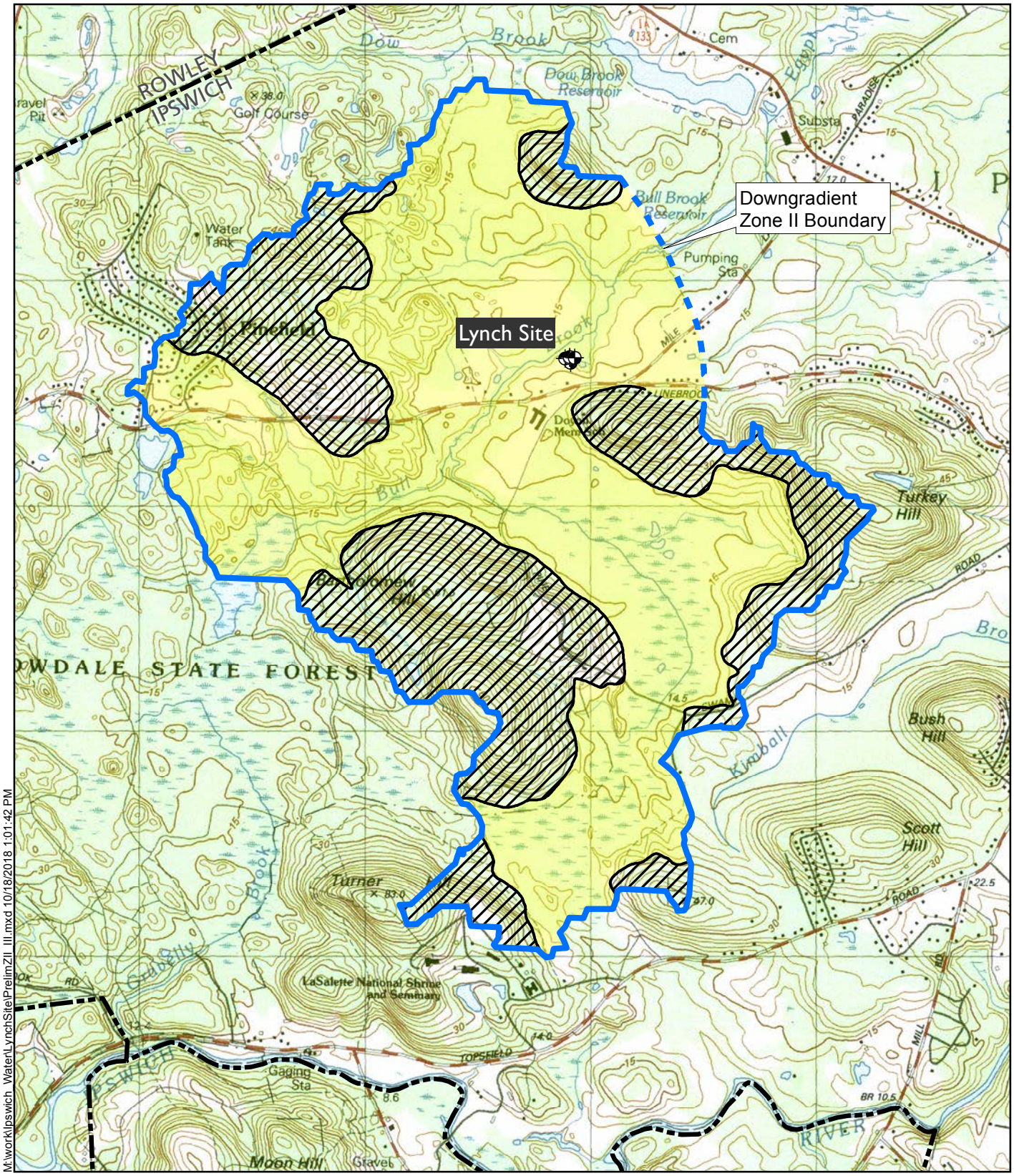
We note from the pumping test that at no time during the 15 days was drawdown observed at the Mile Lane Well (TW 11-16), a distance of 2,800 feet downgradient of the Lynch Site, nor at TW 7-16, a distance of 1,900 feet downgradient (See Figures 1-2 and 4-1). Given that both of these wells are screened in the confined aquifer, we cannot justify a downgradient boundary of 3,125 feet. Instead, we estimate the downgradient boundary to be approximately 2,000 feet, which is near TW 7-16.

The resulting Zones II and III are shown on **Figures 6-1 and 6-2**. The total watershed area (Zones II and III) that could contribute water to the Lynch Site is 2.49 square miles. The total area of the Zone II, which consists of glaciomarine, glaciofluvial and post-glacial swamp deposits, is 1.58 square miles. Assuming a direct recharge to Zone II of 20 inches per year (equivalent to 0.95 mgd per square mile), Zone II receives 1.50-mgd of recharge. The total area of Zone III is 0.91 square mile. Zone III could theoretically contribute an additional 0.31-mgd of recharge, assuming 6.9 inches of annual recharge (equivalent to 0.34-mgd per-square-mile) due to groundwater runoff from the till. The total recharge to Zones II and III would then, theoretically, be 1.81-mgd, more than enough to support a withdrawal of 0.73-mgd (510 gpm) from the Lynch Site.

6.4 Model Limitations

All groundwater flow models – whether they be conceptual, analytical, or numerical – are approximations of complex natural systems. The ultimate success of a modeling effort must be evaluated with respect to the purpose of the model. In this case, the model was intended to define Zone II.

Zone II for the Lynch Site was delineated by Conceptual Modeling methods, using the best available information. Transmissivity values were based on a constant-rate pumping test of 48-hours duration conducted in August 2018. These values should be considered quite reliable, given the pumping-test duration, the number of observation wells, the intensive water-level measurement schedule, and the constant pumping rate. The hydraulic conductivity values are consistent with what would be expected for soils that consist largely of gravel and cobbles with a



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Proposed Wells - Lynch Site

Watershed Divide

Zone II

Zone III

0 1,000 2,000 4,000 Feet

Figure 6-1

Zones II & III

Lynch Site
Ipswich, MA

AECOM Imagine it. Delivered.

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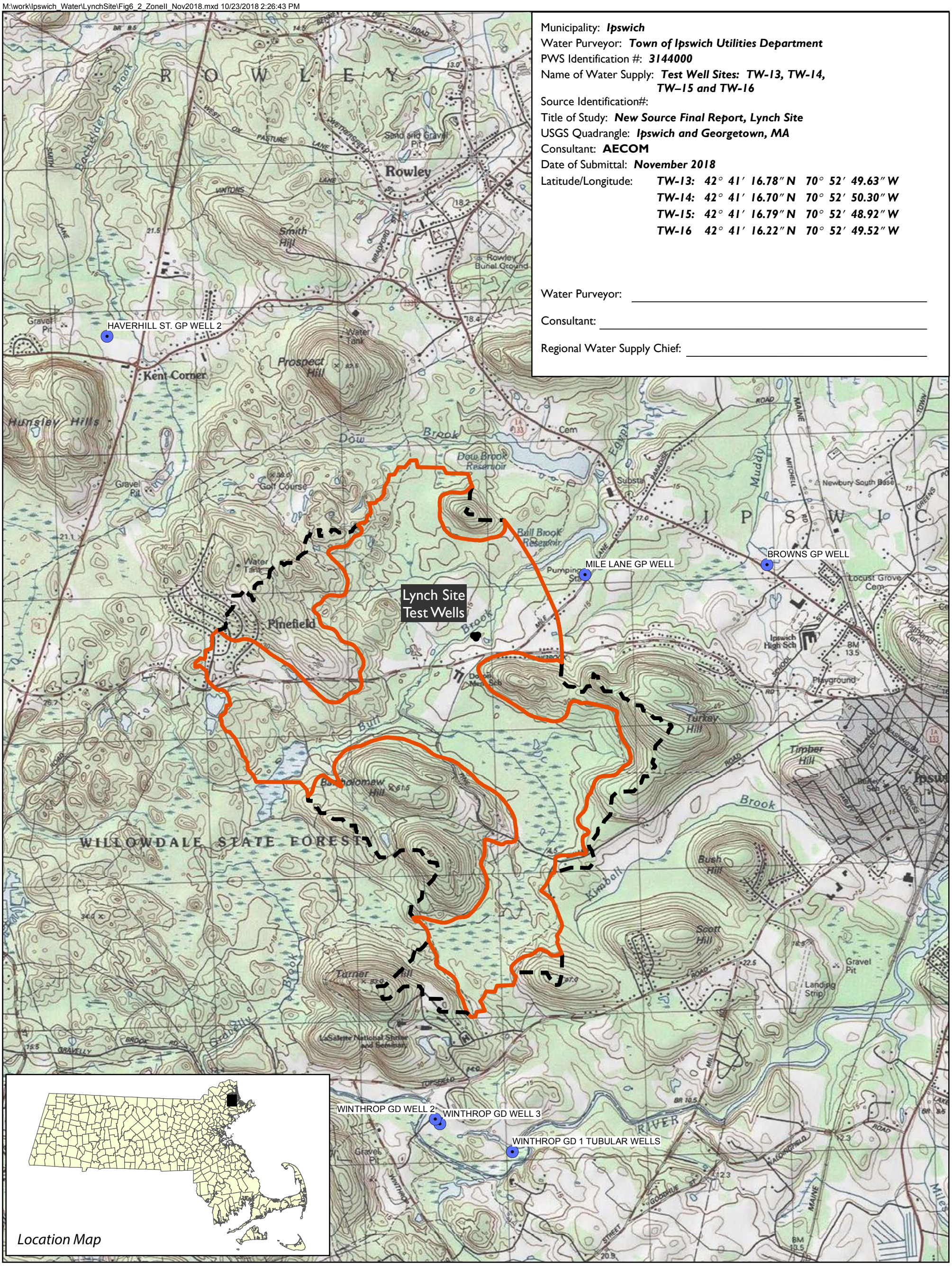

Figure 6-2

Zone II and Zone III

Lynch Site

Ipswich, Massachusetts

AECOM

November 2018

minor sand component. The local groundwater gradient and flow directions are based on actual measured values from a number of surveyed wells. The hydraulic gradient is consistent with the stream gradient of Bull Brook. The interaction between the pumping wells and Bull Brook was observed using hand-driven well points and seepage meters, giving further insight into the hydraulics of the aquifer system.

The lateral and upgradient Zone II boundaries are based on recently published surficial geologic mapping by the U.S. Geological Survey (Stone et al., 2006). The mapping should be considered accurate at the scale of mapping, which is 1:50,000. Detailed field studies would be necessary to refine these boundaries if, for example, a dispute arose on a particular piece of land. The Zone II includes areas of glaciofluvial deposits that we suspect represent only a thin blanket resting on the till or bedrock and may not be saturated, but are contiguous with the main aquifer.

A conscious effort was made to be conservative throughout the Zone II delineation process, especially where information, such as the spatial distribution of the confined aquifer east of the Lynch Site, is incomplete. This conservative philosophy, which is in keeping with DEP guidance, might tend to make the Zone II larger than the true 180-day capture zone of the wells.

This report presents our current conceptual model of the aquifer surrounding the Lynch Site. Future hydrogeologic studies of the site and surroundings may produce refinements to the conceptual model and perhaps to the Zone II.

SECTION 7 - WATER QUALITY

Water samples were collected from the four 8-inch diameter test wells on multiple occasions between August 15 and August 28, 2018. Samples were collected from taps fitted to the discharge pipe at each wellhead, and were then subjected to both field and laboratory water-quality testing. Water samples were tested for those parameters specified in the Pumping Test Proposal submitted in April 2018, and as modified in DEP's site-approval letter of June 20, 2018.

Laboratory testing was performed by Alpha Analytical, Inc. of Westborough, Massachusetts, or its subcontractor laboratories. For many analytes, AECOM obtained composite samples of the four 8-inch diameter test wells. We also tested the wells individually for analytes of particular interest, including iron, manganese, nitrate, sodium, chloride and bacteria. Individual samples were also obtained for Volatile-Organic-Compound (VOC) analysis and Perfluorinated Alkyl Acid (PFAA) analysis. The results of the composite samples are summarized in **Table 7-1. Tables 7-2 through 7-5** contain results of the individual well samples. Alpha's laboratory reports are included in Appendix F.

AECOM field-tested water from the individual wells for pH, specific conductance, temperature, dissolved oxygen, and oxidation-reduction potential using a YSI 556 water-quality testing apparatus, equipped with a flow-through cell. Samples were obtained by diverting water from each well into the flow-through cell at a rate of less than one gpm continuously for a period of two hours. The field water-quality testing results, reported in **Tables 7-6 through 7-9** below, represent the readings observed at the end of the two-hour period. In addition, AECOM field tested the water in Bull Brook (**Table 7-10**) on one occasion for comparison with the groundwater.

The results of the water-quality testing are summarized below:

- Water-quality testing conducted during the pumping test indicates that the water meets primary and secondary Maximum Contaminant Levels (MCLs and SMCLs) established by the US Environmental Protection Agency (EPA) and enforced by the Massachusetts Department of Environmental Protection (DEP).
- Two of the four wells tested positive for Fecal coliform at the end of the pumping test. In TW 14-16, 6.0 colonies per 100 milliliter (Col/100 ml) of Fecal coliform was reported, and 5.0 Col/100 ml of Fecal coliform was found in TW 15-16. All four wells tested negative for e-coli at the midpoint and end of the pumping test. TW 13-16, TW 14-16 and TW 16-16 were all positive for Total Coliform at the end of the pumping test. While the Richards farm pond 600 feet north of Bull Brook is the most likely source, the origin of the bacteria should be investigated.
- The well-drilling contractor reported an odor associated with a slimy black substance found on the pumping equipment when it was removed from the wells in September 2018. The presence and origin of this substance should be further investigated, though it could be related to the coliform bacteria.

TABLE 7-1
LABORATORY WATER QUALITY SUMMARY
COMPOSITE SAMPLES OF 8-INCH TW 13-16, TW 14-16, TW 15-16 AND TW 16-16

Parameter	Units	Reporting Limit	Drinking Water Standard[1]	DAY 1 Aug 15, 2018	Midpoint Aug 21, 2018	FINAL DAY Aug 27, 2018
pH	Std. Unit	NA	6.5-8.5[2]	7.5	7.6	7.6
Turbidity	NTU	0.20	1	0.96	0.39	--
Color	APCU	5.0	15[2]	ND	ND	ND
Odor	TON	1	3[2]	None	None	None
Alkalinity, as $CaCO_3$	mg/L	2.00	NE	132	149	149
Specific Conductance	umhos/cm	10	NE	620	690	640
Hardness	mg/L	0.660	NE	159	174	167
Total Dissolved Solids	mg/L	10	500[2]	380	330	370
Fluoride	mg/L	0.20	4.0	--	--	0.07
Chloride	mg/L	2.50, 5.00	250[2]	136	116	96.4
Total Cyanide	mg/L	0.005	0.2	--	--	ND
Sulfate	mg/L	1.00, 5.00	250[2]	16.7	17.9	21.2
Ammonia-Nitrogen	mg/L	0.075	NE	0.044	0.031	ND
Nitrite-Nitrogen	mg/L	0.050	1	ND	ND	ND
Nitrate-Nitrogen	mg/L	0.10	10	4.3	5.1	5.6
Phosphorus	mg/L	0.010	NE	--	--	ND
Aluminum	mg/L	0.100	0.05-0.2[2]	.037	ND	ND
Antimony	mg/L	0.0040	0.006	--	--	ND
Arsenic	mg/L	0.0010	0.010	--	--	ND
Barium	mg/L	0.0010	2	--	--	0.0200
Beryllium	mg/L	0.0010	0.004	--	--	ND
Cadmium	mg/L	0.0002	0.005	--	--	ND
Calcium	mg/L	0.100	NE	54.2	58.7	55.5
Chromium	mg/L	0.0010	0.1	--	--	0.0007
Copper	mg/L	0.0010	1.0[2]	.0035	0.0004	ND
Iron	mg/L	0.050	0.3[2]	.133	0.036	0.054
Iron, dissolved	mg/L	0.050	0.3[2]	.059	0.019	0.021
Lead	mg/L	0.0010	0.015	--	--	ND
Magnesium	mg/L	0.100	NE	5.71	6.62	6.02
Manganese	mg/L	0.010	0.05[2]	0.006	ND	ND
Manganese, dissolved	mg/L	0.010	0.05[2]	0.002	ND	0.002
Mercury	mg/L	0.0002	0.002	--	--	ND
Nickel	mg/L	0.0020	0.1[3]	--	--	ND
Potassium	mg/L	2.50	NE	3.52	3.47	3.59
Selenium	mg/L	0.0050	0.05	--	--	ND
Silver	mg/L	0.0004	0.10[2]	ND	ND	ND
Sodium	mg/L	2.00	20[3]	79.9	68.7	77.6
Thallium	mg/L	0.0010	0.002			0.0004
Zinc	mg/L	0.0100	5[2]	0.0038	ND	ND
Gross Alpha	pCi/L	0.1	15	--	--	0.4
Gross Beta	pCi/L	3.6	4 millirem/yr	--	--	ND
Radium 226	pCi/L	0.2	5 (Ra226+228)	--	--	ND
Radium 228	pCi/L	0.2	5 (Ra226+228)	--	--	ND
Radon	pCi/L	16.1	10,000[3]	--	--	314
Total Organic Carbon	mg/L	0.500	NE	--	--	1.14
Perchlorate	µg/L	0.050	2	--	--	0.531
SOCs, metolachlor	µg/L	0.1	100[3]	--	--	0.24
SOCs, all others	µg/L	Various	Various	--	--	ND
Oxidation-Reduction Pot.	mV		NE	--	--	200

[1]Mass. Max. Contaminant Level
[2]Mass. Secondary Max. Contaminant Level
[3]Mass. ORS Goal
NTU = nephelometric turbidity units
TON = threshold odor number

-- = not tested
ND = not detected
NE = not established
mg/L = milligram per liter
µg/L = microgram per liter

µmho/cm = micromho per centimeter
pCi/L = picoCurie per liter
SOC = Synthetic Organic Compounds
VOC = Volatile Organic Compounds
col/100ml = colonies per 100 ml

- Sodium levels in the composite samples were found to range from 68.7 to 79.9 milligram per liter (mg/L). The Massachusetts Drinking Water Guideline (ORSG) for sodium is 20 mg/L. As this standard is a guideline, it is not intended as an enforceable standard. In the individual wells, the highest sodium levels were found in TW 16-16 (100 to 116 mg/L), and the lowest were found in TW 14-16 (28.8 to 33.8 mg/L). Elevated sodium levels, in all likelihood, originate largely from road-salting of Linebrook Road and perhaps the elementary-school parking lot. The source of sodium should be further investigated with the aim of reducing its concentration in groundwater.
- Chloride levels parallel the sodium levels. In the composite samples, chloride was found to range from 96.4 to 136 mg/L. The Massachusetts Secondary Maximum Contaminant Level (SMCL) for chloride is 250 mg/L. In the individual wells, the highest chloride levels were found in TW 16-16 (172 to 203 mg/L), and the lowest in TW 14-16 (49.9 to 55.6 mg/L).
- Nitrate levels in the composite samples were found to range from 4.3 to 5.6 mg/L, which are below the Massachusetts Maximum Contaminant Level (MMCL) of 10 mg/L. Nitrate levels were highest in TW 13-16 (5.9 to 6.9 mg/L) and lowest in TW 16-16 (3.9 to 4.2 mg/L). Nitrate likely originates both from agricultural activities and local septic-system discharges, including the elementary school. The sources of nitrate should be investigated with the aim of reducing the levels in groundwater.
- Both iron and manganese were found at levels well below the SMCLs of 0.3 mg/L for iron and 0.05 mg/L for manganese. At the end of the pumping test, iron levels generally ranged from about 0.02 to 0.03 mg/L, and manganese levels were found to be no higher than 0.002 mg/L. Provided these levels remain unchanged over the long-term, the water will *not* require treatment to remove iron and manganese.
- Of the volatile organic compounds (VOCs), only a trace level (0.17 μg/L) of chloroform was detected, and only in TW 16-16. The MMCL for total trihalomethanes, of which chloroform is one, is 80 μg/L. Chloroform is often associated with septic-system discharges.
- Of the Synthetic Organic Compounds (SOCs), only a trace level (0.24 μg/L) of metolachlor was found. Metolachlor is an herbicide used in cultivation of corn, among other crops. The Drinking Water Guideline (ORSG) for metolachlor is 100 μg/L.
- Total Perfluorinated Alkyl Acids (PFAAs) were detected in the range of 8- to 23-nanogram per liter (ng/L), well below the ORSG of 70 ng/L. PFAAs are found in fire-fighting foams, and have been used to make carpets, clothing, fabrics for furniture, paper packaging for food, cookware and many other consumer products. PFAA sources should be investigated.
- Field and laboratory pH values were found to range generally from 7.4 to 7.7.
- On the final day of pumping, field testing indicates a water temperature of 11 to 12 ^{o}C (52 to 54 ^{o}F), a specific conductivity of 400 to 550 μmho/cm, dissolved oxygen (DO) of about 3 to 6 mg/L (25 to 50% of saturation), and oxidation-reduction potential (ORP) of about 55 to 80 mV. The rather high levels of DO could signify young groundwater near a recharge source, although we would expect the ORP to be higher, if this were the case.

TABLE 7-2
LABORATORY WATER QUALITY SUMMARY
8-INCH TEST WELL, TW 13-16

Parameter	Units	Reporting Limit	Drinking Water Standard[1]	Aug 20, 2018	Aug 21, 2018	Aug 23, 2018	Aug 26, 2018	Aug 27, 2018
Chloride	mg/L	5.00	250[2]	102	--	100	94.6	--
Sodium, Total	mg/L	2.00	20[3]	61.6	--	52.5	52.7	--
Nitrate-Nitrogen	mg/L	0.10	10	5.9	--	5.9	6.9	--
Iron, Total	mg/L	0.050	0.3[2]	0.099	--	0.033	0.028	--
Iron, dissolved	mg/L	0.050	0.3[2]	0.014	--	0.027	0.025	--
Manganese, Total	mg/L	0.010	0.05[2]	0.002	--	ND	ND	--
Manganese, dissolved	mg/L	0.010	0.05[2]	ND	--	ND	ND	--
Fecal Coliform	Col/100ml	--	1.0	--	ND	--	--	ND
Total Coliform	Col/100ml	0	Negative	--	Negative	--	--	Positive
E-Coli	Col/100ml	0	Negative	--	Negative	--	--	Negative
VOCs	µg/L	0.5	Various	--	--	--	--	ND
PFBS	ng/L	1.82	--	--	--	--	--	1.46
PFHpA	ng/L	1.82	--	--	--	--	--	1.21
PFHxS	ng/L	1.82	--	--	--	--	--	1.30
PFOA	ng/L	1.82	--	--	--	--	--	3.51
PFNA	ng/L	1.82	--	--	--	--	--	ND
PFOS	ng/L	1.82	--	--	--	--	--	5.05
Total PFOA + PFOS	ng/L	--	70[3]	--	--	--	--	8.56
Total PFAA	ng/L	--	--	--	--	--	--	12.53

TABLE 7-3
LABORATORY WATER QUALITY SUMMARY
8-INCH TEST WELL, TW 14-16

Parameter	Units	Reporting Limit	Drinking Water Standard[1]	Aug 20, 2018	Aug 21, 2018	Aug 23, 2018	Aug 26, 2018	Aug 27, 2018
Chloride	mg/L	5.00	250[2]	49.9	--	55.6	54.2	--
Sodium, Total	mg/L	2.00	20[3]	33.8	--	28.8	29.1	--
Nitrate-Nitrogen	mg/L	0.10	10	6.1	--	5.6	6.0	--
Iron, Total	mg/L	0.050	0.3[2]	0.038	--	0.012	0.015	--
Iron, dissolved	mg/L	0.050	0.3[2]	0.015	--	0.020	0.021	--
Manganese, Total	mg/L	0.010	0.05[2]	ND	--	ND	ND	--
Manganese, dissolved	mg/L	0.010	0.05[2]	ND	--	ND	ND	--
Fecal Coliform	Col/100ml	--	1.0	--	ND	--	--	6.0
Total Coliform	Col/100ml	0	Negative	--	Negative	--	--	Positive
E-Coli	Col/100ml	0	Negative	--	Negative	--	--	Negative
VOCs	µg/L	0.5	Various	--	--	--	--	ND
PFBS	ng/L	1.83	--	--	--	--	--	1.26
PFHpA	ng/L	1.83	--	--	--	--	--	0.582
PFHxS	ng/L	1.83	--	--	--	--	--	0.791
PFOA	ng/L	1.83	--	--	--	--	--	2.01
PFNA	ng/L	1.83	--	--	--	--	--	ND
PFOS	ng/L	1.83	--	--	--	--	--	2.86
Total PFOA + PFOS	ng/L	--	70[3]	--	--	--	--	4.87
Total PFAA	ng/L	--	--	--	--	--	--	7.50

[1]Mass. Max. Contaminant Level
[2]Mass. Secondary Max. Contaminant Level
[3]Mass. ORS Goal

-- = not tested
ND = not detected
µg/L = microgram per liter
ng/L = nanogram per liter

VOC = Volatile Organic Compounds
mg/L = milligram per liter
Col/100ml = colonies per 100 ml

Perfluorinated Alkyl Acids:

PFBS = Perfluorobutanesulfonic acid
PFHpA = Perfluoroheptanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFNA = Perfluorononononic acid
PFOS = Perfluorooctanesulfonic acid

TABLE 7-4
LABORATORY WATER QUALITY SUMMARY
8-INCH TEST WELL, TW 15-16

Parameter	Units	Reporting Limit	Drinking Water Standard[1]	Aug 20, 2018	Aug 21, 2018	Aug 23, 2018	Aug 26, 2018	Aug 27, 2018
Chloride	mg/L	5.00	250[2]	113	--	112	113	--
Sodium, Total	mg/L	2.00	20[3]	65.3	--	60.3	64.8	--
Nitrate-Nitrogen	mg/L	0.10	10	4.9	--	4.7	5.4	--
Iron, Total	mg/L	0.050	0.3[2]	0.029	--	0.020	0.035	--
Iron, dissolved	mg/L	0.050	0.3[2]	0.024	--	0.022	0.022	--
Manganese, Total	mg/L	0.010	0.05[2]	ND	--	ND	ND	--
Manganese, dissolved	mg/L	0.010	0.05[2]	ND	--	ND	ND	--
Fecal Coliform	Col/100ml	--	1.0	--	ND	--	--	5.0
Total Coliform	Col/100ml	0	Negative	--	Negative	--	--	Negative
E-Coli	Col/100ml	0	Negative	--	Negative	--	--	Negative
VOCs	µg/L	0.5	Various	--	--	--	--	ND
PFBS	ng/L	1.83	--	--	--	--	--	2.25
PFHpA	ng/L	1.83	--	--	--	--	--	1.72
PFHxS	ng/L	1.83	--	--	--	--	--	1.55
PFOA	ng/L	1.83	--	--	--	--	--	5.87
PFNA	ng/L	1.83	--	--	--	--	--	0.355
PFOS	ng/L	1.83	--	--	--	--	--	6.72
Total PFOA + PFOS	ng/L	--	70[3]	--	--	--	--	12.59
Total PFAA	ng/L	--	--	--	--	--	--	18.47

TABLE 7-5
LABORATORY WATER QUALITY SUMMARY
8-INCH TEST WELL, TW 16-16

Parameter	Units	Reporting Limit	Drinking Water Standard[1]	Aug 20, 2018	Aug 21, 2018	Aug 23, 2018	Aug 26, 2018	Aug 27, 2018
Chloride	mg/L	5.00	250[2]	203	--	190	172	--
Sodium, Total	mg/L	2.00	20[3]	116	--	100	107	--
Nitrate-Nitrogen	mg/L	0.10	10	4.0	--	3.9	4.2	--
Iron, Total	mg/L	0.050	0.3[2]	0.037	--	0.028	0.032	--
Iron, dissolved	mg/L	0.050	0.3[2]	0.025	--	0.035	0.032	--
Manganese, Total	mg/L	0.010	0.05[2]	ND	--	ND	ND	--
Manganese, dissolved	mg/L	0.010	0.05[2]	ND	--	0.002	ND	--
Fecal Coliform	Col/100ml	--	1.0	--	ND	--	--	ND
Total Coliform	Col/100ml	0	Negative	--	Positive	--	--	Positive
E-Coli	Col/100ml	0	Negative	--	Negative	--	--	Negative
VOCs	µg/L	0.5	Various	--	--	--	--	0.17 chloroform
PFBS	ng/L	1.83	--	--	--	--	--	1.54
PFHpA	ng/L	1.83	--	--	--	--	--	2.01
PFHxS	ng/L	1.83	--	--	--	--	--	2.33
PFOA	ng/L	1.83	--	--	--	--	--	5.78
PFNA	ng/L	1.83	--	--	--	--	--	0.545
PFOS	ng/L	1.83	--	--	--	--	--	10.5
Total PFOA + PFOS	ng/L	--	70[3]	--	--	--	--	16.28
Total PFAA	ng/L	--	--	--	--	--	--	22.71

[1]Mass. Max. Contaminant Level
[2]Mass. Secondary Max. Contaminant Level
[3]Mass. ORS Goal

-- = not tested
ND = not detected
µg/L = microgram per liter
ng/L = nanogram per liter

VOC = Volatile Organic Compounds
mg/L = milligram per liter
Col/100ml = colonies per 100 ml

Perfluorinated Alkyl Acids:

PFBS = Perfluorobutanesulfonic acid
PFHpA = Perfluoroheptanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFNA = Perfluorononononic acid
PFOS = Perfluorooctanesulfonic acid

TABLE 7-6
FIELD WATER QUALITY SUMMARY, 8-INCH TW 13-16

Parameter	August 15, 2018	August 19, 2018	August 21, 2018	August 28, 2018
Temperature, ^{o}C	16.2	12.3	19.6	11.5
Specific conductance, µmho/cm	529	494	508	460
Dissolved oxygen, mg/L	4.27	4.41	4.52	5.15
Dissolved oxygen, % saturation	43.5	41.4	49.4	47.4
Oxidation-reduction potential, mV	13.9	40.2	18.9	65.8
pH, S.U.	8.4	7.7	7.7	7.4

TABLE 7-7
FIELD WATER QUALITY SUMMARY, 8-INCH TW 14-16

Parameter	August 19, 2018	August 21, 2018	August 28, 2018
Temperature, ^{o}C	11.4	11.4	11.4
Specific conductance, µmho/cm	420	413	405
Dissolved oxygen, mg/L	2.99	2.87	2.89
Dissolved oxygen, % saturation	27.5	26.3	25.9
Oxidation-reduction potential, mV	46.5	48.1	54.9
pH, S.U.	7.7	7.7	7.5

TABLE 7-8
FIELD WATER QUALITY SUMMARY, 8-INCH TW 15-16

Parameter	August 19, 2018	August 21, 2018	August 28, 2018
Temperature, ^{o}C	12.1	11.7	12.0
Specific conductance, µmho/cm	466	456	446
Dissolved oxygen, mg/L	5.84	5.80	5.97
Dissolved oxygen, % saturation	54.4	53.5	55.4
Oxidation-reduction potential, mV	65.0	57.6	78.4
pH, S.U.	7.4	7.5	7.3

µmho/cm = micromho per centimeter
S.U. = Standard Units
NT = Not Tested
mV = milliVolt
mg/L = milligram per liter

TABLE 7-9
FIELD WATER QUALITY SUMMARY, 8-INCH TW 16-16

Parameter	August 19, 2018	August 21, 2018	August 28, 2018
Temperature, ^{o}C	11.6	11.2	11.2
Specific conductance, µmho/cm	657	625	547
Dissolved oxygen, mg/L	6.14	6.04	5.73
Dissolved oxygen, % saturation	56.6	55.1	52.3
Oxidation-reduction potential, mV	55.3	54.1	59.2
pH, S.U.	7.7	7.6	7.5

TABLE 7-10
FIELD WATER QUALITY SUMMARY, BULL BROOK AT LINEBROOK ROAD CULVERT

Parameter	September 4, 2018
Temperature, ^{o}C	14.1
Specific conductance, µmho/cm	377
Dissolved oxygen, mg/L	1.55
Dissolved oxygen, % saturation	15.1
Oxidation-reduction potential, mV	73.0
pH, S.U.	7.6

µmho/cm = micromho per centimeter
S.U. = Standard Units
NT = Not Tested
mV = milliVolt
mg/L = milligram per liter

SECTION 8 - PROPOSED GROUNDWATER MONITORING

Based on the results of the water-quality testing and known land uses, we recommend that the Town develop a detailed monitoring program to investigate the source(s) of bacteria found in wells at the Lynch Site, and eliminate pathways for their introduction into the groundwater. The program should also be aimed at identifying sources of nitrate, sodium, chloride, and PFAAs with the goal of reducing their levels in groundwater. The Town should work with local farmers to manage fertilizer use, and evaluate nearby septic-system discharges to reduce nitrate levels. The Town should consider other road-salting strategies to reduce sodium and chloride levels in the drinking water.

SECTION 9 - WELLHEAD PROTECTION PLAN

A letter from DEP dated September 12, 2005 states that the Town of Ipswich is in compliance with the Massachusetts Wellhead Protection Regulations, 310 CMR 22.21(2). Ipswich has both a compliant Water Supply Protection District Bylaw and compliant Floor Drain Regulation. The DEP letter was included in the Town's Request for Site Exam and Prolonged Pumping Test Proposal.

SECTION 10 - CONCLUSIONS AND RECOMMENDATIONS

Based on the pumping test, the Calculated Approvable Yield for a future well field of four gravel-packed wells at the Lynch Site is 510 gpm. Performance testing of the newly constructed wells and experience with the wells over the first few years of pumping may show that the yield is somewhat different. The proposed wells will pump from a five-foot thick, cobble-gravel aquifer, found at a depth of about 50 to 55 feet. Locally, the aquifer is overlain by about 20 feet of clay, which is in turn overlain by a 25- to 30-foot thick sandy aquifer.

The regional aquifer system that provides water to wells at the Lynch Site is complex and not fully understood. The cobble-gravel aquifer is discontinuous; and, its spatial extent and thickness beyond the Lynch Site are uncertain. Numerous lines of evidence indicate that the clay "pinches out", and this may occur as near as about 600 feet north of the Lynch Site at the Richards farm pond. Where the clay is absent, the cobble-gravel aquifer may be exposed at the ground surface or be directly overlain by the sandy aquifer. Both circumstances would allow direct recharge to the cobble-gravel aquifer from precipitation.

The recharge area contributing water to wells at the Lynch Site is estimated to be 2.49 square miles. The total, theoretical recharge from this 2.49-square-mile area is 1.81-mgd, more than enough to support a withdrawal of 0.73-mgd (510 gpm) from the Lynch Site.

Water-quality testing conducted during the pumping test indicates that the water meets primary and secondary Maximum Contaminant Levels (MCLs and SMCLs) established by the US Environmental Protection Agency (EPA) and enforced by the Massachusetts Department of Environmental Protection (DEP). Low levels of coliform bacteria were identified. All four wells sampled on the 14th day of pumping were positive for either Fecal or Total Coliform bacteria. To meet the requirements of the EPA Ground Water Rule and achieve 4-log (99.99%) inactivation of viruses, the water should be chlorinated before being pumped into the distribution system. Chlorination will have the added benefit of removing potential bacterial contamination. Nearby farming activities on land owned by Richards Realty Trust, specifically the Richards farm pond, may be the source of the bacteria.

Sodium levels were found to be as high as 79.9 milligram per liter (mg/L), which exceeds the Massachusetts Drinking Water Guideline (ORSG) of 20 mg/L. As this standard is a guideline, it is not intended as an enforceable standard. Elevated sodium levels, in all likelihood, originate largely from road-salting of Linebrook Road and perhaps the elementary-school parking lot.

Nitrate levels were found to be elevated, ranging from 4.3 to 5.6 mg/L in the combined-well samples, though below the MCL of 10 mg/L. Possible sources of nitrate include local farming and nearby septic-system discharges, including the elementary school. In addition, chloride levels

were found to be as high as 136 mg/L, though still below the SMCL of 250 mg/L. The elevated chloride levels are probably a result of road-salting.

Perfluorinated alkyl acids (PFAAs) were found to range from 8- to 23-nanogram per liter (ng/L) in each of the four 8-inch diameter test-pumping wells. These levels are below the ORSG of 70 ng/L. PFAAs are found in fire-fighting foams, and have been used to make carpets, clothing, fabrics for furniture, paper packaging for food, cookware and many other consumer products.

Levels of iron and manganese were found to be well below the SMCLs of 0.3 mg/L for iron and 0.05 mg/L for manganese. At the end of the pumping test, iron levels generally ranged from about 0.02 to 0.03 mg/L, and manganese levels were found to be no higher than 0.002 mg/L. Provided these levels remain unchanged over the long-term, the water will *not* require treatment to remove iron and manganese.

We recommend that the Town develop a monitoring program to investigate the source(s) of bacteria found in wells at the Lynch Site, and eliminate pathways for their introduction into the groundwater. The program should also be aimed at identifying sources of nitrate, sodium, chloride, and PFAAs with the goal of reducing their levels in groundwater. The Town should work with local farmers to manage fertilizer use, and evaluate nearby septic-system discharges to reduce nitrate levels. The Town should consider other road-salting strategies to reduce sodium and chloride levels in the drinking water.

Evidence from the pumping test indicates a weak and indirect hydraulic link between Bull Brook and the Lynch wells under pumping conditions. AECOM estimates that a diversion of 0 to 18 gpm of streamflow might occur in August, depending on rainfall conditions and daily well-field pumping cycles. A diversion of 18 gpm is less than 10% of the August median streamflow of 216 gpm. Bull Brook is often without flow in August, which implies a potential diversion of 0 gpm when the weather is dry. The discussion of streamflow diversion due to pumping should be put into its proper perspective. In most cases, any volume of water that is diverted to the wells in dry times is water that would otherwise flow 2,000 feet downstream to recharge Bull Brook Reservoir.

Pending DEP approval of the Lynch Well Site for new water supply, the Town should proceed with the design and construction of four new gravel-packed wells and pumping facilities. The pumping facilities should include chlorination to remove bacteria before the water is introduced into the distribution system. Alternatively, chlorination could be achieved at the existing Water Treatment Plant, if the Town chooses to pump the water there before introducing it into the distribution system. Once the Town receives DEP approval of Zone II, the Town should incorporate the new Zone II into its wellhead protection zoning.

The following outlines the expected permitting steps after submittal of the New Source Final Report:

- Under separate cover, AECOM will submit to DEP a Water Management Act (WMA) Permit Amendment application to add the Lynch well sources to the Town's WMA Permit for the Parker River Basin. DEP water-management staff indicates that DEP will issue an Order-To-Complete (OTC), once the WMA Permit application is received.
- Under separate cover, AECOM will submit an Environmental Notification Form (ENF) to the MEPA Office for review of the proposed wells and pumping facilities. Once MEPA reviews the ENF, it will issue a Certificate on the ENF and may require other actions.
- During design of the proposed wells and pumping facilities, we expect that the local Conservation Commission will require permitting associated with construction activities that may occur within wetland resource areas and riverfront.
- DEP will require a permit to construct the well sources (BRP WS 20) and a separate permit to construct the pumping facilities (BRP WS 23C and perhaps others), prior to construction.
- WMA Permit renewals in the Parker River Basin are scheduled for the year 2023, at which time DEP will ask the Town to address issues related to the Sustainable Water Management Initiative (SWMI).

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APPENDIX A

RELEVANT CORRESPONDENCE

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

June 27, 2018

Vicki Halmen
Ipswich Water & Sewer Division
P.O. Box 151
Ipswich, MA 01931

RE: City/Town: Ipswich
PWS Name: Ipswich Water & Sewer Division
PWS-ID No.: 3144000
Program: System Modifications
Action: Approval— Lynch Wellfield Site Exam/Pumping Test Proposal
Transmittal No.: X280136

Dear Ms. Halmen:

Please find attached the following information:

Approval of the site examination and pumping test proposal for a proposed public supply wellfield located off of Linebrook Road in Ipswich.

Please note that the signature on this cover letter indicates formal issuance of the attached document. **Please contact this office at least 5 days prior to the start of the prolonged pumping test.** If you have any questions regarding this letter, please contact James Persky at (978) 694-3227.

Sincerely,

James H. Persky
Environmental Analyst
Drinking Water Program

Sincerely,

Thomas Mahin
Drinking Water Section Chief
Northeast Regional Office

cc: DWP/Boston Office (no attachment)
Bruce Bouck, MassDEP, Drinking Water, Boston
Julie Butler, MassDEP, Water Management, Boston
Douglas DeNatale, AECOM, 250 Apollo Drive, Chelmsford, MA 01824

File Name: Y:\DWP Archive\NERO\Ipswich-3144000-System Modifications-2018-06-27

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

DESCRIPTION OF PROJECT

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed an April 20, 2018 report by your hydrogeologic consultant, AECOM, which contains a site examination request and prolonged pumping test design for a proposed public supply wellfield for the Town of Ipswich Water & Sewer Division.

The Town has been investigating potential locations to supplement or replace its existing supplies, in order to provide redundancy and to minimize the use of two existing municipal wells that have elevated levels of naturally occurring manganese.

Based on 2016 test well drilling, the Town has identified a location off of Linebrook Road to site an additional public water supply source. This location, which is adjacent to Bull Brook upstream from the Town's Bull Brook Reservoir, is called the Lynch site, after a previous property owner. The parcel is now owned by the Town. AECOM estimates that a wellfield of four wells at the site could yield 300 to 400 gallons per minute (gpm). The aquifer at the site is a thin layer of gravel (4 to 6 feet thick) that is 45 to 50 feet below the ground surface. The gravel layer is overlain by a confining layer of glaciomarine clay, with fine sand and silt above that.

MassDEP representatives inspected the wellfield site on June 11, 2018. The Town parcel where the wellfield is located is presently leased for strawberry farming. Roughly 30% of the Zone I protective radius for the wellfield is cultivated fields, though not all of this area is currently in production. Additional farms are located to the north and northwest of the wellfield, outside the Zone I. Bull Brook is about 160 feet north of the nearest proposed well. The land north of Bull Brook is not owned by the Town, and is also leased for farming. This property includes a small portion of the Zone I that includes wetlands and a portion of a farm pond, but no cultivated land. Farming is also being done on Town property about 375 feet east of the wellfield, and on private property 1,000 feet south of the wellfield. A school is located 850 feet southwest of the wellfield, and athletic fields are located 850 feet east of the wellfield.

Preliminary water quality samples were collected from the wellfield at the end of an 8-hour pumping test on August 31, 2016. Total coliform bacteria were detected in the water, which AECOM attributes to contamination of the sample during the sample collection. Iron and manganese levels were below the Secondary Maximum Contaminant Levels for those metals. The water was hard, with a hardness of 134 milligrams per liter (mg/L). The pH was measured in the field as 7.9. The sodium concentration was 104 mg/L, higher than the level in any of Ipswich's current sources of water supply.

Pumping Test Proposal

Subsequent to the submittal of the AECOM April 20, 2018 report, several revisions have been made to the pumping test proposal in electronic mail between AECOM and MassDEP. This description of the pumping test design includes these revisions.

Four 8-inch test wells will be installed at the wellfield site, to serve as production wells during the test. Because the proposed withdrawal rate from the wellfield exceeds 50% of the estimated August median flow in Bull Brook, a 15-day pumping test will be conducted.

For the first 48 hours of the test, a single production well will be pumped at 300 gpm to evaluate the aquifer characteristics. After 48 hours, the pumping rate in that well will be dropped to 75 gpm, and the other three wells will begin pumping at 75 gpm each. The pumping test will then continue for another 13 days. The pumped water will be discharged to Bull Brook roughly 650 feet downstream from the wellfield, outside the Zone I. The four wells will be discharged via separate pipes, so that the pumping rate in each well can be measured, and adjusted as needed (water quality samples will therefore be a composite of samples from the four discharge lines).

After 15 days, the end-of-test water quality samples will be collected. The wells will then be turned off, and recovery measurements will be collected.

Water level measurements will be collected at 15 observation wells, and at 4 drive points along Bull Brook. Seepage meters will be installed at two of the drive points if field conditions permit. The drive point shown as DP-3 in the AECOM report will be moved farther upstream, to Linebrook Road. Two existing wells about 8,000 feet northeast of the wellfield will be used as ambient wells, and real-time data from U.S. Geological Survey groundwater monitoring network wells in Newbury and Wenham will also be used to evaluate ambient groundwater trends. MassDEP had sought to relocate one of the planned observation wells to the north side of Bull Brook, but the land owners did not grant permission for the Town to install a well on that property.

APPROVAL AND REQUIREMENTS

MassDEP **approves** the Lynch wellfield site for further testing for public water supply. MassDEP also **approves** the design of the prolonged pumping test. **Please note that this letter does not constitute approval for water production or use from the site.** Such approval will depend on the results of water quality and water quantity testing of the site, as described in *Guidelines for Public Water Systems*. Pursuant to MassDEP's authority under 310 CMR 22.04(7) to require that each supplier of water operate and maintain its system in a manner that ensures the delivery of safe drinking water to consumers, this permit is made subject to the following conditions:

1. The pumping test must accomplish the work described in AECOM's April 2018 proposal, as amended herein.

2. The pumping test must be conducted within two years of the date of this letter. After this date, a new approval will be required.

3. This office must be informed as to when the pumping test is expected to begin.

4. In addition to the proposed water quality sampling, the wellfield must be sampled at the end of the pumping test for six perfluorinated compounds via EPA Method 537: Perfluorooctanoic acid (PFOA), perfluorooctanesulfonate (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA) and Perfluorobutane sulfonate (PFBS). MassDEP is requiring that all testing of new and replacement public water supply sources include testing for perfluorinated compounds. MassDEP will accept analyses done by laboratories that were approved by the U.S. Environmental Protection Agency for Method 537 during the Unregulated Contaminant Monitoring Rule UCMR3 testing. A listing of these laboratories can be found at:

   https://www.epa.gov/sites/production/files/2016-10/documents/ucmr3-lab-approval.pdf

5. Sampling and analysis of gross beta particle activity is not required.

6. To avoid complications that have occurred on some pumping tests, please make sure that the laboratory analyzing the water quality samples is aware that 1) the samples are drinking water samples, and must be analyzed using drinking water analytical methods, detection limits, and holding times; and 2) nitrate, nitrite, and perchlorate must be included in the inorganic analyses. All laboratory water quality samples must be analyzed by laboratories certified by the Commonwealth of Massachusetts to perform these analyses.

7. A Source Final Report containing the results of the pumping test must be submitted to this office for approval, in order to continue with the permitting process for the well. Two copies of this document must be submitted, along with a MassDEP transmittal form and an application for MassDEP Permit Category BRPWS19.

8. The Source Final Report must include a surveyed site plan that includes at least the entire Zone I area, at a scale large enough to accurately show the locations of the production and observation wells relative to one another and to the property lines.

9. The Source Final Report must include an evaluation of the corrosivity of the water (using secondary contaminants such as pH, alkalinity, chloride, sulfate, and hardness) to determine the need for corrosion control treatment, including whether changes are needed to any corrosion control strategy that may already be in place for Ipswich's existing water sources.

10. The Ipswich Water & Sewer Division will need to obtain a Water Withdrawal Permit amendment in the Parker River Basin to add the Lynch Wellfield as an authorized withdrawal point on its existing permit. If you will exceed your 0.98 million gallon per day authorized withdrawal volume (average daily withdrawal over a calendar year) in the Parker River Basin as a result of the new wellfield, then a new Water Withdrawal Permit will be needed. The Water Withdrawal Permit or amendment application must be submitted at the same time as the Source Final Report; MassDEP will review the two applications concurrently. **A completed Water Conservation Questionnaire must be**

submitted as part of this application, if it has not been submitted prior to the time of application. If you have questions regarding Water Management Act permitting, please contact Julie Butler at (617) 292-5552.

11. If the final wellfield design will use individual submersible pumps in each well rather than a suction pumping system, then the pump intake depths may be no greater than 28 feet below the ground surface. (In order to be eligible for the 250 foot Zone I radius, a wellfield of wells with submersible pumps must mimic the drawdown limitation of a suction lift system.)

12. The Town does not presently own the entire Zone I protective radius for the wellfield. MassDEP will not approve construction of the permanent pumping facilities for the wellfield until the Town demonstrates that it has obtained ownership or control of the Zone I. Control of the Zone I is generally established via easement and Conservation Restriction, as described in MassDEP Drinking Water Program Policy # 94-03. The Conservation Restriction and easement language must be reviewed by MassDEP. Acquisition of water supply land or rights in land requires MassDEP approval and a public hearing.

13. The Town of Ipswich presently has zoning and non-zoning controls that meet the standards of 310 CMR 22.21(2) to protect the Zone II wellhead protection area for the Mile Lane Well. This Zone II is very similar to the estimated Zone II for the Lynch Wellfield. If the final Zone II delineation for the Lynch Wellfield includes any areas that are not part of the existing Zone II for the Mile Lane Well, then the Town must add these areas to the Zone II Groundwater Protection Areas on its Water Supply Protection District Map. MassDEP will not grant final approval to place the Lynch Wellfield on-line for public water supply until the Town demonstrates that the Zone II for the Lynch Wellfield is protected by zoning and non-zoning controls that meet the standards of 310 CMR 22.21(2).

DeNatale, Doug

From: DeNatale, Doug
Sent: Tuesday, August 21, 2018 2:49 PM
To: 'James.Persky@State.MA.US'
Cc: julie.butler@State.MA.US; Amir-Lin, Erika
Subject: Ipswich Pumping Test
Attachments: IpswAug20~21WL.pdf; NewburyOWAug21.pdf; wenhamOWAug21.pdf

Hello, Jim –

I am forwarding to you the following water-level records:

- Lynch Site pumping test records, August 19 -21
- USGS Wenham OW, Aug 20 – 21
- USGS Newbury OW, Aug 20 – 21

It appears that drawdown is beginning to reach a stable condition.

We note the following ambient changes in the last 24 hours:

- Newbury OW: 0.03-ft decline
- Wenham OW: 0.05-ft decline
- OW-13S (20 ft west of TW 13-16 in the shallow aquifer above the clay layer): 0.05-ft decline
- We do not believe MW-6 (Mitchell Road) and MW-7 (Paradise Road) are representative of ambient conditions at Lynch, based on their behavior.

Drawdown in the pumping wells or nearby test wells in 24 hours, August 20 - 21:

- TW 13-16 (2”): 0.03 ft
- TW 14-16 (8”): 0.09 ft
- TW 14-16 (2”): 0.14 ft
- TW 15-16 (2” and 8”): 0.14 ft
- TW 16-16 (2”): 0.06 ft

If we factor in a 0.04-ft ambient decline, then only TW 14-16 and TW 15-16 have yet to stabilize.

We note the following regarding TW 11-16, a possible ambient well, which is 20 feet from the existing Mile Lane Well:

- The Mile Lane Well was taken out of service on Monday, August 6, one week before the start of the pumping test.
- Water levels in TW 11-16 recovered until August 15 and began to decline on August 19
- TW 11-16 is 2,500 feet from the Lynch Site,
- TW 11-16 has declined 0.11 ft in 24 hours

The 8-inch test wells continue to pump at a combined rate of 300 to 304 gpm, each 75 to 77 gpm. As of 11 am this morning, 8 days of pumping has been completed.

We will continue to update you as the test progresses.

Please do not hesitate to contact me if you have any questions or concerns.

Doug

Douglas DeNatale
Senior Hydrogeologist
AECOM
250 Apollo Drive
Chelmsford, MA 01824
T 978-905-2100
F 978-905-2101
D 978-905-2180
Cell Phone: 617-320-8670

doug.denatale@aecom.com

DeNatale, Doug

From:	DeNatale, Doug
Sent:	Thursday, August 23, 2018 3:53 PM
To:	'James.Persky@State.MA.US'
Cc:	julie.butler@State.MA.US; Amir-Lin, Erika; Halmen, Vicki (vhalmen@ipswichutilities.org); tdemers@ipswichutilities.org
Subject:	Lynch Well Site - Ipswich
Attachments:	lynchStabilAug23~2018.pdf

Hello, Jim -

Please see the attached pumping test records for the period: Aug 21 at 1300 to Aug 23 at 1100.

Based on the readings in the 8-inch pumping wells and nearby observation wells over a 24-hour period, aquifer drawdown has stabilized throughout the pumped aquifer:

1. <u>8-inch Pumping Wells:</u>

    - TW 13-18, dd = -0.01 ft
    - TW 14-18, dd = 0.03 ft
    - TW 15-18, dd = 0.05 ft
    - TW 16-18, dd = 0.05 ft

2. <u>2-inch observation wells, distance and 24-hour drawdown:</u>

    - TW 13-16, 2 ft from 8" TW 13-16, dd = 0.04-ft
    - TW 17-16, 2 ft from 8" TW 13-16, dd = -0.02-ft
    - TW 14-16, 15 ft from 8" TW 14-16, dd = 0.04-ft
    - TW 15-16, 15 ft from 8" TW 15-16, dd = 0.05 ft
    - TW 16-16, 15 ft from 8" TW 16-16, dd = 0.04 ft

3. <u>2-inch observation wells, distance from 8" TW 16-16:</u>

    - TW 13A, 250 ft south, dd = 0.04 ft
    - TW 13B, 450 west, dd = 0.01 ft

4. <u>2-inch observation well above the clay layer, representative of ambient conditions:</u>

    - OW -13S, 25 ft NW of TW 13-16, dd = 0.02 ft, all readings within 0.06 ft over the past 46 hours

The pumping rates continue to hold constant between 75 and 77 gpm, each, and a total of about 302 to 306 gpm.

Please review the attached records, and let us know if you have any comment. Feel free to phone me to discuss.

We are planning to terminate pumping on Tuesday, August 28, as originally planned.

Thanks,
Doug

Douglas DeNatale
Senior Hydrogeologist
AECOM
250 Apollo Drive
Chelmsford, MA 01824
T 978-905-2100
F 978-905-2101
D 978-905-2180
Cell Phone: 617-320-8670

doug.denatale@aecom.com

DeNatale, Doug

From:	DeNatale, Doug
Sent:	Wednesday, September 12, 2018 3:25 PM
To:	'James.Persky@State.MA.US'; julie.butler@State.MA.US
Cc:	Amir-Lin, Erika; Halmen, Vicki (vhalmen@ipswichutilities.org); Potter, Dylan (Chelmsford); tdemers@ipswichutilities.org
Subject:	Lynch Recovery - Ipswich
Attachments:	Percent Recovery.xlsx

Tracking:

Recipient	Read
'James.Persky@State.MA.US'	
julie.butler@State.MA.US	
Amir-Lin, Erika	Read: 9/12/2018 3:53 PM
Halmen, Vicki (vhalmen@ipswichutilities.org)	
Potter, Dylan (Chelmsford)	Read: 9/12/2018 3:39 PM
tdemers@ipswichutilities.org	

Hello, Jim and Julie –

Please see attached percent water-level recovery through today, September 12.

Note that today is the 15th day of recovery.

As of today, water-levels have recovered 96 to 97%, or within 0.35- to 0.40-foot of the static water levels measured on August 13.

The water level in the ambient well on site (OW-13S) is approximately 0.50-ft lower than the static level of August 13.

We intend to take one more round of recovery measurements next week, which will complete our recovery phase measurements.

Please let us know if you have any questions or comments.

Thanks,
Doug

Douglas DeNatale
Senior Hydrogeologist
AECOM
250 Apollo Drive
Chelmsford, MA 01824
T 978-905-2100
F 978-905-2101
D 978-905-2180
Cell Phone: 617-320-8670

doug.denatale@aecom.com

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. General Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

From:

Ipswich
Conservation Commission

To: Applicant

IPSWICH WATER DPARTMENT
Name

272 HIGH STREET
Mailing Address

IPSWICH | MA | 01938
City/Town | State | Zip Code

Property Owner (if different from applicant):

Name

Mailing Address

City/Town | State | Zip Code

1. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

Title	Date
FIGURE 2 - WETLAND & RIVERFRONT RESOURCE AREAS	5/17/18

2. Date Request Filed:

JUNE 8, 2018

B. Determination

Pursuant to the authority of M.G.L. c. 131, § 40, the Conservation Commission considered your Request for Determination of Applicability, with its supporting documentation, and made the following Determination.

Project Description (if applicable):

a) INSTALLATION OF HAND DRIVEN WELL POINTS FOR PURPOSE OF DETERMINING FEASIBILITY OF THE AREA FOR TOWN WATER SUPPLY
b) TEMPORARY DISCHARGE OF DRINKING WATER QUALITY TO BULL BROOK
c) INSTALLATION OF 2-INCH DIAMETER OBSERVATION WELLS, SOME WITHIN RESOURCE AREA, & some outside of
d) INSTALLATION OF 8-INCH DIAMETER TEST PUMPING WELLS
e) INSTALLATION OF UTILITY POLE AND LINES FROM LINEBROOK FOR POWER TO THE WELLS

Project Location:

215 LINEBROOK ROAD
Street Address

IPSWICH
City/Town

29C
Assessors Map/Plat Number

003
Parcel/Lot Number

B. Determination (cont.)

The following Determination(s) is/are applicable to the proposed site and/or project relative to the Wetlands Protection Act and regulations:

Positive Determination
Note: No work within the jurisdiction of the Wetlands Protection Act may proceed until a final Order of Conditions (issued following submittal of a Notice of Intent or Abbreviated Notice of Intent) or Order of Resource Area Delineation (issued following submittal of Simplified Review ANRAD) has been received from the issuing authority (i.e., Conservation Commission or the Department of Environmental Protection).

☐ 1. The area described on the referenced plan(s) is an area subject to protection under the Act. Removing, filling, dredging, or altering of the area requires the filing of a Notice of Intent.

☐ 2a. The boundary delineations of the following resource areas described on the referenced plan(s) are confirmed as accurate. Therefore, the resource area boundaries confirmed in this Determination are binding as to all decisions rendered pursuant to the Wetlands Protection Act and its regulations regarding such boundaries for as long as this Determination is valid.

☐ 2b. The boundaries of resource areas listed below are not confirmed by this Determination, regardless of whether such boundaries are contained on the plans attached to this Determination or to the Request for Determination.

☐ 3. The work described on referenced plan(s) and document(s) is within an area subject to protection under the Act and will remove, fill, dredge, or alter that area. Therefore, said work requires the filing of a Notice of Intent.

☐ 4. The work described on referenced plan(s) and document(s) is within the Buffer Zone and will alter an Area subject to protection under the Act. Therefore, said work requires the filing of a Notice of Intent or ANRAD Simplified Review (if work is limited to the Buffer Zone).

☐ 5. The area and/or work described on referenced plan(s) and document(s) is subject to review and approval by:

Ipswich
Name of Municipality

Pursuant to the following municipal wetland ordinance or bylaw:

Ipswich Wetland Protection Bylaw
Name

Chapter XVIII
Ordinance or Bylaw Citation

B. Determination (cont.)

☐ 6. The following area and/or work, if any, is subject to a municipal ordinance or bylaw but not subject to the Massachusetts Wetlands Protection Act:

☐ 7. If a Notice of Intent is filed for the work in the Riverfront Area described on referenced plan(s) and document(s), which includes all or part of the work described in the Request, the applicant must consider the following alternatives. (Refer to the wetland regulations at 10.58(4)c. for more information about the scope of alternatives requirements):

- ☐ Alternatives limited to the lot on which the project is located.
- ☐ Alternatives limited to the lot on which the project is located, the subdivided lots, and any adjacent lots formerly or presently owned by the same owner.
- ☐ Alternatives limited to the original parcel on which the project is located, the subdivided parcels, any adjacent parcels, and any other land which can reasonably be obtained within the municipality.
- ☐ Alternatives extend to any sites which can reasonably be obtained within the appropriate region of the state.

Negative Determination

Note: No further action under the Wetlands Protection Act is required by the applicant. However, if the Department is requested to issue a Superseding Determination of Applicability, work may not proceed on this project unless the Department fails to act on such request within 35 days of the date the request is post-marked for certified mail or hand delivered to the Department. Work may then proceed at the owner's risk only upon notice to the Department and to the Conservation Commission. Requirements for requests for Superseding Determinations are listed at the end of this document.

☐ 1. The area described in the Request is not an area subject to protection under the Act or the Buffer Zone.

☒ 2. The work described in the Request is within an area subject to protection under the Act, but will not remove, fill, dredge, or alter that area. Therefore, said work does not require the filing of a Notice of Intent.

☒ 3. The work described in the Request is within the Buffer Zone, as defined in the regulations, but will not alter an Area subject to protection under the Act. Therefore, said work does not require the filing of a Notice of Intent, subject to the following conditions (if any).
pre- and post work photos by applicant; post-work inspection by Conservation Office

☐ 4. The work described in the Request is not within an Area subject to protection under the Act (including the Buffer Zone). Therefore, said work does not require the filing of a Notice of Intent, unless and until said work alters an Area subject to protection under the Act.

B. Determination (cont.)

☒ 5. The area described in the Request is subject to protection under the Act. Since the work described therein meets the requirements for the following exemption, as specified in the Act and the regulations, no Notice of Intent is required:

310 CMR 10.02(2)(b)(2)(g)
Exempt Activity (site applicable statuatory/regulatory provisions)

☐ 6. The area and/or work described in the Request is not subject to review and approval by:

Ipswich
Name of Municipality

Pursuant to a municipal wetlands ordinance or bylaw.

Ipswich Wetland Protection Bylaw
Name

Chapter XVIII
Ordinance or Bylaw Citation

C. Authorization

This Determination is issued to the applicant and delivered as follows:

☒ by hand delivery on 6/21/18
Date

☐ by certified mail, return receipt requested on
Date

This Determination is valid for **three years** from the date of issuance (except Determinations for Vegetation Management Plans which are valid for the duration of the Plan). This Determination does not relieve the applicant from complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.

This Determination must be signed by a majority of the Conservation Commission. A copy must be sent to the appropriate DEP Regional Office (see http://www.mass.gov/eea/agencies/massdep/about/contacts/find-the-massdep-regional-office-for-your-city-or-town.html) and the property owner (if different from the applicant).

Signatures:

6/20/18
Date

D. Appeals

The applicant, owner, any person aggrieved by this Determination, any owner of land abutting the land upon which the proposed work is to be done, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate Department of Environmental Protection Regional Office (see http://www.mass.gov/eea/agencies/massdep/about/contacts/find-the-massdep-regional-office-for-your-city-or-town.html) to issue a Superseding Determination of Applicability. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and Fee Transmittal Form (see Request for Departmental Action Fee Transmittal Form) as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Determination. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant if he/she is not the appellant. The request shall state clearly and concisely the objections to the Determination which is being appealed. To the extent that the Determination is based on a municipal ordinance or bylaw and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

APPENDIX B

GEOLOGIC AND WELL-CONSTRUCTION LOGS

DRILLING LOG

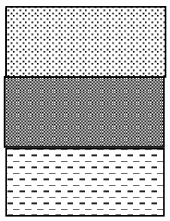
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13A
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
10-Jul-18 to 10-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	36	10" F SAND, some silt, organics, roots, trace F gravel 3" F SAND, some silt, trace C sand 23" M SAND, some F sand, little C sand	dark brown tan brown	loose loose mod. dense	moist moist moist		Sands
5		30	M SAND, some F sand, little C sand, trace F subrounded gravel, increasing gravel toward bottom of sample.	brown	mod. dense	moist		
10		33	M SAND, some F sand, trace C sand, trace F subrounded gravel.	Brown	dense	wet		
15		12	F-C GRAVEL, subrounded to rounded, some C sand, little F-M sand, trace silt.	Brown	dense	wet		
20		9	4" same as above 5" CLAY	brown grey	dense stiff	wet wet		Gravel and Sand
25								Clay

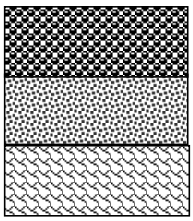
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

Grain Size		Grain-Size Proportions	
F:	Fine	**And:**	35 to 50%
M:	Medium	**Some**:	20 to 35%
C:	Coarse	**Little**:	10 to 20%
		Trace:	1 to 10%

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13A
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
10-Jul-18 to 10-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	17	CLAY, trace M-C sand at top of sample. Moderate to high plasticity.	Grey	Mod. Stiff.			Clay
30		4	F GRAVEL with C SAND, little C gravel, subangular to subrounded. Formation takes water.	Brown	Stiff			Gravel and Sand
35		0	No recovery. Formation does not take water.					
40			**Refusal at 39 feet**					
45								
50								
55								
60			OW-13A: 2" x 200-slot st/st w/w screen, 34-39' bgs 2" diam. PVC riser, 34' to ground surface bentonite seal from 20' to 10' below ground					
65								

DRILLING LOG

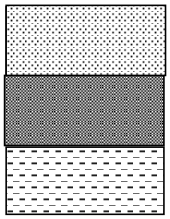
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13B
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
12-Jul-18 to 12-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	36	6" F SAND and SILT with loam, roots 5" F SAND, little silt, little F-C gravel 5" M SAND, some C, trace F-C gravel 6" M SAND, little F sand 13" F SAND	dark brown yellow-tan brown brown tan	loose	moist		Sands and Silts
5		47	24" SANDY SILT, F sand 23" F SAND, little silt	yellow-brown brown	dense	wet		
10		47	F SAND, little silt	brown	dense	wet		
15		46	11" F SILTY SAND 1" CLAY, low plasticity 2" F SILTY SAND 7" CLAY, low plasticity, lean 20" F SAND, some silt	reddish brown olive grey brown olive grey brown	dense stiff dense stiff dense	wet		
20		60	51" SILTY SAND, F sand 9" CLAY, little silt, moderate plasticity	brown olive grey	dense stiff	wet		
25								Clay

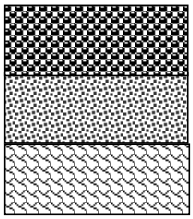
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

Grain Size
F: Fine
M: Medium
C: Coarse

Grain-Size Proportions
And: 35 to 50%
Some: 20 to 35%
Little: 10 to 20%
Trace: 1 to 10%

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13B
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
12-Jul-18 to 12-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	54	38" SILTY SAND, F sand, mottling 16" CLAYEY SILT, trace F sand 1" CLAY	brown/tan olve grey grey	dense stiff soft	wet		Sands and Silts
30		60	CLAYEY SAND, F sand	blue-grey	mod. dense	wet		Clay
35		60	43" CLAY, high plasticity 17" CLAYEY SAND, F sand	blue-grey blue-grey	mod. stiff mod. dense	wet		
40		60	CLAY, sticky, high plasticity	grey	soft	wet		
45		60	CLAY, sticky, high plasticity	grey	soft	wet		
50		60	CLAY, sticky, high plasticity	grey	soft	wet		
55		60	58" CLAY, sticky, high plasticity, becoming olive grey at 58 feet. 2" CLAYEY SAND, F-M sand, some F subangular to angular gravel	grey brown	soft dense	wet		
60		0	No recovery.					Gravel and Sand
65			**Refusal at 62 feet** OW-13B: 2" x 200-slot st/st w/w screen, 55-60' bgs 2" diam. PVC riser, 55' to ground surface bentonite seal from 20' to 10' below ground					

DRILLING LOG

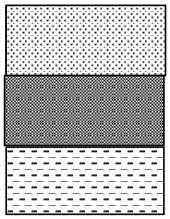
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13C
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
3-Jul-18 to 3-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	28	5" Loamy F-M SAND 9" F SAND, some M sand, trace C sand 14" F SAND, some M sand, trace C sand	dark brown yellow-orange tan	loose loose loose	moist		Sands and Silts
5		34	6" M SAND, little F sand, little C sand, trace F subrounded gravel 18" M SAND, little F sand, trace C sand 8" F SAND, little silt 5" SILT, mottled	brown brown brown light brown	mod. dense dense dense dense	moist moist wet wet		
10		60	40" SILT, occasional stringers of clay, becoming mottled with orange at 13 feet 6" CLAY 14" SILT, some clay, mottled	olive brown olive grey olive brown to grey/orange	stiff stiff stiff	wet		
15		60	14" CLAY, medium plasticity 46" CLAY, sticky, high plasticity	olive brown blue-grey	hard soft	wet		
20		60	CLAY, sticky, high plasticity	blue-grey	soft	wet		Clay
25								

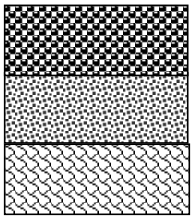
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

Grain Size	
F:	Fine
M:	Medium
C:	Coarse

Grain-Size Proportions	
And:	35 to 50%
Some:	20 to 35%
Little:	10 to 20%
Trace:	1 to 10%

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13C
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
3-Jul-18 to 3-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	60	CLAY, sticky, high plasticity, fat	grey	soft	wet		Clay
30		60	CLAY, sticky, high plasticity, fat	grey	soft	wet		
35		60	CLAY, sticky, high plasticity, fat color change to brown-grey at bottom	grey	soft	wet		
40		18	12" CLAY 6" TILL, clay/sand/silt, F-C gravel	grey brown	stiff hard	wet		Till
			Refusal at 41.5 feet					
45								
50								
55								
60			No well set.					
65								

DRILLING LOG

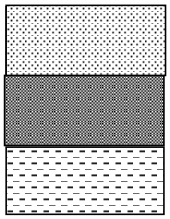
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13D
Veterans Field

DATES	Drilling Method:	Driller:	Borehole Diameter:
2-Jul-18 to 2-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	35	6" F SAND and SILT, loamy, trace F-C gravel, roots. 3" M SAND, little F, trace C, trace F gravel 26" M SAND, some F, trace C, trace F subrounded gravel	dark brown brown brown	loose loose mod. dense	moist		Sands and Silts
5		55	28" M SAND, some F sand, little C sand 3" SILTY CLAY, lean 24" SILTY SAND, F sand	reddish brown brown light brown	dense stiff stiff	wet		
10		51	6" CLAY, trace silt, lean 31" F SAND, little silt 14" SILTY SAND, mottled	brown reddish brown brown to grey	stiff stiff stiff	wet		
15		60	SILTY SAND with CLAY, interbedded, lenses of clayey sand and sandy clay. F sands.	grey	stiff	wet		Clay
20		60	CLAY, sticky, fat, expansive.	grey-blue	soft	wet		
25								

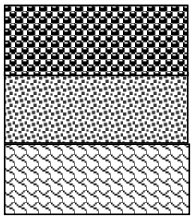
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

Grain Size		Grain-Size Proportions	
F:	Fine	**And:**	35 to 50%
M:	Medium	**Some**:	20 to 35%
C:	Coarse	**Little**:	10 to 20%
		Trace:	1 to 10%

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13D
Veterans Field

DATES	Drilling Method:	Driller:	Borehole Diameter:
2-Jul-18 to 2-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	60	CLAY, sticky, fat.	grey-blue	soft	wet		Clay
30		60	CLAY, sticky, fat.	grey-blue	soft	wet		
35		60	CLAY, sticky, fat.	grey-blue	soft	wet		
40		60	CLAY, sticky, fat.	grey-blue	soft	wet		
45		60	57" Same as above. 3" CLAY, F-C sand, F-C subrounded to subangular gravel, sticky. Drilling slows down around 48 feet	grey-blue brown	soft mod. stiff	wet		
50		16	16" TILL, clay/silt/sand matrix slow drilling	brown	hard	wet		Till
55			**Refusal at 52 feet**					
60			OW-13D: 2" x 10-slot PVC screen, 9-14' bgs 2" diam. PVC riser, 9' to ground surface bentonite seal from 5-8' below ground					
65								

DRILLING LOG

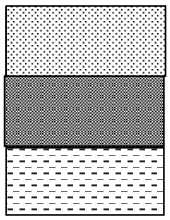
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13F
Doyon School

DATES	Drilling Method:	Driller:	Borehole Diameter:
29-Jun-18 to 29-Jun-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	51	8" F loamy sand, roots, organic-rich 12" F SAND, some silt, trace C sand 7" SILT 15" M SAND, little F, trace C 9" C SAND, some M, little F	dark brown yellow-orange tan brown brown	loose dense stiff dense dense	moist		Sands and Silts
5		51	38" M SAND, little C, little F, trace F gravel 13" F-C GRAVEL, subangular to angular, some C sand, little F sand, silt	brown brown to grey	dense extrm. dense	moist		
10								Gravel and Sand
		55	TILL, silt/clay/F sand matrix, angular to subangular F-C gravel clasts, some C sand. 12-13 feet - CLAY	brown brown	extrm. dense stiff	wet		Till
15		31	19" TILL, same as above. 12" F-C GRAVEL, subangular to subrounded, some C sand, little F-M sand, trace silt.	brown brown	dense dense	wet		
20								Gravel and Sand
		18	12" same as above, GRAVEL, up to 4" 10" TILL, sand/silt matrix.			wet		Till
			Refusal at 22 feet					
25								

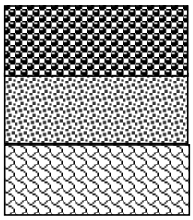
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

OW-13F:
2" x 20-slot PVC screen, 19-22' bgs
2" diam. PVC riser, 19' to ground surface
bentonite seal from 10-15' below ground

Grain Size
F: Fine
M: Medium
C: Coarse

Grain-Size Proportions
And: 35 to 50%
Some: 20 to 35%
Little: 10 to 20%
Trace: 1 to 10%

DRILLING LOG

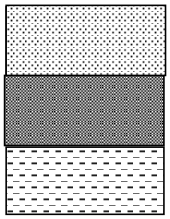
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13G
Doyon School

DATES	Drilling Method:	Driller:	Borehole Diameter:
28-Jun-18 to 29-Jun-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	50	17" F SAND, little silt, trace F-C gravel. 15" F SAND, trace M sand. 9" M SAND, little F sand, some F-C subangular gravel. 7" M SAND, little F, trace C, trace F gravel	dark brown tan brown tan	dense dense dense dense	moist		Sands
5		47	7" M SAND, little F, trace C, tracle F gravel. 12" F SAND, little M, trace F gravel. 22" M SAND, some F, trace F gravel.	brown brown brown	dense dense dense	wet		
10		48	34" M SAND, little F, trace C. 14" M SAND, little C, trace F, some F-C subrounded gravel.	brown brown	dense dense	wet		
15		54	8" same as above, sand and gravel. 40" SILTY SAND, F sand. 6" SILTY SAND, F sand, trace clay.	brown brown to tan grey-blue	dense dense dense	wet		Sands and Silts
20		60	SILTY SAND, F sand, trace clay, intermittent clay stringers	grey-blue	dense	wet		
25								

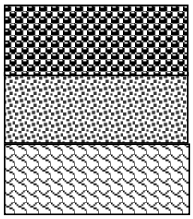
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

Grain Size
F: Fine
M: Medium
C: Coarse

Grain-Size Proportions
And: 35 to 50%
Some: 20 to 35%
Little: 10 to 20%
Trace: 1 to 10%

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13G
Doyon School

DATES	Drilling Method:	Driller:	Borehole Diameter:
28-Jun-18 to 29-Jun-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	60	SILTY SAND, F sand, trace clay, intermittent clay stringers	grey-blue	dense	wet		Sands and Silts
30		60	24" CLAYEY SAND, F sand 36" CLAY, sticky, plastic	grey-blue grey-blue	soft	wet		Clay
35		60	CLAY, sticky, plastic. Intervals of clayey sand.	grey-blue	soft	wet		
40		60	CLAY, sticky, plastic.	grey-blue	soft	wet		
45		60	CLAY, sticky, plastic.	grey-blue	mod. soft	wet		
50		12	CLAY, sticky plastic.	grey-blue	mod. soft	wet		
			Refusal at 51 feet					
55								
60			OW-13G: 2" x 20-slot PVC screen, 11-16' bgs 2" diam. PVC riser, 11' to ground surface bentonite seal from 7-10' below ground					
65								

DRILLING LOG

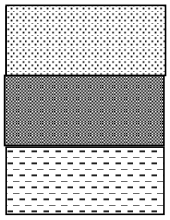
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13H
Doyon School

DATES	Drilling Method:	Driller:	Borehole Diameter:
27-Jun-18 to 28-Jun-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	48	10" loamy F SAND, silt, trace F-C gravel 6" F SAND with SILT, trace C, trace F gravel. 19" F SAND, little M, trace C, trace F-C gravel. 10" F SAND, trace M, clean.	dark brown yellow-orange brown light brown	loose loose mod. Dense	dry moist moist moist		Sands
5		52	14" M SAND, some F, trace C, trace F-C subrounded gravel. 18" F SAND, clean. 16" F SAND, clean.	brown brown light brown	dense dense dense	moist		
10		52	13: M SAND, some F, trace C, striated Fe staining. 6" SILT, mottled. 13" F SAND, little silt. 15" SILT, trace F sand, mottled.	reddish brown grey-brown brown brown-grey	dense stiff dense stiff	wet		
15		47	22" M SAND, some F, little C, trace F-C subrounded to subangular gravel. 25" F SAND, some M, trace C, little silt, trace F subrounded gravel.	brown light reddish brown	dense dense	wet		
20		55	14" SAND, M sand, some F sand. 33" F SAND, little M sand. 8" Interlayered SILT and SAND, F sand.	brown reddish brown brown to grey	dense dense stiff	wet		
25								Silty and Clayey Sands

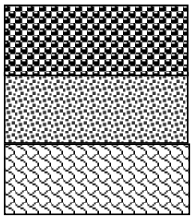
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

Grain Size	
F:	Fine
M:	Medium
C:	Coarse

Grain-Size Proportions	
And:	35 to 50%
Some:	20 to 35%
Little:	10 to 20%
Trace:	1 to 10%

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13H
Doyon School

DATES	Drilling Method:	Driller:	Borehole Diameter:
27-Jun-18 to 27-Jun-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	55	25" SILTY SAND, F sand. 30" CLAYEY SAND, F sand.	brown to tan blue-grey	dense dense	wet		Silty and Clayey Sands
30		57	CLAY and SAND, F sand. Sandier near bottom.	blue-grey	dense	wet		
35		59	12" CLAYEY SAND, F sand, some silt. 14" CLAY and SAND, liquefies easily. 21" CLAY, sticky, high plasticity. 12" CLAYEY SAND, F sand, some silt.	blue-grey blue-grey blue-grey blue-grey	dense dense soft dense	wet		
40		60	CLAY, sticky, high plasticity, fat.	blue-grey	soft	wet		Clay
45		36	CLAY, sticky, high plasticity, fat. abrupt refusal, chips of granite on shoe, likely bedrock.	blue-grey	soft	wet		
			Refusal at 48 feet					
50								
55								
60								
65			OW-13H: 2" x 20-slot PVC screen, 19-24' bgs 2" diam. PVC riser, 19' to ground surface bentonite seal from 15-18' below ground					

DRILLING LOG

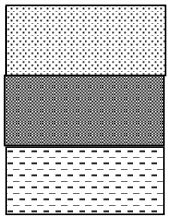
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13K
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
11-Jul-18 to 11-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	39	9" loamy SILT and F SAND, organics. 13" F SAND and SILT, trace C sand. 12" M SAND, little F, trace C. 5" M SAND, little C, trace F, little F-C subangular to angular gravel.	dark brown yellowish brown light brown brown	loose loose mod. Dense	moist		Sands
5		33	12: M SAND, little C, trace F, little F-C subangular to angular gravel. 21" M SAND, some C, trace F, litle F-C subangular gravel.	brown brown	dense dense	wet		
10		25	11" Same as above. 14" C SAND, some M, trace F, trace F subangular to angular gravel.	brown brown	dense dense	wet		
15		41	23" F SAND, little M, trace silt. 18" SILT, little fine sand.	brown orangey-brown	dense stiff	wet		
20		60	Interbedded SILT and CLAY.	brown to reddish brown	stiff	wet		Silts and Sands
25								

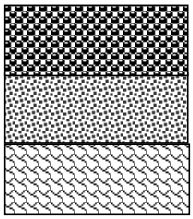
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

Grain Size
F: Fine
M: Medium
C: Coarse

Grain-Size Proportions
And: 35 to 50%
Some: 20 to 35%
Little: 10 to 20%
Trace: 1 to 10%

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13A
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
10-Jul-18 to 10-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	60	33" F SILTY SAND. 27" F SILTY SAND.	brown brown	dense dense	wet		Silts and Sands
30		52	SANDY SILT interlayered with SILTY SAND, F sand.	grey to grey-blue	dense	wet		
35		60	CLAY, sticky, high plasticity.	grey	soft	wet		Clay
40		60	CLAY, sticky, high plasticity.	grey	soft	wet		
45		60	CLAY, sticky, high plasticity. change to olive grey in last foot, some silt stringers, more stiff.	grey	soft	wet		
50		12	TILL, silt/clay matrix, F-C sand, F-C angular gravel.	brown to grey	hard	wet		
55								Till
			Refusal at 55 feet					
60			OW-13K: 2" x 20-slot PVC screen, 11-16' bgs 2" diam. PVC riser, 11' to ground surface bentonite seal from 5-19' below ground					
65								

DRILLING LOG

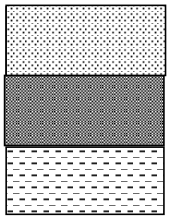
Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13L
Linebrook Road

DATES	Drilling Method:	Driller:	Borehole Diameter:
13-Jul-18 to 13-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	43	7" SILTY SAND, F sand, loamy. Topsoil. 20" SAND, F sand, trace M sand, trace C sand, trace F subrounded to subangular gravel, little silt. 16" SAND, F sand. Clean.	dark brown yellow-brown brown	loose loose loose	dry moist moist		Sands
5		38	4" SAND, F sand. Clean 21" SAND, F sand, little M, trace C, one pc. F subangular gravel. Fe stain. 13" SILT. Mottled.	brown brown olive brown/ grey	dense dense stiff	moist moist wet		
10		60	7" SILT. Mottled. 36" CLAY, low plasticity. 17" CLAY, moderate plasticity.	olivebrown/grey olive brown grey	stiff	wet		
15		53	CLAY, moderate plasticity, lean.	blue-grey	stiff	wet		Clay
20		50	CLAY, sticky, high plasticity.	blue-grey	stiff	wet		
25								

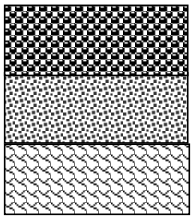
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

Grain Size
F: Fine
M: Medium
C: Coarse

Grain-Size Proportions
And: 35 to 50%
Some: 20 to 35%
Little: 10 to 20%
Trace: 1 to 10%

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

SITE: OW-13L
Linebrook Road

DATES	Drilling Method:	Driller:	Borehole Diameter:
13-Jul-18 to 13-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	60	58" CLAY, stiff, high plasticity, sticky. Color change to olive grey at 27 feet and to olive brown at 28 feet. 2" TILL, stony, F-C angular gravel in clay matrix.	blue-grey brown	stiff ext. dense	wet		Clay
30		36	24" TILL, F-C sand and clay matrix with F angular gravel. 12" deeply weathered bedrock.	brown reddish brown	ext. dense	wet		Till
			Refusal at 33 feet					
35								
40								
45								
50								
55								
60			No well set.					
65								

DRILLING LOG

Prepared by: E. Amir-Lin
AECOM
Chelmsford, MA

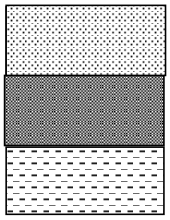
SITE: OW-13S
Lynch Property

DATES	Drilling Method:	Driller:	Borehole Diameter:
12-Jul-18 to 12-Jul-18	Geoprobe 7822 Direct Push	Maher Services	3" diam. Borehole; 2" diam. soil core

Depth, feet	Sample	Recovery, inches	Sample Description	Color	Density	Moisture	Graphic Log	Interpretation
	Sampled Continuously	31	2" SILTY SAND, F sand, loam, roots 17" F SAND, trace C sand, trace gravel 3" F GRAVEL, some F sand, little M. 9" F SAND, little silt.	dark brown yellow-brown brown light brown	loose loose loose mod. dense	dry moist		Sands
5		47	36" F SAND, little silt, same as above. 11" F SAND, little M sand.	light brown brown	mod. dense dense	moist		
10		60	18" F SAND, little M sand. 42" SANDY SILT, F sand, mottled.	brown brown	dense stiff	wet		Silts and silty sands
15		60	11" F SAND, little silt. 12" CLAY, low plasticity. 37" F SAND with SILT, mottled	reddish brown olive grey brown	dense stiff stiff	wet		
20		60	14" CLAY 31" SILTY SAND, F sand 8" CLAYEY SAND, F sand 7" CLAY, sticky, high plasticity	olive grey brown blue-grey blue-grey	stiff dense stiff soft	wet		
25								Clay

Bottom of boring at 25 feet

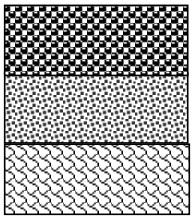
Key to symbols used in graphic log



Fine, Fine to Medium, or Fine to Coarse Sands

Sandy Silt, Silty Sand or Silt

Clay or Silty Clay



Gravel and Sand

Sand and Gravel

Till

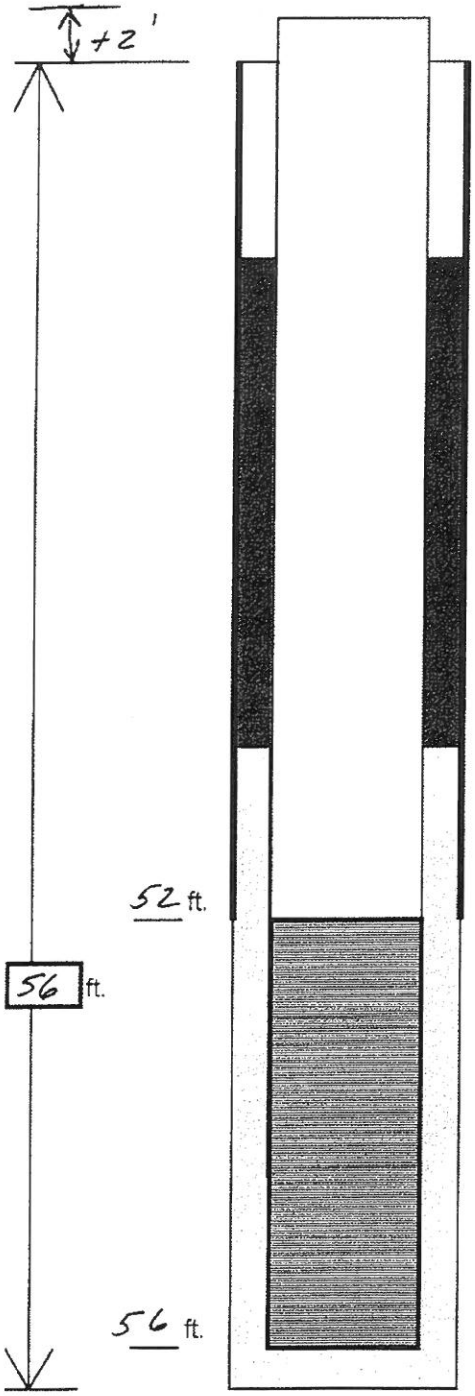
OW-13S:
2" x 20-slot PVC screen, 20-25' bgs
2" diam. PVC riser, 20' to ground surface
bentonite seal from 15-18' below ground

Grain Size
F: Fine
M: Medium
C: Coarse

Grain-Size Proportions
And: 35 to 50%
Some: 20 to 35%
Little: 10 to 20%
Trace: 1 to 10%

Maher Services, Inc.
71 Concord St.
N Reading, MA 01864

978-664-WELL
Fax 978-664-9356



WELL CONSTRUCTION LOG

Well # 13 **Job #:** 3361
Project Ipswich MA
Location Lynch Site
LAT: ____ ____ " **LON:** ____ . ____ "
Driller: AG Proctor
Installation Dates 7-19-18
Static Water Level 7.4 ft.
Drilling Method Dual Rotary
Borehole Advanced using: 8"

Well Details	
Diameter	8"
Total Depth	56
Comp. Depth	56
Casing Left	52
Screen	
Diameter	8" TEIE
Length	4'
Material	S.S
Slot Size	.250
Development\Pumping	
Method	Pump and Surge
Hours	
GPM	
VAC	
Spec. Cap.	

Quantities of Materials(Piece/Bag)		
SiLi Beads		Bags
Sand		Bags
Chips		Bags
Cement		Bags
Volclay		Bags
Lck Plug		each
Pro. Cvr.		each
Gate Box		each
Sakrete		bags

Remarks:

OVER All SCREEN LENGTH 7.65
5' slotted 2' Tight wind .65 Fig-K
with Bail Bottom

Well Construction Diagram

Lynch Site
Ipswich, Massachusetts

Well ID: 13
GPS Coordinates: N W
Ground Elevation: feet
Static Water Level, ft, bgs 7.4

Date Well Installed (mm/dd/yyyy): 7-19-18
Contractor: MAHER SERVICES
Driller Name: AG PROCTOR
MA Certificate #: 839

Drilling Method Used: DUAL ROTARY

Drilling Additives Used: WATER

Source of water: TEST WELL # 13

Borehole Dimension: Hole ø

Depth:	ft	8	in.
Depth:	ft		in.
Depth:	ft		in.

Temporary Well Casing: OD/ID, in.

Depth Range:	ft	
Depth Range:	ft	
Depth Range:	ft	
Depth Range:	ft	

Well screen, depth, below ground
Top: 52 ft
Bottom: 56 ft

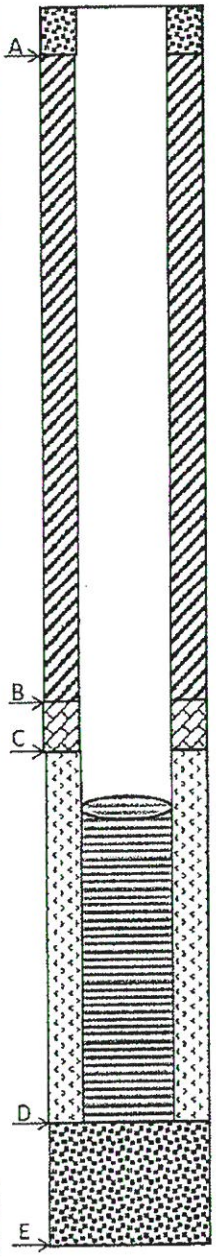
Well seal, depth:
A. Top: ft
B. Bottom: ft

Transition pack, depth:
B. Top: ft
C. Bottom: ft

Artificial filter pack, depth:
C. Top: ft
D. Bottom: ft

Backfill below filter pack, depth:
D Top: ft
E. Bottom: ft
Total Depth: ft

Centralizers:
Material:
Depths, ft:



Pitless Well Unit
Manufacturer:
Product Name:

Well casing above ground
2 ft

Well seal
Product/Material:
Volume: cf

Transition Pack
Material:
Volume: cf

Filter Pack
Manufacturer:
Material:
Gradation:
Volume: cf
Placement Method:

Permanent Well casing
Manufacturer:
Material: M/S
Depth: 52 O.D./I.D. 8"

Well Screen
Manufacturer: JOHNSON
Screen Type: 8" TELE.
Screen Material: S.S.
Slot size: .250 in.
Slotted length: 4 ft
Diameter: 6 3/4" Id in.
Transmitting Capacity ft/sec

Backfill material (below filter pack)
Material:
Volume cf

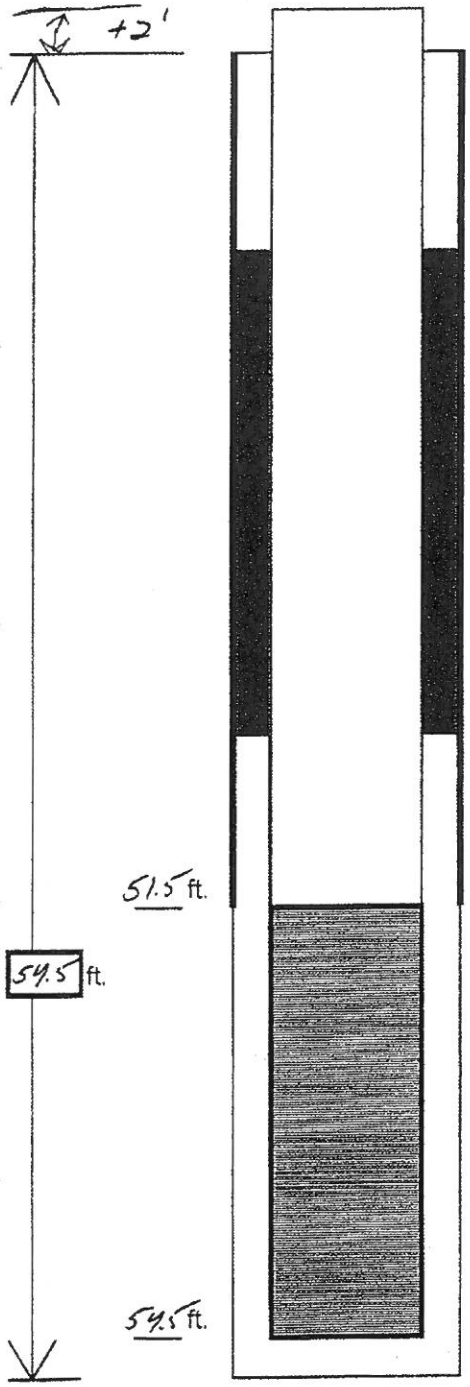
Comments/Notes: OPEN ALL LENGTH OF SCREEN 7.65' 5' SLOTTED 2' TIGHT WIND .65 FIG-K WITH BAIL BOTTOM

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Name, Date:

Maher Services, Inc.
71 Concord St.
N Reading, MA 01864

978-664-WELL
Fax 978-664-9356



WELL CONSTRUCTION LOG

Well # 14 Job #: 3361
Project Ipswich MA
Location Lynch Site
LAT: ___.___" LON: ___.___"
Driller: AG Proctor
Installation Dates 7-19-18
Static Water Level 7.25 ft.
Drilling Method Dual Rotary
Borehole Advanced using: 8"

Well Details	
Diameter	8"
Total Depth	54.5
Comp. Depth	54.5
Casing Left	51.5
Screen	
Diameter	8" TEIC
Length	3
Material	S.S
Slot Size	.250
Development\Pumping	
Method	Pump and Surge
Hours	13
GPM	223
VAC	
Spec. Cap.	21

Quantities of Materials(Piece/Bag)		
SiLi Beads		Bags
Sand		Bags
Chips		Bags
Cement		Bags
Volclay		Bags
Lck Plug		each
Pro. Cvr.		each
Gate Box		each
Sakrete		bags

Remarks:

OVERALL SCREEN LENGTH 7.65
5' SLOTTED 2' TIGHT WIND .65 Fig-K
with BAIL BOTTOM

Well Construction Diagram

Lynch Site
Ipswich, Massachusetts

Well ID: 14
Ground Elevation: feet
GPS Coordinates: N W
Static Water Level, ft, bgs 7.25

Date Well Installed (mm/dd/yyyy): 7-19-18
Contractor: MAHER SERVICES
Driller Name: A G PROCTOR
MA Certificate #: 839

Drilling Method Used: DUAL ROTARY

Drilling Additives Used: WATER

Source of water: TEST WELL #13

Borehole Dimension: Hole ø

Depth:	ft	8	in.
Depth:	ft		in.
Depth:	ft		in.

Temporary Well Casing: OD/ID, in.

Depth Range:	ft	
Depth Range:	ft	
Depth Range:	ft	
Depth Range:	ft	

Well screen, depth, below ground
Top: 51.5 ft
Bottom: 54.5 ft

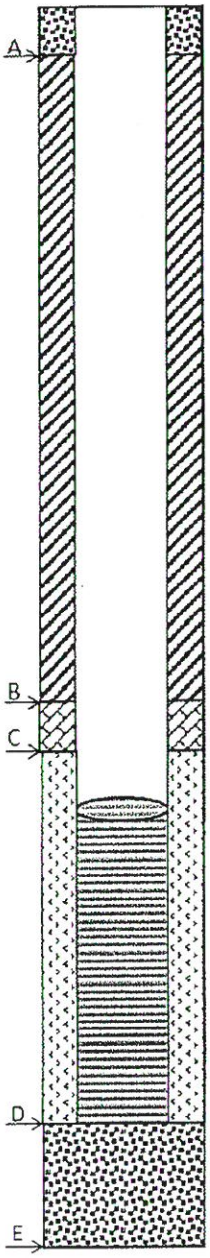
Well seal, depth:
A. Top: ft
B. Bottom: ft

Transition pack, depth:
B. Top: ft
C. Bottom: ft

Artificial filter pack, depth:
C. Top: ft
D. Bottom: ft

Backfill below filter pack, depth:
D Top: ft
E. Bottom: ft
Total Depth: ft

Centralizers:
Material:
Depths, ft:



Pitless Well Unit
Manufacturer:
Product Name:

Well casing above ground
2 ft

Well seal
Product/Material:
Volume: cf

Transition Pack
Material:
Volume: cf

Filter Pack
Manufacturer:
Material:
Gradation:
Volume: cf
Placement Method:

Permanent Well casing
Manufacturer:
Material: M/S
Depth: 51.5 O.D./I.D. 8"

Well Screen
Manufacturer: JOHNSON
Screen Type: 8" TELE
Screen Material: S.S
Slot size: .250 in.
Slotted length: 3 ft
Diameter: 6 3/4" Id in.
Transmitting Capacity ft/sec

Backfill material (below filter pack)
Material:
Volume cf

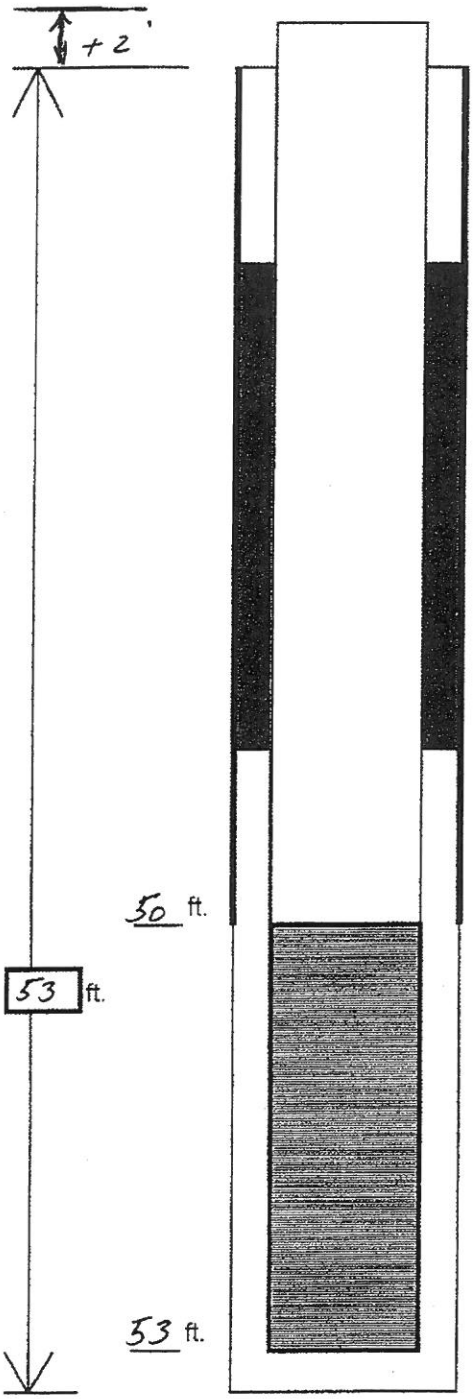
Comments/Notes: OVER ALL LENGTH OF SCREEN 7.65' 5' SLOTTED
2' TIGHT WIND .65 FIG-K WITH BAIL BOTTOM

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Name, Date:

Maher Services, Inc.
71 Concord St.
N Reading, MA 01864

978-664-WELL
Fax 978-664-9356



WELL CONSTRUCTION LOG

Well # 15 **Job #:** 3361
Project Ipswich MA
Location Lynch Site
LAT: ___ ___ " **LON:** ___ . ___ "
Driller: A6 Proctor
Installation Dates 7-20-18
Static Water Level 7.5 **ft.**
Drilling Method Dual Rotary
Borehole Advanced using: 8"

Well Details	
Diameter	8"
Total Depth	53
Comp. Depth	53
Casing Left	50
Screen	
Diameter	8" TELC.
Length	4
Material	S.S.
Slot Size	.250
Development\Pumping	
Method	Pump and Surge
Hours	12
GPM	243
VAC	
Spec. Cap.	31

Quantities of Materials(Piece/Bag)		
SiLi Beads		Bags
Sand		Bags
Chips		Bags
Cement		Bags
Volclay		Bags
Lck Plug		each
Pro. Cvr.		each
Gate Box		each
Sakrete		bags

Remarks:

OVER All SCREEN LENGTH 7.65
5' SlOTTEd 2' Tight wind .65 Fig-K
with BAIl BOTTOM

Well Construction Diagram

Lynch Site
Ipswich, Massachusetts

Well ID: 15
Ground Elevation: feet
GPS Coordinates: N W
Static Water Level, ft, bgs 7.50

Date Well Installed (mm/dd/yyyy): 7-20-18
Contractor: MAHER SERVICES
Driller Name: AC PROCTOR
MA Certificate #: 839

Drilling Method Used: DUAL ROTARY

Drilling Additives Used: WATER

Source of water: TEST WELL # 13

Borehole Dimension: Hole ø

Depth:	ft	8	in.
Depth:	ft		in.
Depth:	ft		in.

Temporary Well Casing: OD/ID, in.

Depth Range:	ft	
Depth Range:	ft	
Depth Range:	ft	
Depth Range:	ft	

Well screen, depth, below ground
Top: 50 ft
Bottom: 53 ft

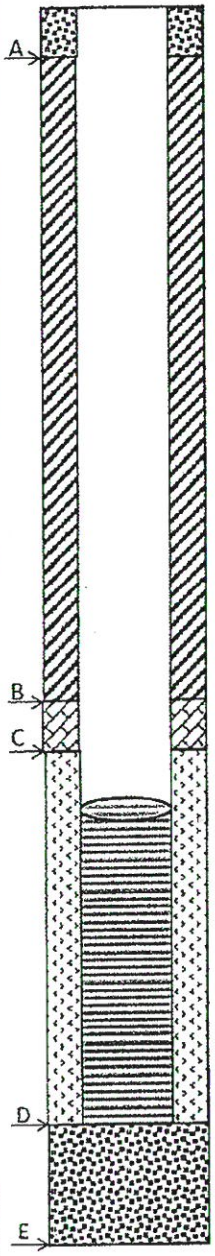
Well seal, depth:
A. Top: ft
B. Bottom: ft

Transition pack, depth:
B. Top: ft
C. Bottom: ft

Artificial filter pack, depth:
C. Top: ft
D. Bottom: ft

Backfill below filter pack, depth:
D Top: ft
E. Bottom: ft
Total Depth: ft

Centralizers:
Material:
Depths, ft:



Pitless Well Unit
Manufacturer:
Product Name:

Well casing above ground
2 ft

Well seal
Product/Material:
Volume: cf

Transition Pack
Material:
Volume: cf

Filter Pack
Manufacturer:
Material:
Gradation:
Volume: cf
Placement Method:

Permanent Well casing
Manufacturer:
Material: M/S
Depth: 50 O.D./I.D. 8"

Well Screen
Manufacturer: JOHNSON
Screen Type: 8" TELE
Screen Material: S.S.
Slot size: .250 in.
Slotted length: 3 ft
Diameter: 6 3/4" Id in.
Transmitting Capacity ft/sec

Backfill material (below filter pack)
Material:
Volume cf

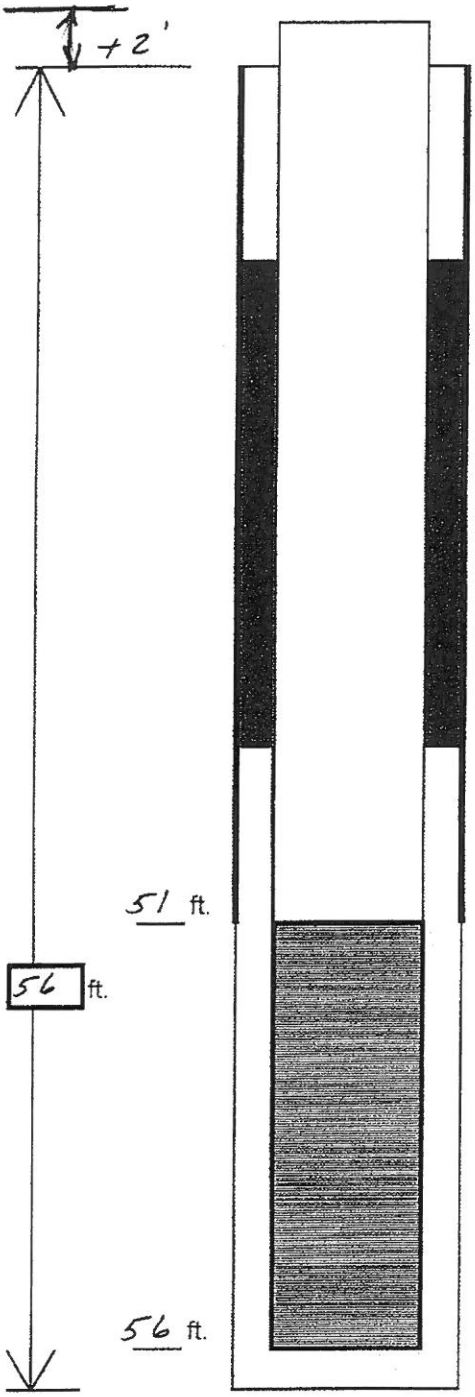
Comments/Notes: OVERALL LENGTH OF SCREEN 7.65' 5' SLOTTED 2' TightWind .65 Fig-K with Bail Bottom

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Name, Date:

Maher Services, Inc.
71 Concord St.
N Reading, MA 01864

978-664-WELL
Fax 978-664-9356



WELL CONSTRUCTION LOG

Well # 16 Job #: 3361
Project Ipswich MA
Location Lynch Site
LAT: ___ ___ " LON: ___ ___ "
Driller: AG Proctor
Installation Dates 7-17-18
Static Water Level 6.9 ft.
Drilling Method Dual Rotary
Borehole Advanced using: 8"

Well Details	
Diameter	8"
Total Depth	56
Comp. Depth	56
Casing Left	51
Screen	
Diameter	8" Tele
Length	5
Material	S.S
Slot Size	.250
Development\Pumping	
Method	Pump and Surge
Hours	13.5
GPM	230
VAC	
Spec. Cap.	21

Quantities of Materials(Piece/Bag)		
SiLi Beads		Bags
Sand		Bags
Chips		Bags
Cement		Bags
Volclay		Bags
Lck Plug		each
Pro. Cvr.		each
Gate Box		each
Sakrete		bags

Remarks:

Well Construction Diagram

Lynch Site
Ipswich, Massachusetts

Well ID: 16
Ground Elevation: feet
GPS Coordinates: N W
Static Water Level, ft, bgs 6.9

Date Well Installed (mm/dd/yyyy): 7-17-18
Contractor: MAHER SERVICES
Driller Name: A G PROCTOR
MA Certificate #: 839

Drilling Method Used: DUAL ROTARY

Drilling Additives Used: WATER

Source of water: TEST WELL # 13

Borehole Dimension: Hole ø

Depth:	ft	8	in.
Depth:	ft		in.
Depth:	ft		in.

Temporary Well Casing: OD/ID, in.

Depth Range:	ft	
Depth Range:	ft	
Depth Range:	ft	
Depth Range:	ft	

Well screen, depth, below ground
Top: 51 ft
Bottom: 56 ft

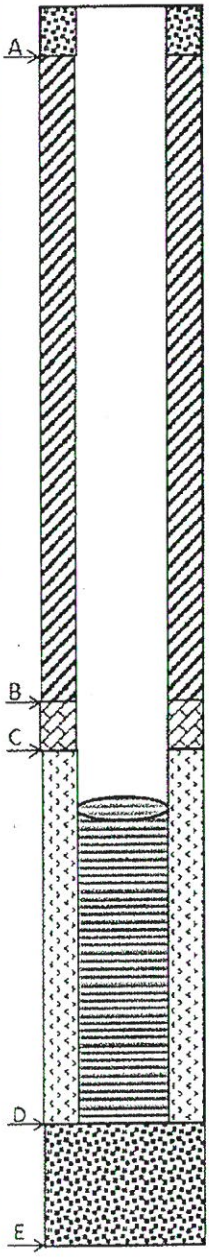
Well seal, depth:
A. Top: ft
B. Bottom: ft

Transition pack, depth:
B. Top: ft
C. Bottom: ft

Artificial filter pack, depth:
C. Top: ft
D. Bottom: ft

Backfill below filter pack, depth:
D Top: ft
E. Bottom: ft
Total Depth: ft

Centralizers:
Material:
Depths, ft:



Pitless Well Unit
Manufacturer:
Product Name:

Well casing above ground
2 ft

Well seal
Product/Material:
Volume: cf

Transition Pack
Material:
Volume: cf

Filter Pack
Manufacturer:
Material:
Gradation:
Volume: cf
Placement Method:

Permanent Well casing
Manufacturer:
Material: M/S
Depth: 51 O.D./I.D. 8"

Well Screen
Manufacturer: Johnson
Screen Type: 8" TELE
Screen Material: S.S.
Slot size: .250 in.
Slotted length: 5 ft
Diameter: 6 3/4" Id in.
Transmitting Capacity ft/sec

Backfill material (below filter pack)
Material:
Volume cf

Comments/Notes: OVERALL LENGTH OF SCREEN 7.65' 5' SLOTTED 2' Tight wind .65 Fig. K with Bail Bottom

I hereby certify that the information on this form is true and correct to the best of my knowledge.

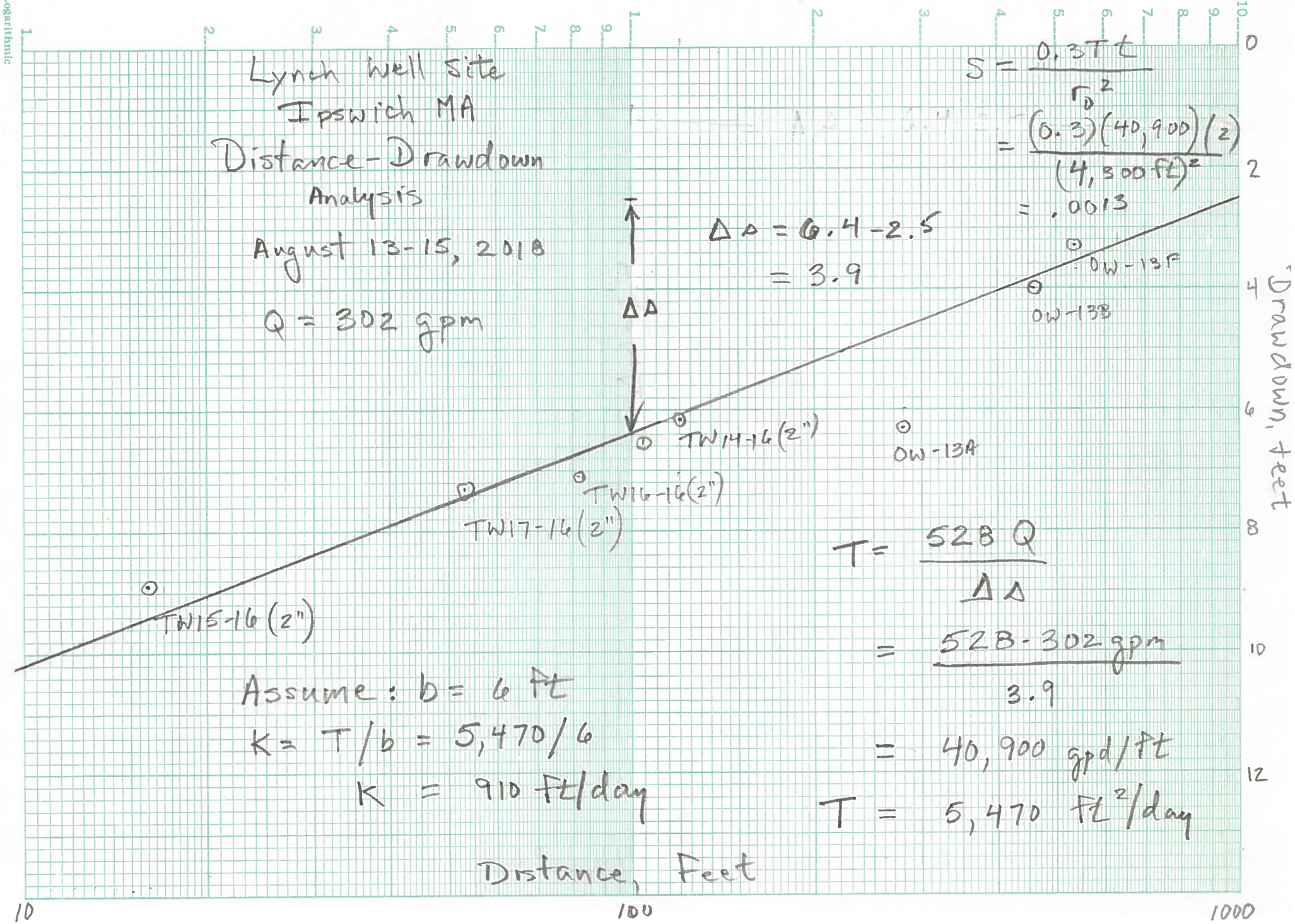
Signature: Name, Date:

APPENDIX C
DRAWDOWN CURVES

Semi-Logarithmic
2 Cycles x 10 to the inch

Lynch Well Site
Ipswich MA
Distance-Drawdown
Analysis
August 13-15, 2018

Q = 302 gpm

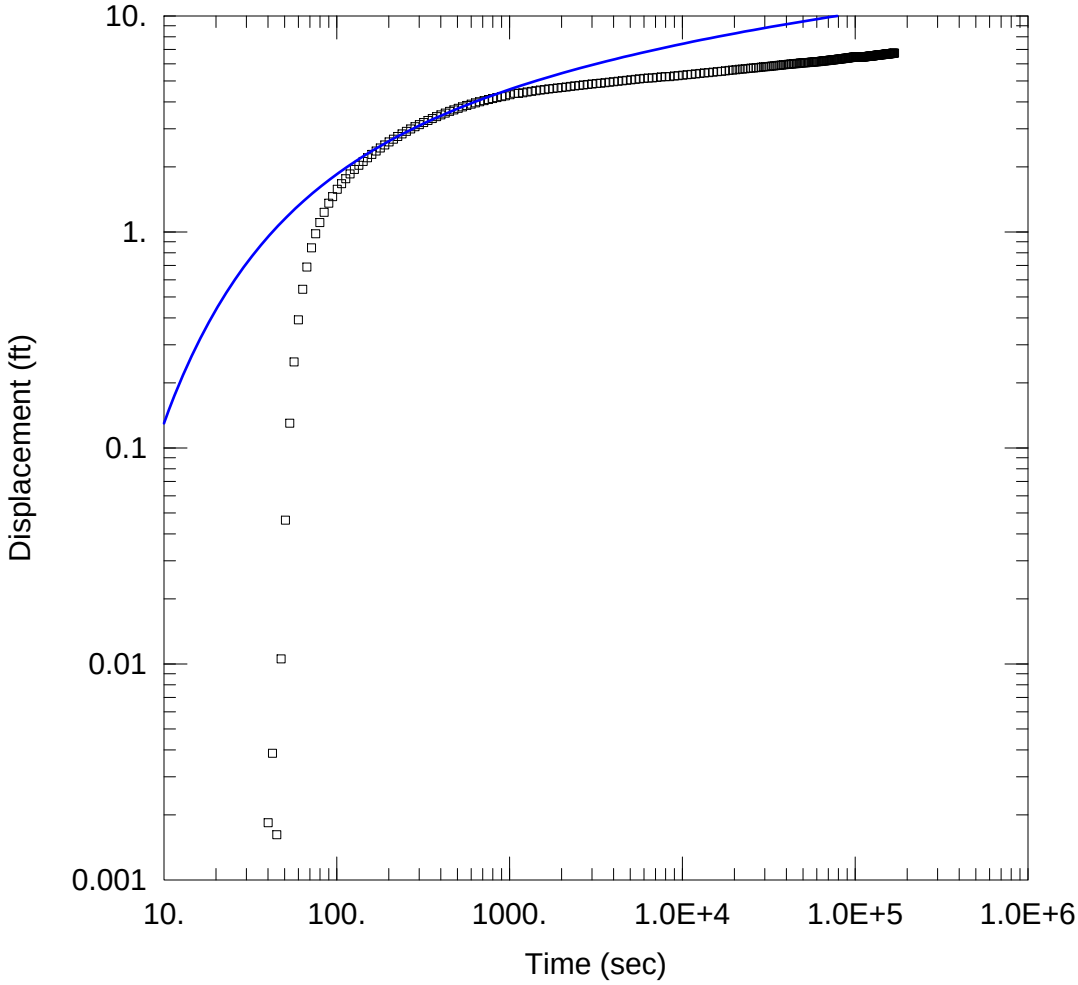


$\Delta D = 6.4 - 2.5$
$= 3.9$

$$S = \frac{0.3 T t}{r_D^2}$$
$$= \frac{(0.3)(40{,}900)(2)}{(4{,}300\ ft)^2}$$
$$= .0013$$

$$T = \frac{528\ Q}{\Delta D}$$
$$= \frac{528 \cdot 302\ gpm}{3.9}$$
$$= 40{,}900\ gpd/ft$$
$$T = 5{,}470\ ft^2/day$$

Assume: b = 6 ft
K = T/b = 5,470/6
K = 910 ft/day



48-HOUR PUMPING TEST

Data Set: \...\OW-13A 48 Hour.aqt
Date: 12/18/18 Time: 13:59:49

PROJECT INFORMATION

Company: AECOM
Client: Town of Ipswich
Project: 60567459
Location: Ipswich, MA
Test Well: TW-15-8 inch
Test Date: 8/13/18

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-15-8 inch	0	0

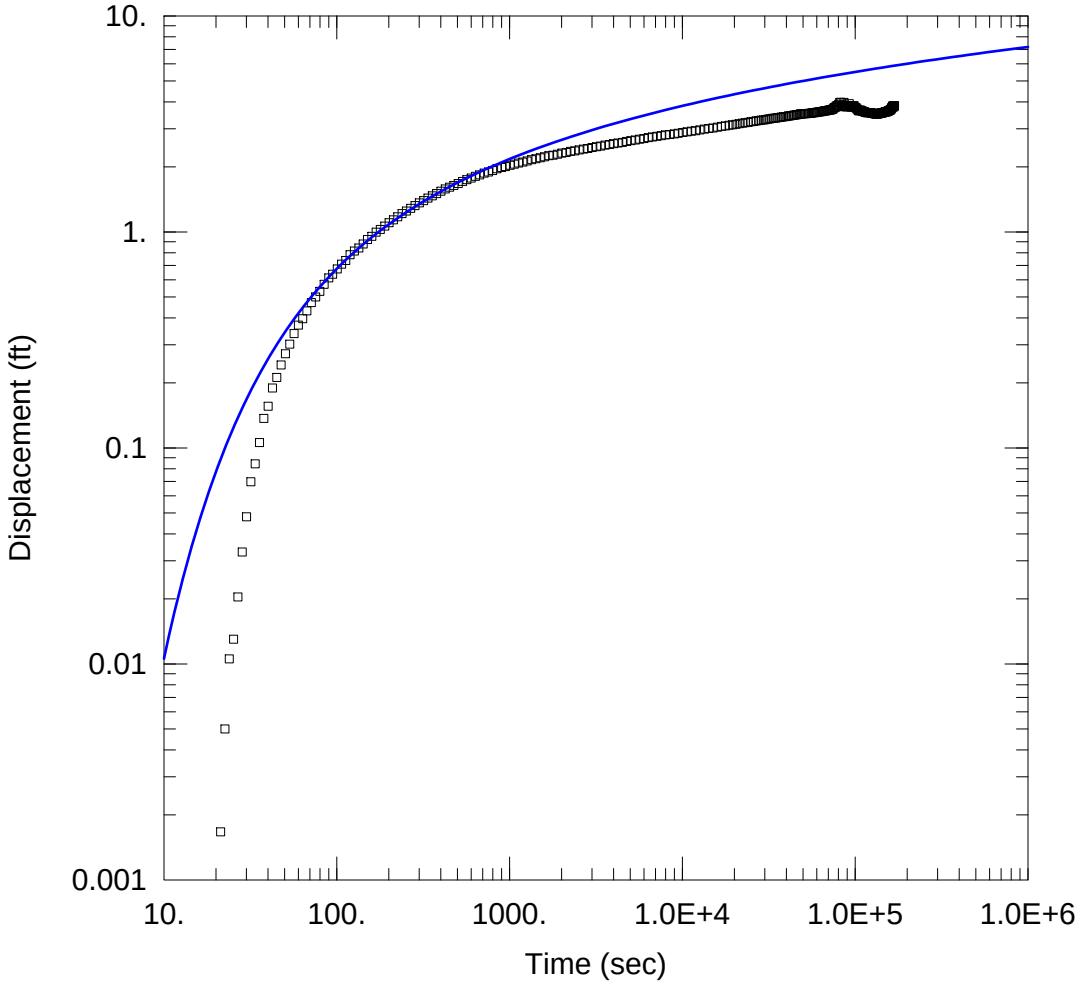
Observation Wells

Well Name	X (ft)	Y (ft)
▫ OW-13A	280	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 3679.9 ft^2/day
S = 3.201E-5
Kz/Kr = 1.
b = 5. ft



48-HOUR PUMPING TEST

Data Set: \...\OW-13B 48 Hour.aqt
Date: 10/09/18 Time: 15:39:39

PROJECT INFORMATION

Company: AECOM
Client: Town of Ipswich
Project: 60567459
Location: Ipswich, MA
Test Well: TW-15-8 inch
Test Date: 8/13/18

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-15-8 inch	0	0

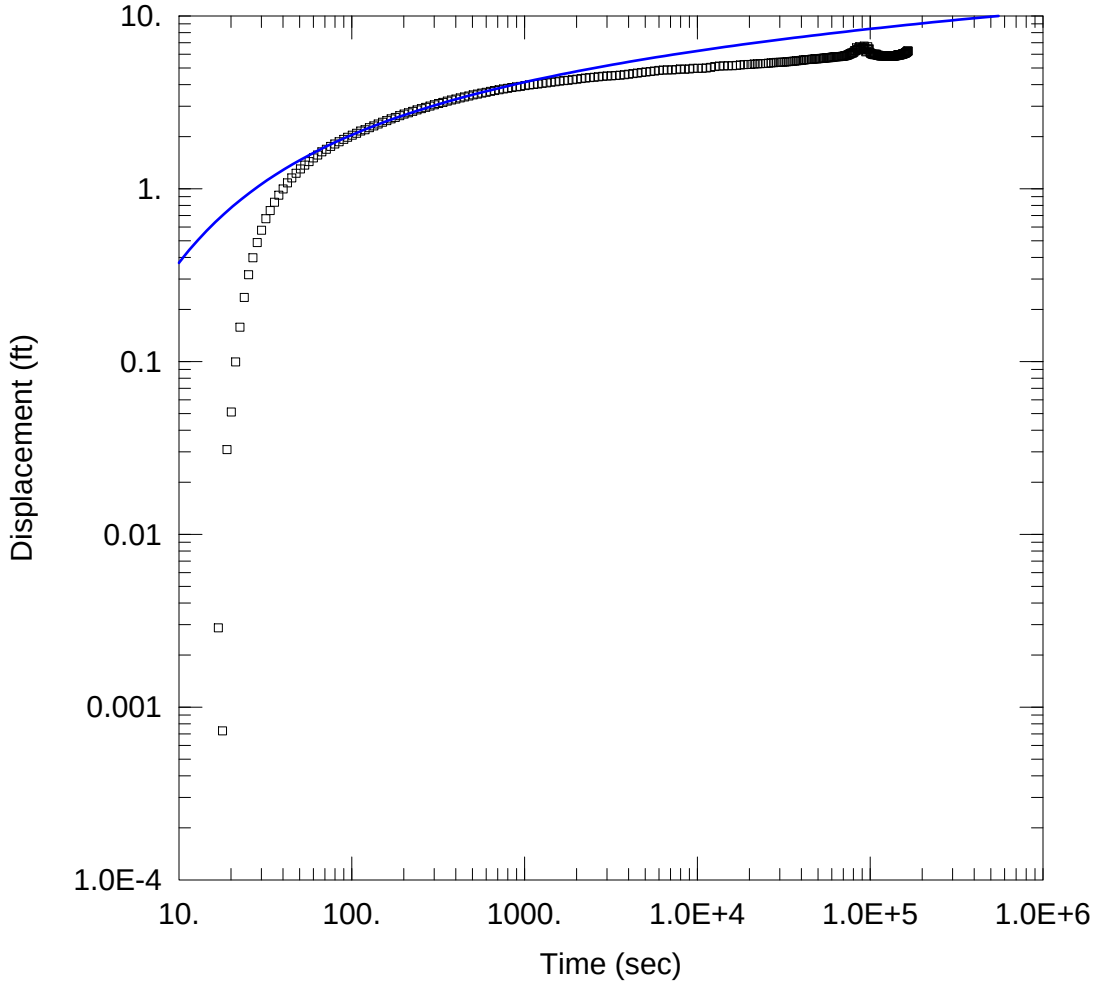
Observation Wells

Well Name	X (ft)	Y (ft)
▫ OW-13B	462	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 6314.8 ft^2/day
S = 3.994E-5
Kz/Kr = 1.
b = 5. ft



48-HOUR PUMPING TEST

Data Set: \...\TW-14-16 48 Hour.aqt
Date: 10/09/18 Time: 15:39:59

PROJECT INFORMATION

Company: AECOM
Client: Town of Ipswich
Project: 60567459
Location: Ipswich, MA
Test Well: TW-15-8 inch
Test Date: 8/13/18

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-15-8 inch	0	0

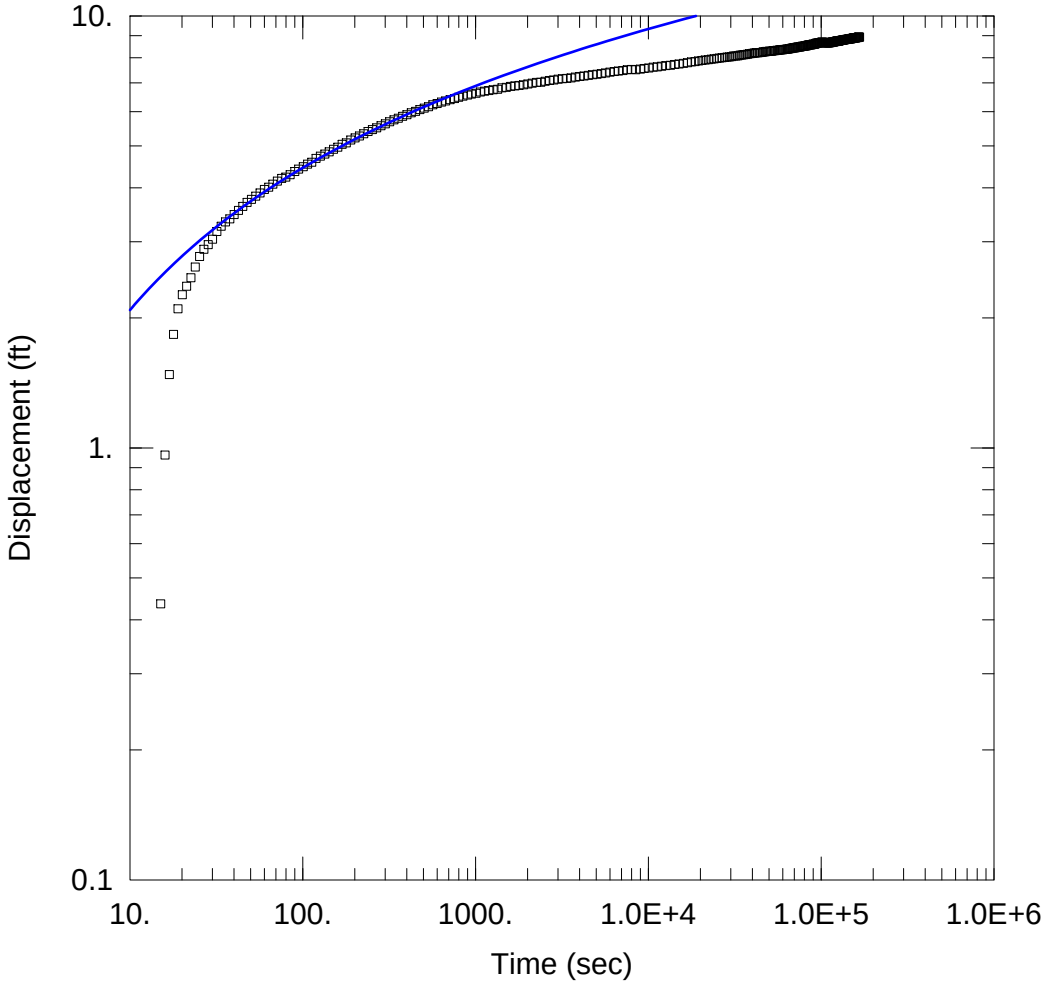
Observation Wells

Well Name	X (ft)	Y (ft)
▫ TW-14-16	123	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 4941.7 ft^2/day
S = 0.0001004
Kz/Kr = 1.
b = 5. ft



48-HOUR PUMPING TEST

Data Set: \...\TW-15-16 48 Hour.aqt
Date: 10/09/18 Time: 15:40:26

PROJECT INFORMATION

Company: AECOM
Client: Town of Ipswich
Project: 60567459
Location: Ipswich, MA
Test Well: TW-15-8 inch
Test Date: 8/13/18

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-15-8 inch	0	0

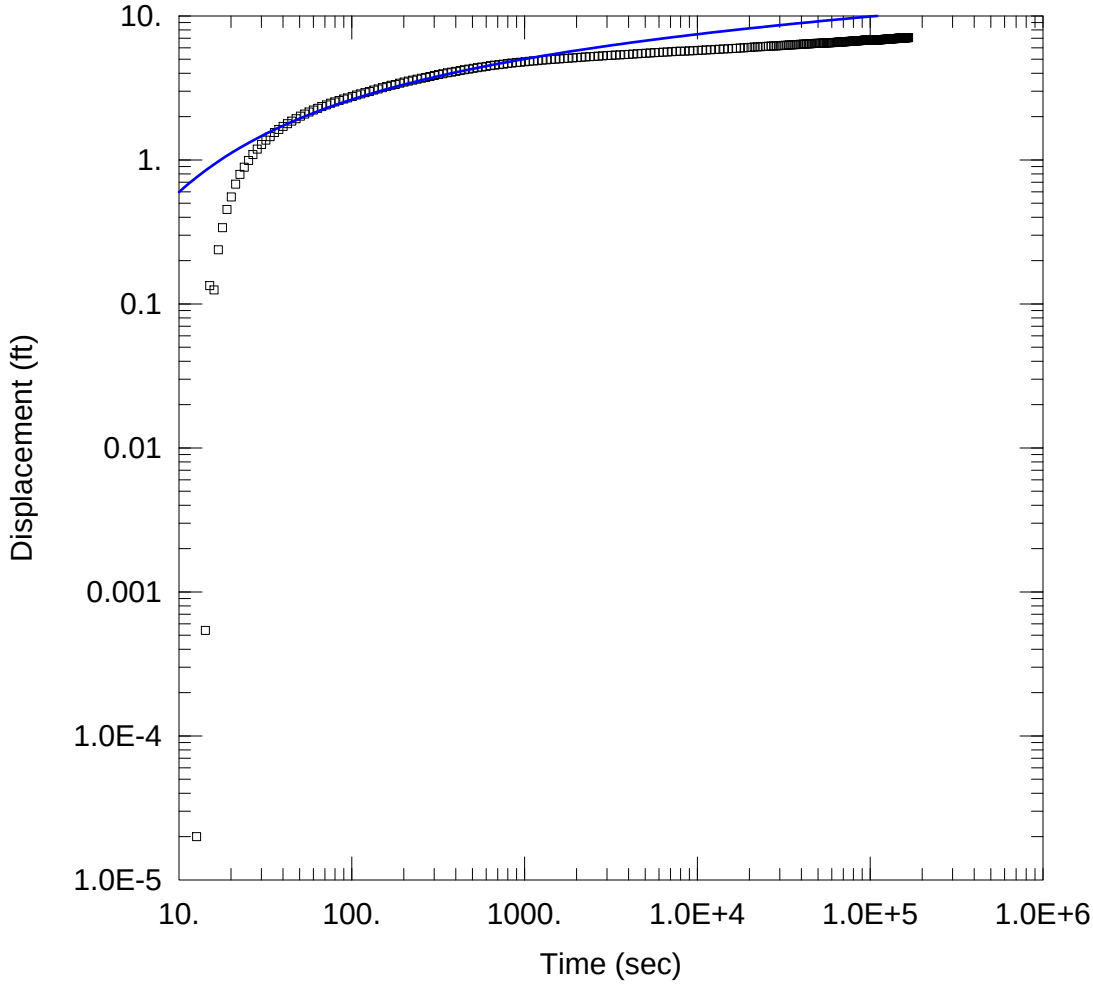
Observation Wells

Well Name	X (ft)	Y (ft)
▫ TW-15-16	15	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 4330.9 ft^2/day
S = 0.0007626
Kz/Kr = 1.
b = 5. ft



48-HOUR PUMPING TEST

Data Set: \...\TW-16-16 48 Hour.aqt
Date: 10/09/18 Time: 15:40:43

PROJECT INFORMATION

Company: AECOM
Client: Town of Ipswich
Project: 60567459
Location: Ipswich, MA
Test Well: TW-15-8 inch
Test Date: 8/13/18

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-15-8 inch	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ TW-16-16	82	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 4331.7 ft^2/day
S = 0.0001484
Kz/Kr = 1.
b = 5. ft

APPENDIX D

STREAMSTATS RESULTS FOR BULL BROOK

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

ARGEO PAUL CELLUCCI
Governor

JANE SWIFT
Lieutenant Governor

BOB DURAND
Secretary

LAUREN A. LISS
Commissioner

February 5, 2001

Site Screening for Siting a New or Expanding Source of Public Water Supply

The Department of Environmental Protection (DEP) is committed to early identification of issues relevant during the New Source Approval process for public water supplies. The Site Exam phase will now require that project proponents complete alternatives analysis, a water conservation questionnaire, the attached site screening document and publish public notice in The Environmental Monitor. Conducting alternatives analysis and assessing water conservation measures earlier in the process, and the use of a preliminary screening tool and public notice will ensure that the project proponent and interested parties will have an opportunity to identify issues and state concerns about proposed source locations. Early identification of issues can help to minimize environmental impact and minimize cost and delay to the project proponent. Identification of these issues will assist the agencies and the proponent in determining whether the proposed source is economically viable and protective of the environment and other water users, and will increase technical and regulatory information needed for pumping test design. The public notice will be published in The Environmental Monitor for proposed public water supply sources subject to the Water Management Act. The Department of Environmental Protection will accept written comments regarding proposed sites for a short time following publication of the notice.

A variety of environmental laws may apply to new source development depending on the location and the project design. Applicable laws may include the Safe Drinking Water Act, the Water Management Act, the Wetlands Protection Act, the Interbasin Transfer Act, the Endangered Species Act, and the Clean Water Act. The Department's Guidelines and Policies for Public Water Systems provide additional guidance about the necessary approvals and the timing of obtaining them.

"Site Screening for Siting New or Expanding Source of Water Supply" will allow proponents to screen each site under consideration, enabling them to make informed decisions in selecting sites and evaluating alternatives for new source development. Project proponents of new sources that will exceed the withdrawal threshold of the Water Management Act noted herein, should apply the screening criteria to each source under consideration.
This guidance should not be considered to be a final determination of the approvability of sites, but is intended to provide direction regarding significant issues that will have to be addressed if a particular site is pursued.

It is the goal of DEP to ensure a reliable supply of safe drinking water at an affordable cost in a manner which has the least possible environmental impact. The Department promotes efficient operation and maintenance of water supply and distribution systems, and the use of storm water management and wastewater disposal systems that recharge groundwater. DEP promotes and implements policies which require the assessment of future demands, the improvement of the efficiency of water supply systems, and conservation to avoid the capital costs and environmental impacts associated with the development of new supplies.

Glenn Haas, Acting Assistant Commissioner
Bureau of Resource Protection

This information is available in alternate format by calling our ADA Coordinator at (617) 574-6872.

DEP on the World Wide Web: http://www.magnet.state.ma.us/dep
Printed on Recycled Paper

COMMONWEALTH OF MASSACHUSETTS
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Lieutenant Governor

BOB DURAND
Secretary

LAUREN A. LISS
Commissioner

REQUEST FOR SITE EXAM
Water Management Program February 5, 2001

Site Screening Worksheet for Siting a New or Expanding Source of Public Water Supply

For a Public Water Supply Pumping 100,000 GPD or Greater

Submit two copies of this form for each source with the Request For Site Exam documentation to DEP/ Drinking Water Program.

Applicant: Ipswich Water Department, Ipswich, MA
Consultant: AECOM, 250 Apollo Drive, Chelmsford, MA Phone: 978-905-2180, D DeNatale
Site Name Lynch Site Basin: Rowley River Basin – draining to Plum Island Sound (Figure 1)

Section A: Demand Management

1. What is the maximum withdrawal rate you are seeking for your proposed source in million gallons per day (mgd)? 0.864 (new sources only)

	Existing	Final 5-yr block Permit Volume	Buildout (2040)
2. What is the average day demand (mgd) of your system?	1.01 mgd (2016)	1.18 mgd	1.39 mgd

3. What is the peak day demand (mgd) of your system? 1.86 mgd (2016)

4.a. What is the approved pumping rate (mgd) of your system? 3.89 mgd (aggregate max. daily approved rate for the active supplies)

b. Do any of these sources have restricted capacity? If so, briefly indicate which sources and the reasons for the capacity restrictions in the space below. Yes, Ipswich River basin well sources are restricted to 0.2 mgd annual average per WMA Registration; Fellows Road Well and Browns Well are now on restricted operation (restricted in terms of pumping rate and days of operation) due to high levels of manganese; Reservoirs have insufficient supply in most summers.

5. Can you meet your average day demand with your largest source off-line? Yes ☐ No x ☐

*Buildout: EOEA Community Preservation Initiative Buildout projections (See Appendix B). If these projections are not available for your town, note the source of your Buildout projections below.

Buildout demand based on Projected demand for year 2040, (AECOM, 2018)

Section A: Demand Management (cont.)

Note: Failure to meet water conservation standards may jeopardize your application.
Prior to commencement of the development of a new public source, the proponent should conduct a thorough analysis of system demand and have a viable water conservation program in place. Complete the Water Conservation Plan and refer to DEP/Water Management conservation guidelines, *Guidelines and Policies for Public Water Systems, Section 10, revised August, 1996, or as amended; and Water Conservation Standards for the Commonwealth of Massachusetts, adopted 1992.*

If your proposed withdrawal involves an interbasin transfer, also refer to DEM/Office of Water Resources Interbasin Transfer Act water conservation measures in, *Appendix A, Interbasin Transfer Act Performance Standards Guidance, approved 8/12/99, and A Guideline to the Application of the Interbasin Transfer Act and Regulations, December 1985.*

Section B. Potential Environmental Impact

Presence of sensitive or multiple receptors may limit site availability for water supply withdrawal.

1. Which of the following sensitive receptors exist within 1000' of your site?
   (Consult the most recent Massachusetts Natural Heritage Program Atlas, MassGIS and other sources.)

- Areas of Critical Environmental Concern Yes _____ No __x__
- Priority habitat for rare and endangered species Yes _____ No __x___
- Lakes and ponds (or other surface water features) Yes __x__ No _____
- Vernal pools Yes _____ No __x__
- Stocked trout streams Yes __x__ No _____
  (See Massachusetts Stocked Trout Waters listing on website: www.state.ma.us/dfwele*)*

Additional considerations:
- Cold water fisheries resource None
- NPDES permit sites (National Pollution Discharge Elimination System)

2. Which of the following potential threats or sensitive receptors exist within one-half mile of your site?
   (Consult the DEP website at www.state.ma.us/dep*, MassGIS and other sources)*

- Hazardous waste sites Yes _____ No __x__
- Wastewater treatment facilities Yes _____ No __x__
- CSOs or SSOs Yes _____ No __x__
- Landfills Yes _____ No __x__
- Agricultural uses Yes __x___ No ____
- Automobile graveyards and junkyards Yes _____ No __x__
- Industrial Park/plant Yes _____ No __x__
- Petroleum and oil bulk stations and terminals Yes _____ No __x__
- Public water withdrawals Yes _____ No __x__
- Private wells Yes ____ No _____

Section B-1. Stream and Basin Section

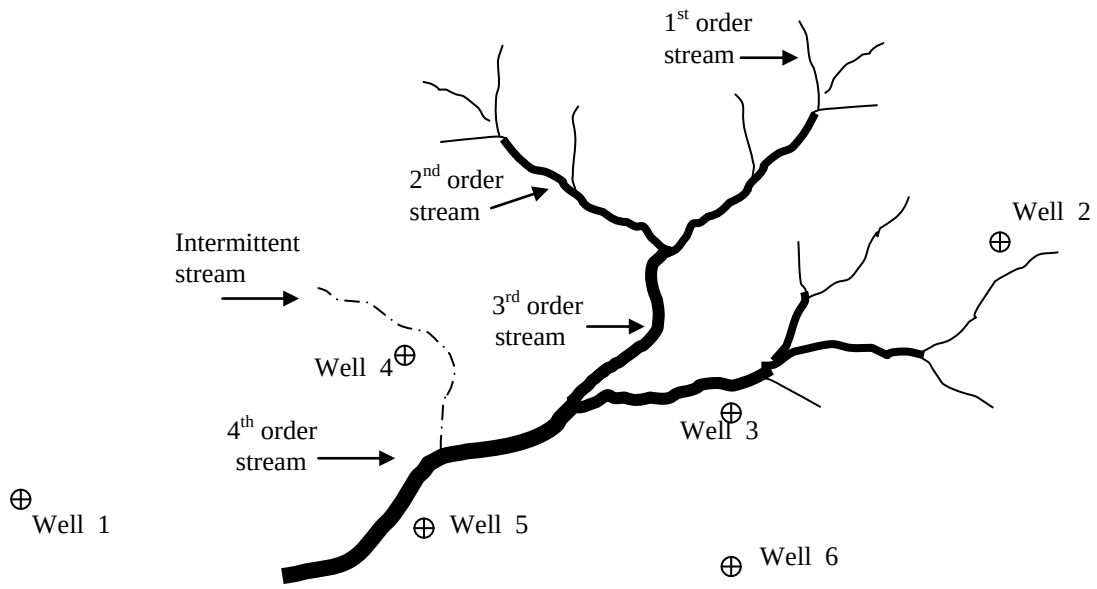
This section is intended to preliminarily evaluate the impacts of proposed sources on streamflow and availability of water in the river basin. The graphic below depicting stream order and well placement illustrates how well location may impact streamflow.

The purpose of this section is not to approve or deny siting a new source, but rather to provide an advisory for caution where siting a withdrawal that may have a significant impact on streamflow.

Stream Order:
A stream of first order is one that has no tributaries. When two streams of first order join, a stream segment of second order begins that may have one or several first-order tributaries along its length. When two streams of second order join, a single stream of third order begins. This stream extends until joined by another third-order river, and there, the fourth order begins, and so on. A junction with a lower-order channel does not change the order of the higher-order stream. (Adapted from the Handbook of Hydrology, 1993)

WATER WITHDRAWAL CONSIDERATION ON STREAMFLOW

PROXIMITY AND STREAM ORDER



Assuming the same pumping rate and a hydrological connection for induced infiltration between a well and a stream, proximity and stream order are two factors which may have a serious impact on flow. Generally, the nearer the withdrawal is to a stream, the greater the impact on flow; and the lower the level of stream order, the greater the impact of a withdrawal on flow. As illustrated above, Wells 1 and 6 may have minimal or no impact on streamflow. Well 5, located near a higher order stream may have less impact on flow than Well 3. Wells 2 and 4 may have the greatest impact on flow due to their close proximity to a first order stream and an intermittent stream.

The following stream screening criteria provides guidance concerning a withdrawal's potential for impact on flow. Generally, for a withdrawal pumping rate less than 7Q10 flow, no significant impact is anticipated. Withdrawals greater than 7Q10 flow, let alone larger pumping volumes greater than 50% of August Median flow, may have significant impacts on flow. Low flow stream statistics (7Q10 and August Median) may be obtained from U.S. Geological Survey (USGS) website noted below. However, statistics obtained from this website are based on unregulated streams and do not take into account cumulative effects on streamflow from existing withdrawals or other impacts, and the proposed withdrawal may warrant further site screening assessment. Stream threshold indicators may also be more restrictive in basins that DEP has determined to be hydrologically stressed.

Responses to the following questions will require internet access to obtain low flow stream statistics from the USGS steamflow statistics website, http://ma.water.usgs.gov/streamstats. The USGS website provides streamflow statistics and basin characteristics for locations of interest by use of an automated procedure that measures characteristics of the land surface area (basin) that drains to the stream and inserts those characteristics into equations that estimate the streamflow statistics (7Q10, August Median, etc).

This methodology is designed to estimate the impact on flow from one proposed withdrawal on an unregulated stream. Withdrawals impacting more than one stream, or where multiple withdrawals or other impacts in the drainage area already exist, will require additional site-specific screening.

Basically, the application allows a user to mouse-click on a point in a stream, from which the program will delineate the contributing watershed drainage area on a map and generate low flow stream statistics along with basin characteristics. Instructions for use are on the website. The USGS display map and corresponding data printout for the proposed withdrawal must be enclosed with this application. Once the low flow statistics have been obtained, the data must be converted into cubic feet per second per square mile (cfsm) and compared to the withdrawal rate.

The click point for the application is the point where the stream intersects the downgradient extent of the preliminary Zone II. The preliminary Zone II delineation is a requirement in the Drinking Water Request For Site Exam part of this application. DEP assumes 100% hydrogeologic communication between the well and the stream so that every drop of water pumped comes from the stream. However, the Department will also consider applied site specific stream depletion methodologies (Jenkins, Barlow, etc.), that attempt to quantify stream flow depletion by wells under Zone II conditions. In such cases, the reduced flow impact may substitute for the withdrawal when comparing the withdrawal rate to stream indicators 7Q10 and 50% of August Median.

To determine the withdrawal's impact on streamflow, follow the steps below.

Step 1: Convert the proposed withdrawal rate given in million gallons per day (Page 1, Section A, Question 1) to gallons per day, and then to cubic feet per second using the following formula:

$$\frac{\textbf{860,000}\ \text{gpd (new sources only)}}{7.48\ \text{gal/cu.ft.} \times 1440\ \text{min/day} \times 60\ \text{seconds/minute}} = \textbf{1.33}\ \text{cfs}$$

Step 2: Determine the contributing drainage area in square miles for the proposed withdrawal location. This area must be determined with the USGS watershed tools by clicking on the stream intersect with the preliminary Zone II at the downgradient point.

What is the contributing drainage area of the proposed withdrawal? **2.59** square miles

What is the distance in feet from the proposed withdrawal to the nearest stream? **160** feet

Step 3: Conversion to cfsm:
Find the flow per unit area (cfsm) for the withdrawal at this location by dividing the cfs flow found in Step 1 by the contributing drainage area in Step 2:

$$\frac{1.33\ \text{withdrawal (cfs)}}{2.59\ \text{drainage area (sq. mi.)}} = \mathbf{0.51\ \ cfsm}$$

Example: Find cfsm for a proposed withdrawal at 0.5 mgd with an upgradient watershed of 5 square miles.
Note: 0.5 mgd converts to .77 cfs

$$\frac{\text{withdrawal (0.5 mgd) or } 0.77\ \text{cfs (Step 1)}}{\text{upgradient watershed } 5\ \text{sq. mi. (Step 2)}} = 0.154\ \text{cfsm (Step 3)}$$

Step 4: The 7Q10 streamflow, measured in cfs, represents the probable minimum flow over a 7-day period that will occur on average once in 10 years. With the USGS website, obtain the 7Q10 cfs flow for the stream location point, convert 7Q10 cfs to cfsm (Step 3), and compare this flow with your proposed withdrawal.

7Q10 flow 0.081 cfs (36 gpm)
7Q10 flow 0.031 cfsm

CAUTION

Withdrawals which are greater than 7Q10 cfsm of a stream have the potential to increase the frequency and duration of low flow, and may result in moderate to significant environmental impact. Such withdrawals may be unapprovable or severely restricted by permit conditions. This guidance should be used as a planning tool, and applicants are encouraged to select alternatives that minimize environmental impact and meet other water supply planning objectives for water quality and productivity. Further analysis will be necessary to determine the potential impact of all proposed withdrawals and mitigating circumstances.

Step 5: With the USGS website, obtain the August Median cfs flow for the stream at the designated point, convert the August Median cfs to cfsm (Step 3), take 50% of August Median (cfsm) and compare this flow with your proposed withdrawal in cfsm.

August Median: 0.482 cfs (216 gpm)
August Median: 0.186 cfsm
50% August Median: 0.093 cfsm

CAUTION

Impacts on streamflow are best determined through physical characteristics of the watershed, site hydrology and pumping tests, but as a screening guideline, a proposed source in which the withdrawal rate of a watershed area is **50% of the August Median** (cfsm) or greater, is considered to have the potential to significantly reduce streamflow. Such withdrawals may be unapprovable or severely restricted by permit conditions. This guidance should be used as a planning tool, and applicants are encouraged to select alternatives that minimize environmental impact and meet other water supply planning objectives for water quality and productivity. Further analysis will be necessary to determine the potential impact of all proposed withdrawals and mitigating circumstances.

Since the August Median statistic may reflect wide ranging and relatively high flows, particularly in small watershed drainage areas, the more conservative 50% of August Median flow was selected as the screening threshold level to protect impacts on river flow from withdrawals.

Section C. Regulatory Review

1. Name all potential water supplies which you have under consideration, including regional sources and those located in other communities, and attach a locus map depicting the location of each.
   Lynch Site: TW 13-16, TW 14-16, TW 15-16, TW 16-16

2. Massachusetts Environmental Policy Act (MEPA) *(MGL ch 30 s. 61 through 62H) (301 CMR 11.00)*
   MEPA provides meaningful opportunities for public review of the potential environmental impacts of projects for which agency action is required. The MEPA review is an informal administrative process of environmental planning that enables the proponent and each participating agency to consider the positive and negative, short-term and long-term, and cumulative potential environmental impacts for all phases of a project. *(See MEPA website at www.ma.state.us/MEPA.)*

   MEPA review thresholds for water: *(301 CMR 11.03(4)) (other non-water thresholds may also apply)*
   ENF and Other MEPA Review if the Secretary So Requires.
   - new withdrawal or expansion of withdrawal of 100,000 or more gpd from a new water source that requires new construction for the withdrawal.

- new withdrawal or expansion of withdrawal of 500,000 or more gpd from a water supply system above the lesser of current system-wide authorized withdrawal volume or three-years' average system-wide actual withdrawal volume.
- construction of one or more new water mains five or more miles in length.
- construction of a new drinking water treatment plant with a capacity of 1,000,000 or more gpd.
- expansion of an existing drinking water treatment plant by the greater of 1,000,000 gpd or 10% of existing capacity.
- alteration requiring a variance in accordance with the Watershed Protection Act, unless the project consists solely of one single family dwelling.
- non-bridged steam crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities.

ENF and Mandatory EIR*:*

- new withdrawal or expansion in withdrawal of
  - 2,500,000 or more gpd from a surface water source; or
  - 1,500,000 or more gpd from a groundwater source.
- new interbasin transfer of water of 1,000,000 or more gpd from a surface or groundwater source or any amount determined significant by the Water Resource Commission.
- construction of one or more new water mains ten or more miles in length.
- new water service to a municipality across a municipal boundary through new or existing pipelines.

Will your water withdrawal require MEPA review Yes [x] No [ ]

3. Water Management Act (WMA) Permit/ DEP Water Management Program *(310 CMR 36.00)*

A water withdrawal permit is required for new or expanded water withdrawals above the threshold volume. Water withdrawal uses may include, but not be limited to **public water supply**; industrial uses; agricultural uses, such as **cranberry growers**; and irrigation uses, such as for **golf courses**.

Threshold volume means:

- an average daily volume of 100,000 gallons for any period of three consecutive months, from a total withdrawal of not less than 9,000,000 gallons; or
- an average daily volume of 100,000 gallons for periods which exceed three consecutive months, calculated by dividing the total withdrawal by the period of operation.
- a permit amendment is required for existing permit holders adding a new source where system wide withdrawal volumes are not being increased.

3a. Will your water withdrawal require a WMA permit? Yes [x] No [ ]

Permit Amendment

3b. Are you currently a Registrant and/or a Permitee under the WMA? Yes [x] No [ ]

If yes, provide registration and permit numbers:

Registration Number(s)	Permit Number(s)
31614401 (Parker)	**WMA Permit #9P2-3-16-144.01 (Parker)**
31714402 (Ipswich)	

4. Interbasin Transfer (IBT) Act Approval / Water Resource Commission *(MGL ch 21 ss. 8B-8D)*

(See Massachusetts Major Basin Map at http://ma.water.usgs.gov/basin)

An interbasin transfer is defined as any transfer of the surface and groundwater, including wastewater of the Commonwealth outside a river basin. A water transfer must cross one of the basin boundaries and a municipal boundary line to be considered an interbasin transfer. If a community is sewered to another town out of the basin of the water supply, the Interbasin Act may be triggered.

An interbasin transfer is any action that increases the ability to transfer water or wastewater out of a donor basin over the present rate of interbasin transfer. Actions requiring review include but are not limited to:

- drilling of production wells;
- significantly increasing the capacity of a well;
- development of a reservoir or enlargement of reservoir storage capacity;

- building of transfer facilities, such as pumps, pipelines, tunnels or other conveyance facilities;
- building of water filtration plants where such plants increase the ability to transfer water out-of-basin;
- changes in any withdrawal constraints contained in any provision of MGL, Special Acts, Judicial decree, regulatory agency rule or operating rule of a water supplier;
- structural change in a wastewater system that causes an increase in the transfer out of a donor basin.

Will your water withdrawal require an IBT application review? Yes [ ] No [x]
see ** below

** If your proposed withdrawal will require an IBT review:

- be advised that certain performance standards, including prerequisite requirements, must be met for application approval. See *Interbasin Transfer Act: Performance Standards Guidance, adopted August 12, 1999.*
- the applicant also must meet with DEM/Office of Water Resources staff before the Alternative Analysis is completed and submitted as part of the Request For Site Exam application.

5. Wetlands Permit / Massachusetts Wetlands Protection Act *(MGL ch 131, s. 40) (310 CMR 10.00)*
   Administered by DEP and Local Conservation Commissions
   Any work in a wetlands or within 100' buffer of the wetlands. This includes creating an access way to the water withdrawal, as well as drilling, pumping, and filling wetlands.

   5a. Will your water withdrawal require a Wetlands Permit? **TBD** Yes [ ] No [ ]

   5b. Is your proposed withdrawal within the 200' riverfront area? Yes [x] No [ ]

6. 404 Permit / Army Corps of Engineers (*Clean Water Act of 1977)*
   Are you planning any dredging or filling for your water withdrawal in a waterway or wetland?
   Section 404 of the Clean Water Act defines the landward limit of jurisdiction as the high tide line in tidal waters and the ordinary high water mark as the limit in non-tidal waters. When adjacent wetlands are present, the limit of jurisdiction extends to the limit of the wetlands.

   Will your water withdrawal require a 404 Permit? Yes [ ] No [x]

7. 401 Permit / DEP 401 Water Quality Certification Program *(314 CMR 9.00)*
   Provides added protection for projects with the potential for large or cumulative impacts to ensure compliance with the surface water quality standards. Actions, involving but not limited to, any one activity listed below, that require a 401 application review are:
   - loss of greater than 5,000 square feet of wetlands;
   - within an Outstanding Resource Water;
   - involving any real estate subdivision;
   - not subject to the Wetlands Protection Act
   - containing rare or endangered species habitat in isolated vegetated wetlands;
   - within a salt marsh;
   - dredging greater than 100 cubic yards.

   Will your water withdrawal require a 401 Permit? Yes [ ] No [x]

APPENDIX A

Department of Environmental Management
Office of Water Resources
Basin Plan Status, August 2000

BASIN	VOLUMES	UPDATES
Hudson River Basin	I, II, III*	
Ipswich River Basin (including communities in the North Coastal)	I, II, III	
Charles River Basin	I, II, summary draft III (never completed)	Demands
Concord River Basin	I; Short Hydrology	Some Demands
Blackstone River Basin	I; conceptual plan (3 versions)	Demands?
Nashua River Basin	I	Demands
Neponset River Basin	I; I,II,III combined plan	Demands
Taunton River Basin	I; I,II,III combined plan	Demands + inflow/outflow
North Coastal	I,II,III combined plan	
Mystic River Basin	Short Hydrology/Demands	
Ten Mile River Basin	Short Hydrology/Demands	
Weymouth-Weir Basin	Draft I; Short hydrology/demands	
South Coastal	Draft I; I,II,III combined plan	
Cape Cod	Basin plan	
Islands	Short Hydrology/Demands	
Deerfield River Basin	Short Hydrology/Demands	
Housatonic River Basin	Basin Plan	
Westfield River Basin	Short Hydrology/Demands	
Farmington River Basin	Short Hydrology (combined with Westfield) No Demands	
Millers River Basin	Short Hydrology/Demands	
Chicopee River Basin	Short Hydrology/Demands	
Connecticut River Basin	Short Hydrology/Demands	
Buzzards Bay	Basin Plan	
Parker	no plan	Demands only

*Unless otherwise noted, Volumes I, II and III make up a full basin plan

APPENDIX B

Supportive materials:

- Basin Plans (see Appendix A)
  Contact DEM / Office of Water Resources for further information.
- Outstanding Resource Waters (ORWs)
  Contact DEP Regional Office for further information.
- Stream indicators (7Q10 and August Median) and low flow statistics
  USGS Water Resources Data for Massachusetts
  USGS Gazetteers of Hydrologic Characteristics of Streams in Massachusetts
  USGS websites: http://ma.water.usgs.gov/basin
  http://ma.water.usgs.gov/streamstats
- References:
  - Jenkins, C.T., 1970 Computation of Rate and Volume of Stream Depletion By Wells. USGS Techniques of Water-Resources Investigations, Book 4, Chapter D1.
  - Barlow, P.M., 1999 USGS/ Documentation of Computer Program STRMDEPL – A Program to Calculate Streamflow Depletion by Wells Using Analytical Solutions. (Work in progress)
- NPDES sites
  Contact DEP / Watershed Permitting Program / Surface and Groundwater Sections

List of related programs and phone numbers:

EOEA Basin Team Leader Information ……..		617 727-9800
EOEA Community Preservation Buildout …….		617 626-1153
Massachusetts Natural Heritage Program		508 792-7270
MEPA		617 626-1020
MassGIS		617 727-5227
DEM/	Office of Water Resources	617 973-8755
	Water Resource Commission	617 626-1050
	Interbasin Transfer Act	617 973-8745
Army Corps of Engineers / 404 Permit		800 362-4367
DEP/	Boston switchboard	617 292-5500
	Western Region	413 784-1100
	Central Region	508 792-7650
	Northeast Region	978 661-7600
	Southeast Region	508 946-2700
	DEP Basin Chiefs, contact DEP regional offices	
	Water Management Program	617 292-5706
	Drinking Water Program	617 292-5770
	Wellhead Protection Program	617 556-1070
	Wetlands and Waterways	617 292-5695
	401 Water Quality Certification Program	617 292-5655
	Bureau of Waste Site Cleanup	617 292-5648
	DEP GIS	617 556-1115

APPENDIX E

PUMPING TEST RECORDS

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA
Two-hour readings

					TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Date/ Rainfall/ Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)												
Antecedent Readings																
8/6/2018					9.78	10.66	8.35	10.22	9.51	8.06	9.6	11.2	9.54	11.09	16.12	10.49
8/8/2018					9.78	10.69	8.35	10.29	9.37	8.06	9.59	11.24	9.54	11.04	16.12	10.5
8/10/2018					9.8	10.77	8.49	10.32	9.47	8.15	9.67	11.31	9.35	11.15	16.2	10.59
8/13/2018	0 hrs	1100			9.43	10.44	8.09	10.13	9.04	7.82	9.38	10.96	8.98	10.79	15.86	10.3
Pumping Test Readings																
8/13/2018	2 hrs	1300	6 / 305	306	15.29	16.2	13.92	10.04	14.06	12.50	20.41	18.41	14.83	16.40	-	13.09
0.3"	3 hrs	1400		303	15.35	16.31	14.03	10.11	14.15	12.59	20.51	18.51	14.82	16.59	21.20	13.17
100 gpm	4 hrs	1500		302	15.55	16.46	14.16	10.12	14.29	12.73	20.61	18.61	15.08	16.72	21.37	13.26
	5 hrs	1600		302	15.62	16.53	14.26	10.12	14.39	12.82	20.75	18.72	15.09	16.81	21.45	13.35
	6 hrs	1700		304	15.71	16.62	14.37	10.13	14.54	12.91	20.86	18.80	15.22	16.94	21.53	13.39
	7 hrs	1800	4"	303	15.80	16.71	14.43	10.13	14.60	12.98	20.93	18.89	15.29	17.00	21.65	13.48
	8 hrs	1900		303	15.88	16.81	14.52	10.13	14.67	13.05	20.99	18.96	15.38	17.06	21.71	13.56
	10 hrs	2100		302	15.94	16.87	14.58	10.13	14.74	13.12	21.06	19.04	15.43	17.11	21.77	13.61
	12 hrs	2300		301	16.00	16.93	14.64	10.13	14.81	13.21	21.14	19.12	15.51	17.18	21.84	13.69
8/14/2018	14 hrs	0100		302	16.06	17.02	14.71	10.12	14.88	13.28	21.22	19.20	15.59	17.26	21.93	13.76
	16 hrs	0300		301	16.14	17.05	14.79	10.12	14.94	13.33	21.28	19.24	15.63	17.31	21.98	13.79
	18 hrs	0500		303	16.19	17.13	14.84	10.11	14.99	13.39	21.31	19.29	15.68	17.36	22.05	13.85
	20 hrs	0700		302	16.26	17.18	14.88	10.11	15.06	13.44	21.36	19.35	15.72	17.43	22.11	13.90
between 1500 -	22 hrs	0900	6"	303	16.29	17.22	14.96	10.11	15.14	13.50	21.43	19.41	15.78	17.51	22.16	13.96
1600 received	24 hrs	1100		302	16.34	17.29	15.02	10.11	15.22	13.56	21.53	19.45	15.86	17.56	22.25	14.01
0.65" of rain	26 hrs	1300		301	16.44	17.33	15.05	10.12	15.23	13.61	21.61	19.55	15.94	17.59	22.28	14.05
	28 hrs	1500		301	16.58	17.39	15.12	10.12	15.29	13.67	21.64	19.59	15.96	17.62	22.33	14.11
	30 hrs	1700		301	16.44	17.35	15.08	10.10	15.22	13.65	21.62	19.56	15.91	17.62	22.31	14.04
	32 hrs	1900	4"	300	16.49	17.41	15.12	10.08	15.30	13.67	21.68	19.59	15.99	17.66	22.35	14.08
	34 hrs	2100		302	16.53	17.45	15.16	10.08	15.34	13.70	21.71	19.67	16.02	17.69	22.39	14.10
	36 hrs	2300		303	16.56	17.49	15.20	10.05	15.36	13.75	21.76	19.68	16.06	17.74	22.42	14.14
8/15/2018	38 hrs	0100		303	16.59	17.51	15.23	10.05	15.38	13.77	21.79	19.70	16.11	17.77	22.46	14.17
0.0"	40 hrs	0300		301	16.62	17.55	15.26	10.04	15.44	13.81	21.81	19.73	16.13	17.81	22.49	14.19
200 gpm	42 hrs	0500		302	16.64	17.58	15.29	10.03	15.44	13.84	21.85	19.77	16.15	17.82	22.52	14.21
	44 hrs	0700		303	16.72	17.61	15.34	10.03	15.51	13.86	21.91	19.82	16.2	17.88	22.55	14.24
	46 hrs	0900		302	16.75	17.62	15.35	10.03	15.52	13.9	21.94	19.85	16.24	17.9	22.58	14.27
	48 hrs	1100		304	16.79	17.66	15.39	10.03	15.59	13.98	21.96	19.86	16.25	17.91	22.16	14.29

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA
Two-hour readings

					TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Date/ Rainfall/ Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)												
changed out	50 hrs	1300	9.5, 10, 10, 10		26.06	20.10	23.80	10.03	18.20	15.76	17.78	18.58	18.33	19.25	22.46	14.64
orifice plates	52 hrs	1500			27.14	20.14	24.84	10.04	18.35	15.88	17.97	18.74	18.43	19.39	22.56	14.72
	54 hrs	1700			27.5	20.20	25.11	10.06	18.45	15.92	18.07	18.78	18.51	19.44	22.60	14.74
	56 hrs	1900	9.5, 10, 10, 10		27.32	20.26	25.00	10.06	18.44	15.98	18.07	18.84	18.53	19.49	22.66	14.79
	58 hrs	2100			27.43	20.31	25.10	10.07	18.48	16.03	18.11	18.87	18.55	19.54	22.69	14.82
	60 hrs	2300			27.65	20.33	25.33	10.07	18.54	16.06	18.14	18.91	18.59	19.58	22.72	14.86
8/16/2018	62 hrs	0100			27.50	20.34	25.21	10.06	18.53	16.09	18.17	18.94	18.61	19.59	22.75	14.88
0.0"	64 hrs	0300			27.61	20.39	25.28	10.06	18.55	16.12	18.21	18.97	18.65	19.63	22.78	14.92
150 gpm	66 hrs	0500			27.54	20.42	25.19	10.07	18.61	16.15	18.24	19.00	18.69	19.66	22.82	14.93
	68 hrs	0700			27.64	20.42	25.28	10.07	18.62	16.16	18.25	19.03	18.7	19.66	22.82	14.96
	70 hrs	0900			27.63	20.42	25.3	10.08	18.64	16.19	18.29	19.04	18.68	19.68	22.86	14.99
	72 hrs	1100	9.5, 10, 10, 10		27.71	20.48	25.35	10.09	18.65	16.22	18.33	19.06	18.75	19.71	22.87	15.00
	74 hrs	1300			27.62	20.5	25.31	10.1	18.68	16.24	18.32	19.07	18.81	19.74	22.89	15.01
	76 hrs	1500			27.67	20.53	25.35	10.12	18.76	16.25	18.36	19.11	18.82	19.75	22.91	15.04
	78 hrs	1700	10, 10, 10, 10		27.61	20.55	25.31	10.14	18.73	16.27	18.34	19.13	18.76	19.77	22.95	15.07
	80 hrs	1900			27.64	20.6	25.31	10.15	18.76	16.3	18.39	19.15	18.84	19.82	22.96	15.08
	82 hrs	2100			27.6	20.63	25.29	10.16	18.8	16.32	18.41	19.17	18.86	19.84	22.98	15.11
8/17/2018	84 hrs	2300			27.63	20.66	25.32	10.15	18.81	16.35	18.43	19.19	18.89	19.86	23.01	15.12
0.05"	86 hrs	0100			27.41	20.68	25.12	10.15	18.81	16.36	18.43	19.21	18.91	19.86	23.02	15.14
100 gpm	88 hrs	0300			27.55	20.7	25.23	10.15	18.83	16.38	18.45	19.24	18.92	19.89	23.04	15.16
	90 hrs	0500			27.55	20.71	25.24	10.16	18.85	16.39	18.47	19.25	18.92	19.91	23.06	15.17
	92 hrs	0700			28.54	20.59	26.07	10.15	18.94	16.39	18.46	19.26	18.94	19.9	23.07	15.18
	94 hrs	0900	9.5, 10, 9.5, 10		28.59	20.58	26.13	10.16	18.88	16.4	18.54	19.26	18.95	19.91	23.09	15.19
	96 hrs	1100														

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA
Two-hour readings

					TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Date/ Rainfall/ Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)												
	98 hrs	1300			28.46	20.65	26.05	10.18	18.91	16.43	18.54	19.29	19.01	19.94	23.12	15.22
	100 hrs	1500			28.6	20.67	26.14	10.2	18.96	16.45	18.56	19.32	19.04	19.97	23.14	15.23
	102 hrs	1700	10, 10, 10, 10													
	104 hrs	1900			28.4	20.72	25.98	10.2	18.94	16.48	18.56	19.34	19.02	20	23.16	15.27
	106 hrs	2100			28.24	20.76	25.88	10.2	18.96	16.51	18.59	19.36	19.07	20.03	23.18	15.28
	108 hrs	2300			28.58	20.73	26.2	10.2	18.99	16.52	18.61	19.38	19.05	20.04	23.19	15.29
8/18/2018	110 hrs	0100														
0.45"	112 hrs	0300			28.02	20.86	25.7	10.2	19.01	16.56	18.64	19.41	19.11	20.09	23.23	15.32
10 gpm	114 hrs	0500			28.02	20.85	25.7	10.2	19.01	16.57	18.65	19.43	19.1	20.06	23.24	15.33
	116 hrs	0700	9.25, 10.5, 10, 10		28.05	20.84	25.71	10.2	19.03	16.58	18.67	19.44	19.1	20.08	23.24	15.33
	118 hrs	0900			28.09	20.85	25.66	10.21	19.06	16.58	18.66	19.45	19.11	20.08	23.25	15.33
	120 hrs	1100			28.03	20.88	25.69	10.22	19.13	16.58	18.68	19.45	19.12	20.11	23.29	15.34
	122 hrs	1300									18.69	19.46			23.27	15.35
	124 hrs	1500			27.98	20.9	25.66	10.22	19.14	16.63	18.75	19.5	19.15	20.13	23.3	15.39
	126 hrs	1700			28.05	20.93	25.69	10.23	19.11	16.66	18.74	19.52	19.18	20.16	23.33	15.41
	128 hrs	1900	9.5, 10, 10, 10		28.12	20.95	25.78	10.23	19.12	16.68	18.77	19.53	19.18	20.18	23.34	15.43
	130 hrs	2100			28.09	20.98	25.73	10.23	19.14	16.71	18.79	19.56	19.21	20.19	23.36	15.46
	132 hrs	2300			28.14	20.96	25.81	10.23	19.14	16.72	18.79	19.58	19.23	20.23	23.37	15.47
8/19/2018	134 hrs	0100			28.09	20.99	25.78	10.22	19.16	16.73	18.81	19.58	19.27	20.23	23.39	15.49
0.0"	136 hrs	0300			28.26	20.99	25.91	10.22	19.17	16.76	18.81	19.6	19.25	20.24	23.39	15.51
100 gpm	138 hrs	0500														
	140 hrs	0700			28.27	21.02	25.89	10.22	19.23	16.77	18.84	19.62	19.28	20.26	23.42	15.52
	142 hrs	0900			28.28	21.04	25.91	10.22	19.23	16.78	18.85	19.64	19.31	20.28	23.44	15.53
	144 hrs	1100			28.3	21.05	25.91	10.23	19.23	16.79	18.91	19.65	19.34	20.3	23.46	15.54

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA
Two-hour readings

					TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Date/ Rainfall/ Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)												
	146 hrs	1300			28.3	21.06	25.96	10.23	19.29	16.81	18.89	19.66	19.32	20.31	23.47	15.55
	148 hrs	1500			28.6	21.08	26.19	10.24	19.26	16.81	18.91	19.67	19.33	20.34	23.47	15.56
	150 hrs	1700	9.5, 10, 10, 10		28.45	21.06	26.1	10.25	19.3	16.82	18.91	19.68	19.38	20.32	23.49	15.56
	152 hrs	1900			28.46	21.1	26.08	10.25	19.29	16.84	18.93	19.7	19.37	20.35	23.52	15.58
	154 hrs	2100			28.51	21.11	26.15	10.26	19.3	16.86	18.94	19.72	19.37	20.36	23.52	15.59
	156 hrs	2300			28.91	21.08	26.49	10.26	19.31	16.86	18.95	19.73	19.39	20.37	23.53	15.6
8/20/2018	158 hrs	0100			28.82	21.1	26.44	10.26	19.34	16.87	18.96	19.74	19.39	20.39	23.54	15.61
0.0"	160 hrs	0300			28.99	21.1	26.57	10.26	19.35	16.89	18.98	19.74	19.41	20.39	23.56	15.62
100gpm	162 hrs	0500			28.42	21.19	26.05	10.26	19.35	16.9	18.98	19.77	19.46	20.41	23.56	15.63
	164 hrs	0700	9.5, 10, 9.75, 10		28.49	21.16	26.11	10.26	19.34	16.91	19.01	19.77	19.42	20.41	23.59	15.64
	166 hrs	0900			28.39	21.18	26.04	10.26	19.39	16.92	19.03	19.78	19.44	20.43	23.59	15.65
	168 hrs	1100			28.45	21.2	26.06	10.27	19.37	16.94	19.02	19.79	19.47	20.44	23.6	15.65
	170 hrs	1300			28.48	21.2	26.14	10.28	19.39	16.94	19.04	19.81	19.45	20.43	23.62	15.67
	172 hrs	1500			28.58	21.21	26.22	10.29	19.38	16.97	19.05	19.81	19.5	20.49	23.65	15.7
	174 hrs	1700	9.25, 10, 9.75, 10		28.48	21.22	26.3	10.3	19.41	16.97	19.06	19.82	19.47	20.48	23.65	15.69
	176 hrs	1900			29.04	21.2	26.6	10.3	19.43	16.99	19.07	19.85	19.52	20.49	23.66	15.71
	178 hrs	2100			29.03	21.24	26.59	10.31	19.48	17	19.09	19.87	19.54	20.5	23.68	15.72
	180 hrs	2300			29.06	21.24	26.62	10.31	19.49	17.01	19.09	19.87	19.55	20.53	23.71	15.72
8/21/2018	182 hrs	0100			29.07	21.24	26.62	10.31	19.46	17.02	19.1	19.88	19.53	20.51	23.69	15.73
0.0"	184 hrs	0300			29.08	21.23	26.68	10.31	19.49	17.03	19.12	19.89	19.55	20.56	23.7	15.74
100 gpm	186 hrs	0500			29.2	21.25	26.74	10.31	19.5	17.04	19.12	19.91	19.6	20.56	23.73	15.76
	188 hrs	0700			29.18	26.72	21.23	10.31	19.51	17.04	19.14	19.92	19.58	20.56	23.73	15.72
	190 hrs	0900			29.08	26.63	21.2	10.25	19.46	17.05	19.15	19.93	19.52	20.49	23.67	15.78
	192 hrs	1100			21.12	26.66	21.23	10.26	19.46	17.09	19.16	19.94	19.6	20.53	23.68	15.81

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA
Two-hour readings

					TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Date/ Rainfall/ Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)												
	194 hrs	1300			29.04	21.22	26.58	10.25	19.45	17.09	19.51	20.53	19.16	19.95	23.68	15.81
	196 hrs	1500	10, 10, 10, 10		28.99	21.23	26.58	10.25	19.46	17.08	19.56	20.51	19.17	20.16	23.68	15.8
	198 hrs	1700			29.01	21.24	26.58	10.25	19.48	17.1	19.55	20.52	19.18	19.97	23.69	15.81
	200 hrs	1900			29.04	21.26	26.61	10.25	19.51	17.11	19.21	19.98	19.62	20.55	23.71	15.82
	202 hrs	2100			29.06	21.26	26.65	10.26	19.46	17.12	19.21	19.99	19.57	20.56	23.72	15.84
	204 hrs	2300			29.07	21.28	26.66	10.26	19.5	17.13	19.22	19.99	19.59	20.56	23.72	15.84
8/22/2018	206 hrs	0100			29.14	21.28	26.71	10.26	19.53	17.14	19.24	20.01	19.58	20.57	23.74	15.86
0.85"	208 hrs	0300			28.97	21.32	26.56	10.26	19.53	17.15	19.24	20.01	19.6	20.59	23.76	15.86
100 gpm	210 hrs	0500			28.99	21.32	26.59	10.26	19.56	17.16	19.25	20.02	19.6	20.59	23.76	15.87
	212 hrs	0700	10, 10, 10, 10		29.06	21.31	26.65	10.26	19.55	17.16	19.25	20.04	19.65	20.6	23.76	15.87
	214 hrs	0900			29.09	21.29	26.61	10.25	19.51	17.15	19.25	20.04	19.59	20.59	23.75	15.85
	216 hrs	1100			28.93	21.29	26.58	10.22	19.5	17.13	19.24	20.03	19.57	20.57	23.75	15.85
	218 hrs	1300			29.02	21.29	26.59	10.21	19.51	17.15	19.24	20.02	19.6	20.58	23.75	15.84
	220 hrs	1500			29.03	21.29	26.6	10.2	19.5	17.14	19.25	20.03	19.59	20.58	23.76	15.85
	222 hrs	1700	10, 10, 10, 9.5		29.05	21.3	26.6	10.2	19.51	17.15	19.27	20.04	19.59	20.6	23.76	15.86
	224 hrs	1900			28.96	21.33	26.56	10.21	19.52	17.18	19.29	20.04	19.63	20.6	23.78	15.87
	226 hrs	2100			29.07	21.34	26.57	10.21	19.56	17.18	19.29	20.06	19.62	20.61	23.78	15.88
8/23/2018	228 hrs	2300			29.08	21.34	26.65	10.21	19.56	17.18	19.29	20.06	19.63	20.63	23.79	15.88
0.0"	230 hrs	0100			28.99	21.35	26.59	10.22	19.6	17.18	19.3	20.06	19.67	20.62	23.8	15.88
200 gpm	232 hrs	0300			28.99	21.35	26.6	10.22	19.56	17.19	19.3	20.06	19.65	20.62	23.8	15.88
	234 hrs	0500			28.95	21.36	26.56	10.23	19.57	17.2	19.3	20.07	19.65	20.63	23.81	15.88
	236 hrs	0700	10, 10, 10, 9.5		29.05	21.36	26.57	10.23	19.58	17.22	19.32	20.08	19.68	20.65	23.82	15.88
	238 hrs	0900			29.02	21.37	26.59	10.23	19.6	17.22	19.31	20.09	19.66	20.65	23.82	15.89
	240 hrs	1100			29.03	21.37	26.6	10.24	19.56	17.21	19.31	2.09	19.68	20.65	23.82	15.9

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA
Two-hour readings

					TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Date/ Rainfall/ Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)												
	242 hrs	1300			29.01	21.37	26.54	10.25	19.59	17.22	19.32	20.09	19.65	20.65	23.87	15.9
	244 hrs	1500			28.96	21.4	26.52	10.26	19.58	17.22	19.33	20.1	19.68	20.66	23.83	15.9
	246 hrs	1700	10, 10.25, 10, 9.75		28.94	21.39	26.55	10.27	19.56	17.23	19.35	20.1	19.67	20.67	23.84	15.91
	248 hrs	1900			28.98	21.41	26.59	10.28	19.61	17.24	19.35	20.13	19.69	20.68	23.85	15.93
	250 hrs	2100			29.09	21.42	26.69	10.28	19.62	17.26	19.36	20.14	19.74	20.68	23.86	15.93
	252 hrs	2300			29.09	21.42	26.69	10.28	19.62	17.26	19.37	20.14	19.71	20.69	23.87	15.93
8/24/2018	254 hrs	0100			29.06	21.42	26.67	10.28	19.61	17.26	19.37	20.14	19.71	20.7	23.87	15.94
0.0"	256 hrs	0300			29.49	21.37	27.04	10.28	19.61	17.27	19.38	20.15	19.73	20.69	23.87	15.95
150 gpm	258 hrs	0500			29.5	21.38	27.06	10.28	19.62	17.27	19.38	20.15	19.72	20.7	23.87	15.95
	260 hrs	0700	10, 10, 10, 10		29.56	21.38	27.08	10.29	19.68	17.27	19.38	20.15	19.72	20.7	23.89	15.96
	262 hrs	0900			29.53	21.41	27.06	10.29	19.66	17.28	19.39	20.17	19.78	20.74	23.89	15.96
	264 hrs	1100			29.49	21.4	27.02	10.3	19.69	17.29	19.41	20.16	19.75	20.73	23.9	15.97
	266 hrs	1300			29.5	21.39	27.06	10.3	19.7	17.3	19.41	20.15	19.75	20.72	23.9	15.98
	268 hrs	1500			29.52	21.41	27.05	10.31	19.71	17.3	19.43	20.15	19.74	20.72	23.91	15.98
	270 hrs	1700	10, 10, 10, 10		29.56	21.42	27.09	10.31	19.67	17.3	19.43	20.17	19.76	20.73	23.91	15.98
	272 hrs	1900			29.54	21.44	27.09	10.31	19.71	17.32	19.43	20.2	19.77	20.76	23.93	15.99
	274 hrs	2100			29.56	21.44	27.09	10.31	19.68	17.33	19.43	20.21	19.77	20.76	23.93	16
	276 hrs	2300			29.59	21.44	27.13	10.31	19.7	17.33	19.44	20.21	19.78	20.76	23.94	16.01
8/25/2018	278 hrs	0100			29.62	21.45	27.16	10.32	19.71	17.33	19.45	20.22	19.79	20.78	23.95	16.02
0.0"	280 hrs	0300			29.57	21.46	27.12	10.32	19.71	17.35	19.44	20.23	19.8	20.78	23.96	16.02
150 gpm	282 hrs	0500			29.59	21.47	27.13	10.33	19.72	17.36	19.46	20.23	19.81	20.78	23.96	16.02
	284 hrs	0700	10, 10, 10.25, 10		29.58	21.47	27.15	10.33	19.72	17.36	19.46	20.24	19.84	20.8	23.97	16.03
	286 hrs	0900			29.61	21.48	27.14	10.34	19.71	17.36	19.47	20.25	19.8	20.79	23.98	16.03
	288 hrs	1100			29.63	21.48	27.13	10.34	19.75	17.37	19.46	20.24	19.82	20.8	23.98	16.03

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA
Two-hour readings

					TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Date/ Rainfall/ Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)												
	290 hrs	1300			29.47	21.51	27.02	10.36	19.76	17.36	19.47	20.25	19.84	20.81	23.98	16.04
	292 hrs	1500			29.44	21.52	27.01	10.36	19.76	17.36	19.48	20.26	19.84	20.83	23.99	16.05
	294 hrs	1700	10, 10, 10, 10		29.45	21.52	27.02	10.36	19.74	17.38	19.48	20.26	19.84	20.82	24	16.06
	296 hrs	1900			29.46	21.53	27.04	10.36	19.75	17.39	19.5	20.28	19.84	20.83	24	16.07
	298 hrs	2100			29.52	21.53	27.09	10.36	19.75	17.4	19.5	20.28	19.84	20.82	24	16.08
	300 hrs	2300			29.53	21.54	27.07	10.36	19.75	17.41	19.51	20.29	19.84	20.84	24.01	16.08
8/26/2018	302 hrs	0100			29.53	21.54	27.09	10.36	19.76	17.41	19.51	20.29	19.84	20.84	24.02	16.09
0.0"	304 hrs	0300			29.52	21.54	27.09	10.37	19.76	17.42	19.51	20.3	19.85	20.84	24.03	16.09
100 gpm	306 hrs	0500			29.53	21.55	27.11	10.37	19.77	17.43	19.52	20.31	19.87	20.85	24.03	16.1
	308 hrs	0700	10, 10, 10, 10		29.59	21.55	27.12	10.38	19.81	17.44	19.54	20.31	19.9	20.86	24.05	16.11
	310 hrs	0900			29.55	21.56	27.12	10.39	19.84	17.45	19.56	20.31	19.89	20.89	24.06	16.12
	312 hrs	1100			29.55	21.56	27.11	10.39	19.81	17.46	19.56	20.31	19.9	20.89	24.06	16.12
	314 hrs	1300			29.54	21.58	27.1	10.4	19.8	17.47	19.56	20.33	19.91	20.89	24.07	16.14
	316 hrs	1500			29.5	21.59	27.05	10.41	19.83	17.46	19.56	20.34	19.92	20.89	24.07	16.14
	318 hrs	1700	10, 10, 10.25, 10		29.58	21.59	27.07	10.42	19.81	17.45	19.56	20.34	19.91	20.9	24.07	16.12
	320 hrs	1900			29.53	21.61	27.1	10.41	19.84	17.47	19.59	20.36	19.92	20.91	24.08	16.14
	322 hrs	2100			29.51	21.62	27.08	10.41	19.83	17.48	19.6	20.37	19.92	20.9	24.09	16.15
	324 hrs	2300			29.5	21.66	27.08	10.42	19.87	17.52	19.61	20.4	19.96	20.94	24.11	16.16
8/27/2018	326 hrs	0100			29.28	21.69	26.86	10.42	19.87	17.52	19.64	20.41	19.95	20.95	24.12	16.17
0.0"	328 hrs	0300			29.3	21.69	26.92	10.42	19.88	17.53	19.64	20.42	19.97	20.97	24.13	16.18
100 gpm	330 hrs	0500			29.35	21.7	26.96	10.43	19.9	17.54	19.65	20.43	20	20.97	24.14	16.19
	332 hrs	0700	10, 10, 10, 10		29.61	21.67	27.18	10.43	19.9	17.54	19.66	20.43	20.02	20.98	24.15	16.19
	334 hrs	0900			29.81	21.79	27.42	10.43	20.03	17.64	19.72	20.52	20.1	21.09	24.19	16.23
	336 hrs	1100														

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA
Two-hour readings

					TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Date/ Rainfall/ Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)												
	338 hrs	1300			29.61	21.7	27.15	10.45	19.93	17.55	19.69	20.46	20.04	21.03	24.19	16.24
	340 hrs	1500			29.61	21.7	27.18	10.45	19.94	17.55	19.69	20.47	20.04	21	24.18	16.23
	342 hrs	1700	10, 10, 10.25, 10.5		29.65	21.71	27.2	10.46	19.95	17.58	19.69	20.47	20.04	21.02	24.18	16.23
	344 hrs	1900			29.66	21.72	27.23	10.46	19.94	17.58	19.71	20.48	20.04	21.02	24.2	16.24
	346 hrs	2100			29.68	21.74	27.25	10.47	19.95	17.6	19.71	20.49	20.08	21.03	24.21	16.25
	348 hrs	2300			29.68	21.74	27.24	10.47	19.96	17.62	19.71	20.49	20.05	21.03	24.21	16.25
8/28/2018	350 hrs	0100			29.69	21.74	27.26	10.47	19.96	17.62	19.72	20.5	20.05	21.04	24.22	16.26
0.0"	352 hrs	0300			29.69	21.74	27.26	10.47	19.96	17.62	19.73	20.51	20.06	21.04	24.22	16.26
75 gpm	354 hrs	0500			29.69	21.76	27.26	10.48	19.98	17.63	19.74	20.52	20.06	21.04	24.23	16.28
	356 hrs	0700			29.72	21.75	27.26	10.48	19.99	17.64	19.75	20.51	20.03	21.08	24.25	16.28
	358 hrs	0900	Richards Pond = 0"		29.77	21.77	27.34	10.48	20.00	17.64	19.75	20.52	20.08	21.08	24.25	16.29
	360 hrs	1100														
Recovery Readings																
8/29/2018		0800	Brk = 50 gpm, Richards Pond = 4"		11.7	12.64	10.31	10.55	11.41	10	11.51	13.16	11.14	12.29	18.04	12.19
8/31/2018		0800	Brk = 50 gpm, Richards Pond = 14.5"		10.85	11.8	9.48	10.63	10.61	9.19	10.69	12.35	10.31	12.14	17.21	11.47
9/2/2018		1300	Brk = 30 gpm, Richards Pond = 18.5"		10.54	11.51	9.18	10.66	10.23	8.88	10.39	12.06	10.02	11.86	16.91	11.2
9/4/2018		0800	Brk = 30 gpm, Richards Pond = 25.5"		10.35	11.29	8.98	10.69	10.02	8.7	10.19	11.82	9.85	11.67	16.71	11.04
9/7/2018		0800	Brk = 30 gpm, Richards Pond = 29.5"													
9/12/2018		1000	Rain 1.60" Sept 10-12		9.83	10.79	8.49	10.52	9.50	8.18	9.69	11.35	9.33	11.18	16.22	10.61
			Bull Brk = 100-150 gpm													
			Richards Pond = 35.35"													
9/17/2018		0800			LOCKED	10.72	10.93	10.52	LOCKED	8.1	LOCKED	11.26	LOCKED	11.08	16.14	10.52

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out		
Antecedent Readings																			
8/6/2018			18.36	18.76	9.92	13.13	12.31												21.17
8/8/2018			18.36															9.53	21.29
8/10/2018			18.44	15.65	9.93	13.18	12.37	7.54	12.34									8.96	21.32
8/13/2018	0 hrs	1100																	
Pumping Test Readings																			
8/13/2018	2 hrs																		
	3 hrs																		
	4 hrs																		
	5 hrs																		
	6 hrs	1700	19.46	15.16					12.11									8.85	21.32
	7 hrs																		
	8 hrs	1900								1.95	2.04	1.53	1.86	2.57	2.81	2.45	2.71		
	10 hrs																		
	12 hrs	2300	20.15	15.13					12.09										
8/14/2018	14 hrs																		
	16 hrs																		
	18 hrs	0500	20.42	15.08					12.02										
	20 hrs																		
	22 hrs	0900								1.85	2.04	1.44	1.74	2.44	2.71	2.39	2.59		
	24 hrs	1100	20.63						12.00									8.64	21.32
	26 hrs	1300		15.03															
	28 hrs																		
	30 hrs	1700	20.83	14.96					11.89										
	32 hrs	1800								1.76	1.82	1.17	1.29	2.34	2.62	2.14	2.38		
	34 hrs																		
	36 hrs	2300	20.97	14.90					11.82										
8/15/2018	38 hrs																		
	40 hrs																		
	42 hrs	0500	21.11	14.84					11.75										
	44 hrs																		
	46 hrs																		
	48 hrs																		

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-1
Lynch Property, Linebrook Road, Ipswich, MA

Once Daily **Three Times Total** **Three Times Total**

			TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time																
Antecedent Readings																		
8/6/2018			8.62	13.05	12.93	13.42	13.21											
8/8/2018																		
8/10/2018			8.5	11.6	11.5	11.91	11.76	12.97	12.05	11.34	10.51	8.01	11.11	12.02	3.74	11.82		26.19
8/13/2018	0 hrs	1100																
Pumping Test Readings																		
8/13/2018	2 hrs																	
	3 hrs																	
	4 hrs																	
	5 hrs																	
	6 hrs	1700																
	7 hrs																	
	8 hrs	1900																
	10 hrs																	
	12 hrs	2300																
8/14/2018	14 hrs																	
	16 hrs																	
	18 hrs	0500																
	20 hrs																	
	22 hrs	0900																
	24 hrs	1100																
	26 hrs	1300																
	28 hrs																	
	30 hrs	1700																
	32 hrs	1800																
	34 hrs																	
	36 hrs	2300																
8/15/2018	38 hrs																	
	40 hrs																	
	42 hrs	0500																
	44 hrs																	
	46 hrs																	
	48 hrs																	

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out		
	50 hrs																		
	52 hrs	1500	21.32	14.75															
	54 hrs	1700			9.76	13.09	12.41											8.41	21.32
	55 hrs	1800								1.82	1.89	1.27	1.53	2.51	2.69	2.32	2.49		
	56 hrs	1900	21.4	14.76															
	58 hrs																		
	60 hrs	2300	21.51	14.77	9.72	13.09	12.44	7.1	11.62										
8/16/2018	62 hrs																		
	64 hrs	0300	21.58	14.75															
	66 hrs	0500			9.74	13.08	12.46	7.07	11.56										
	67 hrs	0600																8.41	21.31
	68 hrs	0700	21.61	14.76						1.85	1.92	1.36	1.58	2.61	2.77	2.40	2.51		
	69 hrs	0800																	
	70 hrs																		
	72 hrs	1100	21.73	14.74	9.79	13.06	12.45	7.08	11.54										
	74 hrs	1300																8.40	21.31
	76 hrs	1500	21.82	14.74															
	78 hrs	1700			9.77	13.06	12.49	7.06	11.5										
	79 hrs	1800								1.89	1.96	1.46	1.72	2.69	2.82	2.49	2.65		
	80 hrs	1900	21.90	14.76															
	82 hrs																		
	84 hrs	2300	21.97	14.75	9.76	13.06	12.52	7.08	11.48										
8/17/2018	85 hrs	0000																8.43	21.31
	86 hrs																		
	88 hrs	0300	22.04	14.76															
	90 hrs	0500			9.74	13.05	12.53	7.05	11.43										
	92 hrs	0700	22.1	14.75															
	94 hrs	0900	22.15	14.73	9.79	13.05	12.52	7.06	11.4										
	96 hrs	1100																	

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-1
Lynch Property, Linebrook Road, Ipswich, MA

			Once Daily					**Three Times Total**						**Three Times Total**				
			TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time																
	50 hrs																	
	52 hrs	1500																
	54 hrs	1700																
	55 hrs	1800																
	56 hrs	1900																
	58 hrs																	
	60 hrs	2300																
8/16/2018	62 hrs																	
	64 hrs	0300																
	66 hrs	0500																
	67 hrs	0600																
	68 hrs	0700																
	69 hrs	0800																
	70 hrs																	
	72 hrs	1100																
	74 hrs	1300	8.1	11.36	11.27	11.66	11.45											
	76 hrs	1500																
	78 hrs	1700																
	79 hrs	1800																
	80 hrs	1900																
	82 hrs																	
	84 hrs	2300																
8/17/2018	85 hrs	0000																
	86 hrs																	
	88 hrs	0300																
	90 hrs	0500																
	92 hrs	0700																
	94 hrs	0900	8.09	11.35	11.2	11.62	11.44	11.91	11.94	11.32	10.44	7.89	10.97	11.75	3.63	11.55		25.89
	96 hrs	1100																

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out		
	98 hrs																		
	100 hrs	1500	22.22	14.73															
	102 hrs	1700																	
	103 hrs	1800								1.89	2.01	1.56	1.88	2.69	2.81	2.57	2.75		
	104 hrs	1900	22.26	14.71															
	106 hrs																		
	108 hrs	2300	22.31	14.71	9.75	13.04	12.58	7.08	11.39										
8/18/2018	109 hrs	0000																8.39	21.33
	110 hrs																		
	112 hrs	0300	22.37	14.7															
	114 hrs	0500			9.76	13.05	12.59	7.06	11.41										
	116 hrs	0700	22.41	14.7															
	117 hrs	0800								1.90	2.02	1.58	1.84	2.65	2.69	2.56	2.70		
	118 hrs	0900																	
	119 hrs	1000																8.33	21.33
	120 hrs	1100	22.45	14.71	9.78	13.04	12.59	7.08	11.46										
	122 hrs																		
	124 hrs	1500	22.49	14.7															
	126 hrs	1700			9.79	13.04	12.6	7.07	11.43										
	127 hrs	1800								1.83	1.89	1.41	1.71	2.72	2.83	2.50	2.73		
	128 hrs	1900	22.53	14.73															
	130 hrs																		
	132 hrs	2300	22.58	14.71	9.75	13.04	12.64	7.07	11.41										
8/19/2018	133 hrs	0000																	
	134 hrs																	8.37	27.65
	136 hrs	0300	22.63	14.69															
	138 hrs	0500			9.75	13.04	12.64	7.04	11.43										
	140 hrs	0700	22.65	14.7						1.99	2.08	1.74	2.08	2.85	3.05	2.59	2.90		
	142 hrs																		
	144 hrs	1100	22.68	14.72	9.79		12.67	7.05	11.47									8.36	27.58

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-1
Lynch Property, Linebrook Road, Ipswich, MA

			Once Daily					**Three Times Total**					**Three Times Total**					
			TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time																
	98 hrs																	
	100 hrs	1500																
	102 hrs	1700																
	103 hrs	1800																
	104 hrs	1900																
	106 hrs																	
	108 hrs	2300																
8/18/2018	109 hrs	0000																
	110 hrs																	
	112 hrs	0300																
	114 hrs	0500																
	116 hrs	0700																
	117 hrs	0800																
	118 hrs	0900	8.11	11.3	11.19	11.59	11.39											
	119 hrs	1000																
	120 hrs	1100																
	122 hrs																	
	124 hrs	1500																
	126 hrs	1700																
	127 hrs	1800																
	128 hrs	1900																
	130 hrs																	
	132 hrs	2300																
8/19/2018	133 hrs	0000																
	134 hrs																	
	136 hrs	0300																
	138 hrs	0500																
	140 hrs	0700																
	142 hrs																	
	144 hrs	1100	8.06	11.31	11.15	11.6	11.36											

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out		
	146 hrs																		
	148 hrs	1500	22.71	14.71															
	150 hrs	1700			9.79	13.05	12.67	7.04	11.5										
	151 hrs	1800								1.95	2.07	1.69	2.03	2.80	2.90	2.59	2.84		
	152 hrs	1900	22.74	14.71															
	154 hrs																		
	156 hrs	2300	22.78	14.74	9.8	13.05	12.71	7.03	11.56										
8/20/2018	157 hrs	0000																8.37	27.55
	158 hrs																		
	160 hrs	0300	22.8	14.75															
	162 hrs	0500			9.81	13.06	12.73	7.02	11.6										
	164 hrs	0700	22.83	14.76						1.92	2.05	1.66	2.02	2.79	2.89	2.61	2.79		
	166 hrs																		
	168 hrs	1100	22.85	14.77	9.82	13.05	12.71	7.02	11.63										
	170 hrs	1300																8.38	27.49
	172 hrs	1500	22.88	14.8															
	174 hrs	1700			9.86	13.06	12.72	7.02	11.69										
	175 hrs	1800								1.90	2.02	1.67	1.96	2.84	2.91	2.65	2.85		
	176 hrs	1900	22.92	14.83															
	178 hrs																		
	180 hrs	2300	22.93	14.85	9.85	13.06	12.74	7.02	11.71										
8/21/2018	181 hrs	0000																8.39	27.43
	182 hrs																		
	184 hrs	0300	22.96	14.86															
	186 hrs	0500			9.86	13.06	12.78	7.02	11.77										
	188 hrs	0700	22.91	14.87						1.97	2.03	1.68	2.03	2.35	2.93	2.71	2.88		
	190 hrs																	8.35	27.35
	192 hrs	1100	22.94	14.83	9.8	13.00	12.72	7.00	11.72										

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-1
Lynch Property, Linebrook Road, Ipswich, MA

			Once Daily					**Three Times Total**						**Three Times Total**				
			TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time																
	146 hrs																	
	148 hrs	1500																
	150 hrs	1700																
	151 hrs	1800																
	152 hrs	1900																
	154 hrs																	
	156 hrs	2300																
8/20/2018	157 hrs	0000																
	158 hrs																	
	160 hrs	0300																
	162 hrs	0500																
	164 hrs	0700																
	166 hrs																	
	168 hrs	1100																
	170 hrs	1300	8.05	11.25	11.41	11.58	11.37											
	172 hrs	1500																
	174 hrs	1700																
	175 hrs	1800																
	176 hrs	1900																
	178 hrs																	
	180 hrs	2300																
8/21/2018	181 hrs	0000																
	182 hrs																	
	184 hrs	0300																
	186 hrs	0500																
	188 hrs	0700																
	190 hrs		8.01	11.19	11.08	11.51	11.26											
	192 hrs	1100																

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out		
	194 hrs																		
	196 hrs	1500	22.95	14.8															
	198 hrs	1700			9.79	13	12.7	6.95	11.7										
	199 hrs	1800								1.88	1.93	1.66	1.94	2.84	2.86	2.65	2.79		
	200 hrs	1900	22.97	14.81															
	202 hrs																		
	204 hrs	2300	22.99	14.83	9.79	12.99	12.73	6.95	11.7										
	205 hrs	0000																8.31	27.27
8/22/2018	206 hrs																		
	208 hrs	0300	23.02	14.83															
	210 hrs	0500			9.79	12.98	12.74	6.95	11.67										
	212 hrs	0700	23.05	14.84						1.89	1.94	1.65	1.93	2.86	2.87	2.67	2.81	8.06	27.21
	214 hrs																		
	216 hrs	1100	23.06	14.74	9.72	12.99	12.74	6.96	11.51										
	218 hrs																		
	220 hrs	1500	23.09	14.7															
	222 hrs	1700			9.7	12.99	12.75	6.93	11.46										
	223 hrs	1800								1.75	1.80	1.40	1.60	2.64	2.69	2.37	2.62		
	224 hrs	1900	23.1	14.67														8.06	27.2
	226 hrs																		
	228 hrs	2300	23.12	14.66	9.72	12.98	12.77	6.91	11.43										
	230 hrs																		
	232 hrs	0300	23.15	14.65															
	234 hrs	0500			9.73	12.98	12.77	6.9	11.39										
	236 hrs	0700								1.74	1.81	1.34	1.61	2.64	2.64	2.36	2.60		

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-1
Lynch Property, Linebrook Road, Ipswich, MA

			Once Daily					**Three Times Total**					**Three Times Total**					
			TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time																
	194 hrs																	
	196 hrs	1500																
	198 hrs	1700																
	199 hrs	1800																
	200 hrs	1900																
	202 hrs																	
	204 hrs	2300																
	205 hrs	0000																
8/22/2018	206 hrs																	
	208 hrs	0300																
	210 hrs	0500																
	212 hrs	0700																
	214 hrs																	
	216 hrs	1100																
	218 hrs		7.86	11.07	10.94	11.41	11.14											
	220 hrs	1500																
	222 hrs	1700																
	223 hrs	1800																
	224 hrs	1900																
	226 hrs																	
	228 hrs	2300																
	230 hrs																	
	232 hrs	0300																
	234 hrs	0500																
	236 hrs	0700																

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out		
	238 hrs	0900	23.16	14.66														8.1	27.12
	240 hrs	1100			9.75	12.98	12.79	6.86	11.37										
	242 hrs																		
	244 hrs	1500	23.19	14.65															
	246 hrs	1700			9.75	12.97	12.79	6.84	11.31										
	247 hrs	1800								1.75	1.80	1.35	1.49	2.71	2.67	2.44	2.56		
	248 hrs	1900	23.21	14.66														8.11	27.11
	250 hrs																		
	252 hrs	2300	23.23	14.67	9.78	12.98	12.81	6.85	11.3										
	254 hrs																		
8/24/2018	256 hrs	0300	23.24	14.67															
	258 hrs	0500			9.78	12.98	12.81	6.85	11.26										
	260 hrs	0700	23.26	14.68						1.81	1.87	1.43	1.66	2.74	2.71	2.50	2.67		
	262 hrs																		
	264 hrs	1100	23.27	14.69	9.81	12.98	12.83	6.86	11.22										
	265 hrs	1200																	
	266 hrs	1300																8.15	27.02
	268 hrs	1500	23.28	14.68															
	270 hrs	1700			9.8	12.97	12.82	6.86	11.2										
	271 hrs	1800								1.81	1.84	1.50	1.71	2.81	2.77	2.59	2.70		
	272 hrs	1900	23.31	14.66														8.18	27.01
	274 hrs																		
	276 hrs	2300	23.32	14.67	9.8	12.99	12.87	6.85	11.17										
	278 hrs																		
8/25/2018	280 hrs	0300	23.35	14.67															

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-1
Lynch Property, Linebrook Road, Ipswich, MA

			Once Daily					**Three Times Total**						**Three Times Total**				
			TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time																
	238 hrs	0900																
	240 hrs	1100	7.87	11.07	10.96	11.41	11.15											
	242 hrs																	
	244 hrs	1500																
	246 hrs	1700																
	247 hrs	1800																
	248 hrs	1900																
	250 hrs																	
	252 hrs	2300																
	254 hrs																	
8/24/2018	256 hrs	0300																
	258 hrs	0500																
	260 hrs	0700																
	262 hrs																	
	264 hrs	1100																
	265 hrs	1200	7.89	11.1	11	11.4	11.2											
	266 hrs	1300																
	268 hrs	1500																
	270 hrs	1700																
	271 hrs	1800																
	272 hrs	1900																
	274 hrs																	
	276 hrs	2300																
	278 hrs																	
8/25/2018	280 hrs	0300																

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out		
	282 hrs	0500			9.81	13	12.87	6.85	11.16										
	284 hrs	0700	23.37	14.66						1.85	1.90	1.56	1.84	2.76	2.77	2.61	2.76		
	286 hrs																	8.21	26.95
	288 hrs	1100	23.37	14.66	9.87	13.02	12.87	6.86	11.14										
	290 hrs																		
	292 hrs	1500	23.39	14.65															
	294 hrs	1700			9.82	13.01	12.88	6.87	11.15										
	295 hrs	1800								1.87	1.91	1.62	1.84	2.83	2.77	2.68	2.76		
	296 hrs	1900	23.4	14.65														8.2	27.07
	298 hrs																		
	300 hrs	2300	23.41	14.67	9.83	13.01	12.9	6.88	11.16										
8/26/2018	302 hrs																		
	304 hrs	0300	23.43	14.66															
	306 hrs	0500			9.85	13.02	12.91	6.87	11.16										
	308 hrs	0700	23.45	14.67						1.87	1.93	1.65	1.96	2.84	2.84	2.71	2.85		
	310 hrs	0900																8.23	26.87
	312 hrs	1100	23.46	14.66	9.84	13.02	12.91	6.89	11.16										
	314 hrs																		
	316 hrs	1500	23.49	14.66															
	318 hrs	1700			9.86	13.02	12.92	6.89	11.18										
	319 hrs	1800								1.91	1.93	1.71	1.95	2.88	2.84	2.76	2.86		
	320 hrs	1900	23.49	14.66														8.36	26.83
	322 hrs																		
	324 hrs	2300	23.49	14.67	9.86	13.02	12.95	6.9	11.2										

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-1
Lynch Property, Linebrook Road, Ipswich, MA

			Once Daily					Three Times Total						Three Times Total				
			TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time																
	282 hrs	0500																
	284 hrs	0700																
	286 hrs		7.94	11.14	11.02	11.44	11.24											
	288 hrs	1100																
	290 hrs																	
	292 hrs	1500																
	294 hrs	1700																
	295 hrs	1800																
	296 hrs	1900																
	298 hrs																	
	300 hrs	2300																
8/26/2018	302 hrs																	
	304 hrs	0300																
	306 hrs	0500																
	308 hrs	0700																
	310 hrs	0900	7.96	13.07	12.97	12.03	11.18											
	312 hrs	1100																
	314 hrs																	
	316 hrs	1500																
	318 hrs	1700																
	319 hrs	1800																
	320 hrs	1900																
	322 hrs																	
	324 hrs	2300																

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out		
8/27/2018	326 hrs																		
	328 hrs	0300	23.52	14.68															
	330 hrs	0500			9.86	13.02	12.96	6.92	11.21										
	332 hrs	0700	23.53	14.69						1.90	1.95	1.74	2.03	2.88	2.88	2.78	2.90		
	334 hrs	0900																8.6	26.74
	336 hrs	1100	23.53	14.7	9.85	13.02	12.94	6.92	11.23										
	338 hrs																		
	340 hrs	1500	23.56	14.71															
	342 hrs	1700			9.87	13.02	12.99	6.92	11.25										
	343 hrs	1800								1.91	1.94	1.79	2.06	2.97	2.94	2.89	2.91		
	344 hrs	1900	23.58	14.72														8.62	26.73
	346 hrs																		
	348 hrs	2300	23.59	14.73	9.88	13.04	12.99	6.95	11.27										
8/28/2018	350 hrs																		
	352 hrs	0300	23.6	14.75															
	354 hrs	0500			9.88	13.04	13	6.96	11.26										
	356 hrs	0700	23.62	14.74															
	358 hrs																		
	360 hrs																		
Recovery Readings																			
8/29/2018			21.97	14.76					11.26	2.10	2.18	1.84	2.13	2.82	2.93	2.90	3.00	8.59	26.66
8/31/2018			19.8	14.81					11.4	2.19	2.26	1.89	2.23	2.76	3.00	2.98	3.05	8.69	26.45
9/2/2018		1300	19.23	22.66					12.69	2.20	2.30	1.94	2.27	2.73	2.96	3.04	3.05		
9/4/2018			19.08	20.9						2.25	2.36	1.93	2.28	2.72	2.98	3.06	3.04	9.66	26.15
9/6/2018																			
9/12/2018		1000	18.63	20.66			12.78		12.23	1.97	2.05	1.65	1.92	2.41	2.72	2.65	2.88		
9/17/2018		0800	18.5	24.2	10.19	13.29	12.71	7.38	13.26	2.03	2.12	1.76	2.11	2.48	2.83	2.84	2.99	9.4	25.26

15-Day Pumping Test - TW-13, TW-14, TW-15, TW-1
Lynch Property, Linebrook Road, Ipswich, MA

			Once Daily					**Three Times Total**						**Three Times Total**				
			TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time																
8/27/2018	326 hrs																	
	328 hrs	0300																
	330 hrs	0500																
	332 hrs	0700																
	334 hrs	0900	8.36	12.79	12.66	13.37	13.15											
	336 hrs	1100																
	338 hrs																	
	340 hrs	1500																
	342 hrs	1700																
	343 hrs	1800																
	344 hrs	1900																
	346 hrs																	
	348 hrs	2300																
8/28/2018	350 hrs																	
	352 hrs	0300																
	354 hrs	0500																
	356 hrs	0700																
	358 hrs																	
	360 hrs																	
Recovery Readings																		
8/29/2018																		
8/31/2018																		
9/2/2018		1300																
9/4/2018																		
9/6/2018																		
9/12/2018		1000																
9/17/2018		0800	9.4	14.32	14.19	14.91	14.7	13.36	12.45	11.76	10.92	8.39	11.33	13.82	3.93	14.4	11.81	NR

Facility : Ipswich WWTF
Receiving stream : Greenwood Creek
Month: 18-Aug
Wastewater Superintendent: John T Parkhurst
Assistant Superintendent: Scott Yaffe

General			
Date	**Day**	**Oper. Int.**	**Precip. inches**
1	Wed	SY	0
2	Thu	SY	0
3	Fri	SY	0.4
4	Sat	JN	0.35
5	Sun	JN	0
6	Mon	JN	0
7	Tue	JN	0
8	Wed	JN	0.1
9	Thu	JN	0.2
10	Fri	JN	0
11	Sat	AP	0.8
12	Sun	AP	0.4
13	Mon	SY	0.3
14	Tue	SY	0.6
15	Wed	SY	0
16	Thu	SY	0
17	Fri	SY	0.1
18	Sat	SY	0.6
19	Sun	SY	0
20	Mon	SY	0
21	Tue	SY	0
22	Wed	SY	0.9
23	Thu	SY	0
24	Fri	SY	0
25	Sat	JC	0
26	Sun	JC	0
27	Mon	JC	0
28	Tue	JC	0
29	Wed	JN	0
30	Thu	JN	0
31	Fri	JC	0
TOTAL			4.75
AVERAGE			0.16
MIN			0
MAX			0.9

Facility : Ipswich WWTF
Receiving stream : Greenwood Creek
Month: 18-Sep
Wastewater Superintendent: John T Parkhurst
Assistant Superintendent: Scott Yaffe

General			
Date	**Day**	**Oper. Int.**	**Precip. inches**
1	Sat	JC	0
2	Sun	JC	0
3	Mon	SY	0
4	Tue	JC	0
5	Wed	JC	0
6	Thu	JC	0.1
7	Fri	JC	0
8	Sat	JN	0
9	Sun	JN	0
10	Mon	JN	1.5
11	Tue	SY	0
12	Wed	SY	0.1
13	Thu	SY	0
14	Fri	SY	0
15	Sat	SY	0
16	Sun	SY	0
17	Mon	JN	0.6
18	Tue	JN	2.1
19	Wed	JN	0
20	Thu	JN	0
21	Fri	JN	0
22	Sat	AP	0
23	Sun	AP	0
24	Mon	SY	
25	Tue		
26	Wed		
27	Thu		
28	Fri		
29	Sat		
30	Sun		
TOTAL			4.4
AVERAGE			0.19
MIN			0
MAX			2.1

USGS 424520070562401 MA-NIW 27 NEWBURY, MA

Daily Mean Depth to water level, feet below land surface

DATE	Aug 2018	Sep 2018
1	9.01[P]	9.44[P]
2	9.05[P]	9.47[P]
3	9.09[P]	9.50[P]
4	9.11[P]	9.54[P]
5	9.12[P]	9.58[P]
6	9.15[P]	9.61[P]
7	9.18[P]	9.65[P]
8	9.22[P]	9.69[P]
9	9.25[P]	9.73[P]
10	9.29[P]	9.77[P]
11	9.30[P]	9.69[P]
12	9.25[P]	9.66[P]
13	9.24[P]	9.67[P]
14	9.20[P]	9.69[P]
15	9.18[P]	9.71[P]
16	9.19[P]	9.72[P]
17	9.21[P]	9.75[P]
18	9.21[P]	
19	9.22[P]	
20	9.25[P]	
21	9.26[P]	
22	9.25[P]	
23	9.21[P]	
24	9.22[P]	
25	9.23[P]	
26	9.24[P]	
27	9.26[P]	
28	9.28[P]	
29	9.31[P]	
30	9.35[P]	
31	9.40[P]	
COUNT	31	17
MAX	9.4	9.77
MIN	9.01	9.44

USGS 423506070491401 MA-WPW 76R WENHAM, MA

Daily Mean Depth to water level, feet below land surface

DATE	Aug 2018	Sep 2018
1	2.96[P]	3.14[P]
2	3.01[P]	3.17[P]
3	3.07[P]	3.20[P]
4	3.01[P]	3.23[P]
5	3.03[P]	3.25[P]
6	3.10[P]	3.27[P]
7	3.15[P]	3.28[P]
8	3.19[P]	3.30[P]
9	3.17[P]	3.33[P]
10	3.17[P]	3.30[P]
11	3.13[P]	2.44[P]
12	2.66[P]	2.71[P]
13	2.69[P]	2.65[P]
14	2.62[P]	2.72[P]
15	2.68[P]	2.76[P]
16	2.74[P]	2.79[P]
17	2.79[P]	2.84[P]
18	2.80[P]	
19	2.83[P]	
20	2.87[P]	
21	2.90[P]	
22	2.68[P]	
23	2.73[P]	
24	2.82[P]	
25	2.87[P]	
26	2.91[P]	
27	2.95[P]	
28	2.99[P]	
29	3.04[P]	
30	3.08[P]	
31	3.12[P]	
COUNT	31	17
MAX	3.19	3.33
MIN	2.62	2.44

15-Day Pumping T W-13, TW-14, TW-15, TW-16
Lynch Property, L ok Road, Ipswich, MA
Two-hour readings

Date/Rainfall/Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)	TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Antecedent Readings																
8/6/2018					9.78	10.66	8.35	10.22	9.51	8.06	9.6	11.2	9.54	11.09	16.12	10.49
8/8/2018					9.78	10.69	8.35	10.29	9.37	8.06	9.59	11.24	9.54	11.04	16.12	10.5
8/10/2018					9.8	10.77	8.49	10.32	9.47	8.15	9.67	11.31	9.35	11.15	16.2	10.59
8/13/2018	0 hrs	1100			9.43	10.44	8.09	10.13	9.04	7.82	9.38	10.96	8.98	10.79	15.86	10.3
Pumping Test Readings																
8/13/2018	2 hrs	1300	6 / 305	306	15.29	16.2	13.92	10.04	14.06	12.50	20.41	18.41	14.83	16.40	-	13.09
0.3"	3 hrs	1400		303	15.35	16.31	14.03	10.11	14.15	12.59	20.51	18.51	14.82	16.59	21.20	13.17
100 gpm	4 hrs	1500		302	15.55	16.46	14.16	10.12	14.29	12.73	20.61	18.61	15.08	16.72	21.37	13.26
	5 hrs	1600		302	15.62	16.53	14.26	10.12	14.39	12.82	20.75	18.72	15.09	16.81	21.45	13.35
	6 hrs	1700		304	15.71	16.62	14.37	10.13	14.54	12.91	20.86	18.80	15.22	16.94	21.53	13.39
	7 hrs	1800	4"	303	15.80	16.71	14.43	10.13	14.60	12.98	20.93	18.89	15.29	17.00	21.65	13.48
	8 hrs	1900		303	15.88	16.81	14.52	10.13	14.67	13.05	20.99	18.96	15.38	17.06	21.71	13.56
	10 hrs	2100		302	15.94	16.87	14.58	10.13	14.74	13.12	21.06	19.04	15.43	17.11	21.77	13.61
	12 hrs	2300		301	16.00	16.93	14.64	10.13	14.81	13.21	21.14	19.12	15.51	17.18	21.84	13.69
8/14/2018	14 hrs	0100		302	16.06	17.02	14.71	10.12	14.88	13.28	21.22	19.20	15.59	17.26	21.93	13.76
	16 hrs	0300		301	16.14	17.05	14.79	10.12	14.94	13.33	21.28	19.24	15.63	17.31	21.98	13.79
	18 hrs	0500		303	16.19	17.13	14.84	10.11	14.99	13.39	21.31	19.29	15.68	17.36	22.05	13.85
	20 hrs	0700		302	16.26	17.18	14.88	10.11	15.06	13.44	21.36	19.35	15.72	17.43	22.11	13.90
between 1500 - 1600 received 0.65" of rain	22 hrs	0900	6"	303	16.29	17.22	14.96	10.11	15.14	13.50	21.43	19.41	15.78	17.51	22.16	13.96
	24 hrs	1100		302	16.34	17.29	15.02	10.11	15.22	13.56	21.53	19.45	15.86	17.56	22.25	14.01
	26 hrs	1300		301	16.44	17.33	15.05	10.12	15.23	13.61	21.61	19.55	15.94	17.59	22.28	14.05
	28 hrs	1500		301	16.58	17.39	15.12	10.12	15.29	13.67	21.64	19.59	15.96	17.62	22.33	14.11
	30 hrs	1700		301	16.44	17.35	15.08	10.10	15.22	13.65	21.62	19.56	15.91	17.62	22.31	14.04
	32 hrs	1900	4"	300	16.49	17.41	15.12	10.08	15.30	13.67	21.68	19.59	15.99	17.66	22.35	14.08
	34 hrs	2100		302	16.53	17.45	15.16	10.08	15.34	13.70	21.71	19.67	16.02	17.69	22.39	14.10
	36 hrs	2300		303	16.56	17.49	15.20	10.05	15.36	13.75	21.76	19.68	16.06	17.74	22.42	14.14
8/15/2018	38 hrs	0100		303	16.59	17.51	15.23	10.05	15.38	13.77	21.79	19.70	16.11	17.77	22.46	14.17
0.0"	40 hrs	0300		301	16.62	17.55	15.26	10.04	15.44	13.81	21.81	19.73	16.13	17.81	22.49	14.19
200 gpm	42 hrs	0500		302	16.64	17.58	15.29	10.03	15.44	13.84	21.85	19.77	16.15	17.82	22.52	14.21
	44 hrs	0700		303	16.72	17.61	15.34	10.03	15.51	13.86	21.91	19.82	16.2	17.88	22.55	14.24
	46 hrs	0900		302	16.75	17.62	15.35	10.03	15.52	13.9	21.94	19.85	16.24	17.9	22.58	14.27
	48 hrs	1100		304	16.79	17.66	15.39	10.03	15.59	13.98	21.96	19.86	16.25	17.91	22.16	14.29
changed out	50 hrs	1300	9.5, 10, 10, 10		26.06	20.10	23.80	10.03	18.20	15.76	17.78	18.58	18.33	19.25	22.46	14.64
orifice plates	52 hrs	1500			27.14	20.14	24.84	10.04	18.35	15.88	17.97	18.74	18.43	19.39	22.56	14.72
	54 hrs	1700			27.5	20.20	25.11	10.06	18.45	15.92	18.07	18.78	18.51	19.44	22.60	14.74
	56 hrs	1900	9.5, 10, 10, 10		27.32	20.26	25.00	10.06	18.44	15.98	18.07	18.84	18.53	19.49	22.66	14.79
	58 hrs	2100			27.43	20.31	25.10	10.07	18.48	16.03	18.11	18.87	18.55	19.54	22.69	14.82
	60 hrs	2300			27.65	20.33	25.33	10.07	18.54	16.06	18.14	18.91	18.59	19.58	22.72	14.86
8/16/2018	62 hrs	0100			27.50	20.34	25.21	10.06	18.53	16.09	18.17	18.94	18.61	19.59	22.75	14.88
0.0"	64 hrs	0300			27.61	20.39	25.28	10.06	18.55	16.12	18.21	18.97	18.65	19.63	22.78	14.92
150 gpm	66 hrs	0500			27.54	20.42	25.19	10.07	18.61	16.15	18.24	19.00	18.69	19.66	22.82	14.93
	68 hrs	0700			27.64	20.42	25.28	10.07	18.62	16.16	18.25	19.03	18.7	19.66	22.82	14.96
	70 hrs	0900			27.63	20.42	25.3	10.08	18.64	16.19	18.29	19.04	18.68	19.68	22.86	14.99
	72 hrs	1100	9.5, 10, 10, 10		27.71	20.48	25.35	10.09	18.65	16.22	18.33	19.06	18.75	19.71	22.87	15.00
	74 hrs	1300			27.62	20.5	25.31	10.1	18.68	16.24	18.32	19.07	18.81	19.74	22.89	15.01
	76 hrs	1500			27.67	20.53	25.35	10.12	18.76	16.25	18.36	19.11	18.82	19.75	22.91	15.04
	78 hrs	1700	10, 10, 10, 10		27.61	20.55	25.31	10.14	18.73	16.27	18.34	19.13	18.76	19.77	22.95	15.07
	80 hrs	1900			27.64	20.6	25.31	10.15	18.76	16.3	18.39	19.15	18.84	19.82	22.96	15.08
	82 hrs	2100			27.6	20.63	25.29	10.16	18.8	16.32	18.41	19.17	18.86	19.84	22.98	15.11

15-Day Pumping T 'W-13, TW-14, TW-15, TW-16
Lynch Property, L ɔk Road, Ipswich, MA
Two-hour readings

Date/Rainfall/Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)	TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
8/17/2018	84 hrs	2300			27.63	20.66	25.32	10.15	18.81	16.35	18.43	19.19	18.89	19.86	23.01	15.12
0.05"	86 hrs	0100			27.41	20.68	25.12	10.15	18.81	16.36	18.43	19.21	18.91	19.86	23.02	15.14
100 gpm	88 hrs	0300			27.55	20.7	25.23	10.15	18.83	16.38	18.45	19.24	18.92	19.89	23.04	15.16
	90 hrs	0500			27.55	20.71	25.24	10.16	18.85	16.39	18.47	19.25	18.92	19.91	23.06	15.17
	92 hrs	0700			28.54	20.59	26.07	10.15	18.94	16.39	18.46	19.26	18.94	19.9	23.07	15.18
	94 hrs	0900	9.5, 10, 9.5, 10		28.59	20.58	26.13	10.16	18.88	16.4	18.54	19.26	18.95	19.91	23.09	15.19
	96 hrs	1100														
	98 hrs	1300			28.46	20.65	26.05	10.18	18.91	16.43	18.54	19.29	19.01	19.94	23.12	15.22
	100 hrs	1500			28.6	20.67	26.14	10.2	18.96	16.45	18.56	19.32	19.04	19.97	23.14	15.23
	102 hrs	1700	10, 10, 10, 10													
	104 hrs	1900			28.4	20.72	25.98	10.2	18.94	16.48	18.56	19.34	19.02	20	23.16	15.27
	106 hrs	2100			28.24	20.76	25.88	10.2	18.96	16.51	18.59	19.36	19.07	20.03	23.18	15.28
	108 hrs	2300			28.58	20.73	26.2	10.2	18.99	16.52	18.61	19.38	19.05	20.04	23.19	15.29
8/18/2018	110 hrs	0100														
0.45"	112 hrs	0300			28.02	20.86	25.7	10.2	19.01	16.56	18.64	19.41	19.11	20.09	23.23	15.32
10 gpm	114 hrs	0500			28.02	20.85	25.7	10.2	19.01	16.57	18.65	19.43	19.1	20.06	23.24	15.33
	116 hrs	0700	9.25, 10.5, 10, 10		28.05	20.84	25.71	10.2	19.03	16.58	18.67	19.44	19.1	20.08	23.24	15.33
	118 hrs	0900			28.09	20.85	25.66	10.21	19.06	16.58	18.66	19.45	19.11	20.08	23.25	15.33
	120 hrs	1100			28.03	20.88	25.69	10.22	19.13	16.58	18.68	19.45	19.12	20.11	23.29	15.34
	122 hrs	1300									18.69	19.46			23.27	15.35
	124 hrs	1500			27.98	20.9	25.66	10.22	19.14	16.63	18.75	19.5	19.15	20.13	23.3	15.39
	126 hrs	1700			28.05	20.93	25.69	10.23	19.11	16.66	18.74	19.52	19.18	20.16	23.33	15.41
	128 hrs	1900	9.5, 10, 10, 10		28.12	20.95	25.78	10.23	19.12	16.68	18.77	19.53	19.18	20.18	23.34	15.43
	130 hrs	2100			28.09	20.98	25.73	10.23	19.14	16.71	18.79	19.56	19.21	20.19	23.36	15.46
	132 hrs	2300			28.14	20.96	25.81	10.23	19.14	16.72	18.79	19.58	19.23	20.23	23.37	15.47
8/19/2018	134 hrs	0100			28.09	20.99	25.78	10.22	19.16	16.73	18.81	19.58	19.27	20.23	23.39	15.49
0.0"	136 hrs	0300			28.26	20.99	25.91	10.22	19.17	16.76	18.81	19.6	19.25	20.24	23.39	15.51
100 gpm	138 hrs	0500														
	140 hrs	0700			28.27	21.02	25.89	10.22	19.23	16.77	18.84	19.62	19.28	20.26	23.42	15.52
	142 hrs	0900			28.28	21.04	25.91	10.22	19.23	16.78	18.85	19.64	19.31	20.28	23.44	15.53
	144 hrs	1100			28.3	21.05	25.91	10.23	19.23	16.79	18.91	19.65	19.34	20.3	23.46	15.54
	146 hrs	1300			28.3	21.06	25.96	10.23	19.29	16.81	18.89	19.66	19.32	20.31	23.47	15.55
	148 hrs	1500			28.6	21.08	26.19	10.24	19.26	16.81	18.91	19.67	19.33	20.34	23.47	15.56
	150 hrs	1700	9.5, 10, 10, 10		28.45	21.06	26.1	10.25	19.3	16.82	18.91	19.68	19.38	20.32	23.49	15.56
	152 hrs	1900			28.46	21.1	26.08	10.25	19.29	16.84	18.93	19.7	19.37	20.35	23.52	15.58
	154 hrs	2100			28.51	21.11	26.15	10.26	19.3	16.86	18.94	19.72	19.37	20.36	23.52	15.59
	156 hrs	2300			28.91	21.08	26.49	10.26	19.31	16.86	18.95	19.73	19.39	20.37	23.53	15.6
8/20/2018	158 hrs	0100			28.82	21.1	26.44	10.26	19.34	16.87	18.96	19.74	19.39	20.39	23.54	15.61
0.0"	160 hrs	0300			28.99	21.1	26.57	10.26	19.35	16.89	18.98	19.74	19.41	20.39	23.56	15.62
100gpm	162 hrs	0500			28.42	21.19	26.05	10.26	19.35	16.9	18.98	19.77	19.46	20.41	23.56	15.63
	164 hrs	0700	9.5, 10, 9.75, 10		28.49	21.16	26.11	10.26	19.34	16.91	19.01	19.77	19.42	20.41	23.59	15.64
	166 hrs	0900			28.39	21.18	26.04	10.26	19.39	16.92	19.03	19.78	19.44	20.43	23.59	15.65
	168 hrs	1100			28.45	21.2	26.06	10.27	19.37	16.94	19.02	19.79	19.47	20.44	23.6	15.65
	170 hrs	1300			28.48	21.2	26.14	10.28	19.39	16.94	19.04	19.81	19.45	20.43	23.62	15.67
	172 hrs	1500			28.58	21.21	26.22	10.29	19.38	16.97	19.05	19.81	19.5	20.49	23.65	15.7
	174 hrs	1700	9.25, 10, 9.75, 10		28.48	21.22	26.3	10.3	19.41	16.97	19.06	19.82	19.47	20.48	23.65	15.69
	176 hrs	1900			29.04	21.2	26.6	10.3	19.43	16.99	19.07	19.85	19.52	20.49	23.66	15.71
	178 hrs	2100			29.03	21.24	26.59	10.31	19.48	17	19.09	19.87	19.54	20.5	23.68	15.72
	180 hrs	2300			29.06	21.24	26.62	10.31	19.49	17.01	19.09	19.87	19.55	20.53	23.71	15.72

15-Day Pumping T W-13, TW-14, TW-15, TW-16
Lynch Property, L. ok Road, Ipswich, MA
Two-hour readings

Date/Rainfall/Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)	TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
8/21/2018	182 hrs	0100			29.07	21.24	26.62	10.31	19.46	17.02	19.1	19.88	19.53	20.51	23.69	15.73
0.0"	184 hrs	0300			29.08	21.23	26.68	10.31	19.49	17.03	19.12	19.89	19.55	20.56	23.7	15.74
100 gpm	186 hrs	0500			29.2	21.25	26.74	10.31	19.5	17.04	19.12	19.91	19.6	20.56	23.73	15.76
	188 hrs	0700			29.18	26.72	21.23	10.31	19.51	17.04	19.14	19.92	19.58	20.56	23.73	15.72
	190 hrs	0900			29.08	26.63	21.2	10.25	19.46	17.05	19.15	19.93	19.52	20.49	23.67	15.78
	192 hrs	1100			21.12	26.66	21.23	10.26	19.46	17.09	19.16	19.94	19.6	20.53	23.68	15.81
	194 hrs	1300			29.04	21.22	26.58	10.25	19.45	17.09	19.51	20.53	19.16	19.95	23.68	15.81
	196 hrs	1500	10, 10, 10, 10		28.99	21.23	26.58	10.25	19.46	17.08	19.56	20.51	19.17	20.16	23.68	15.8
	198 hrs	1700			29.01	21.24	26.58	10.25	19.48	17.1	19.55	20.52	19.18	19.97	23.69	15.81
	200 hrs	1900			29.04	21.26	26.61	10.25	19.51	17.11	19.21	19.98	19.62	20.55	23.71	15.82
	202 hrs	2100			29.06	21.26	26.65	10.26	19.46	17.12	19.21	19.99	19.57	20.56	23.72	15.84
	204 hrs	2300			29.07	21.28	26.66	10.26	19.5	17.13	19.22	19.99	19.59	20.56	23.72	15.84
8/22/2018	206 hrs	0100			29.14	21.28	26.71	10.26	19.53	17.14	19.24	20.01	19.58	20.57	23.74	15.86
0.85"	208 hrs	0300			28.97	21.32	26.56	10.26	19.53	17.15	19.24	20.01	19.6	20.59	23.76	15.86
100 gpm	210 hrs	0500			28.99	21.32	26.59	10.26	19.56	17.16	19.25	20.02	19.6	20.59	23.76	15.87
	212 hrs	0700	10, 10, 10, 10		29.06	21.31	26.65	10.26	19.55	17.16	19.25	20.04	19.65	20.6	23.76	15.87
	214 hrs	0900			29.09	21.29	26.61	10.25	19.51	17.15	19.25	20.04	19.59	20.59	23.75	15.85
	216 hrs	1100			28.93	21.29	26.58	10.22	19.5	17.13	19.24	20.03	19.57	20.57	23.75	15.85
	218 hrs	1300			29.02	21.29	26.59	10.21	19.51	17.15	19.24	20.02	19.6	20.58	23.75	15.84
	220 hrs	1500			29.03	21.29	26.6	10.2	19.5	17.14	19.25	20.03	19.59	20.58	23.76	15.85
	222 hrs	1700	10, 10, 10, 9.5		29.05	21.3	26.6	10.2	19.51	17.15	19.27	20.04	19.59	20.6	23.76	15.86
	224 hrs	1900			28.96	21.33	26.56	10.21	19.52	17.18	19.29	20.04	19.63	20.6	23.78	15.87
	226 hrs	2100			29.07	21.34	26.57	10.21	19.56	17.18	19.29	20.06	19.62	20.61	23.78	15.88
8/23/2018	228 hrs	2300			29.08	21.34	26.65	10.21	19.56	17.18	19.29	20.06	19.63	20.63	23.79	15.88
0.0"	230 hrs	0100			28.99	21.35	26.59	10.22	19.6	17.18	19.3	20.06	19.67	20.62	23.8	15.88
200 gpm	232 hrs	0300			28.99	21.35	26.6	10.22	19.56	17.19	19.3	20.06	19.65	20.62	23.8	15.88
	234 hrs	0500			28.95	21.36	26.56	10.23	19.57	17.2	19.3	20.07	19.65	20.63	23.81	15.88
	236 hrs	0700	10, 10, 10, 9.5		29.05	21.36	26.57	10.23	19.58	17.22	19.32	20.08	19.68	20.65	23.82	15.88
	238 hrs	0900			29.02	21.37	26.59	10.23	19.6	17.22	19.31	20.09	19.66	20.65	23.82	15.89
	240 hrs	1100			29.03	21.37	26.6	10.24	19.56	17.21	19.31	2.09	19.68	20.65	23.82	15.9
	242 hrs	1300			29.01	21.37	26.54	10.25	19.59	17.22	19.32	20.09	19.65	20.65	23.87	15.9
	244 hrs	1500			28.96	21.4	26.52	10.26	19.58	17.22	19.33	20.1	19.68	20.66	23.83	15.9
	246 hrs	1700	10, 10.25, 10, 9.75		28.94	21.39	26.55	10.27	19.56	17.23	19.35	20.1	19.67	20.67	23.84	15.91
	248 hrs	1900			28.98	21.41	26.59	10.28	19.61	17.24	19.35	20.13	19.69	20.68	23.85	15.93
	250 hrs	2100			29.09	21.42	26.69	10.28	19.62	17.26	19.36	20.14	19.74	20.68	23.86	15.93
	252 hrs	2300			29.09	21.42	26.69	10.28	19.62	17.26	19.37	20.14	19.71	20.69	23.87	15.93
8/24/2018	254 hrs	0100			29.06	21.42	26.67	10.28	19.61	17.26	19.37	20.14	19.71	20.7	23.87	15.94
0.0"	256 hrs	0300			29.49	21.37	27.04	10.28	19.61	17.27	19.38	20.15	19.73	20.69	23.87	15.95
150 gpm	258 hrs	0500			29.5	21.38	27.06	10.28	19.62	17.27	19.38	20.15	19.72	20.7	23.87	15.95
	260 hrs	0700	10, 10, 10, 10		29.56	21.38	27.08	10.29	19.68	17.27	19.38	20.15	19.72	20.7	23.89	15.96
	262 hrs	0900			29.53	21.41	27.06	10.29	19.66	17.28	19.39	20.17	19.78	20.74	23.89	15.96
	264 hrs	1100			29.49	21.4	27.02	10.3	19.69	17.29	19.41	20.16	19.75	20.73	23.9	15.97
	266 hrs	1300			29.5	21.39	27.06	10.3	19.7	17.3	19.41	20.15	19.75	20.72	23.9	15.98
	268 hrs	1500			29.52	21.41	27.05	10.31	19.71	17.3	19.43	20.15	19.74	20.72	23.91	15.98
	270 hrs	1700	10, 10, 10, 10		29.56	21.42	27.09	10.31	19.67	17.3	19.43	20.17	19.76	20.73	23.91	15.98
	272 hrs	1900			29.54	21.44	27.09	10.31	19.71	17.32	19.43	20.2	19.77	20.76	23.93	15.99
	274 hrs	2100			29.56	21.44	27.09	10.31	19.68	17.33	19.43	20.21	19.77	20.76	23.93	16
	276 hrs	2300			29.59	21.44	27.13	10.31	19.7	17.33	19.44	20.21	19.78	20.76	23.94	16.01

15-Day Pumping T W-13, TW-14, TW-15, TW-16
Lynch Property, L. ɔk Road, Ipswich, MA
Two-hour readings

Date/Rainfall/Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)	TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
8/25/2018	278 hrs	0100			29.62	21.45	27.16	10.32	19.71	17.33	19.45	20.22	19.79	20.78	23.95	16.02
0.0"	280 hrs	0300			29.57	21.46	27.12	10.32	19.71	17.35	19.44	20.23	19.8	20.78	23.96	16.02
150 gpm	282 hrs	0500			29.59	21.47	27.13	10.33	19.72	17.36	19.46	20.23	19.81	20.78	23.96	16.02
	284 hrs	0700	10, 10, 10.25, 10		29.58	21.47	27.15	10.33	19.72	17.36	19.46	20.24	19.84	20.8	23.97	16.03
	286 hrs	0900			29.61	21.48	27.14	10.34	19.71	17.36	19.47	20.25	19.8	20.79	23.98	16.03
	288 hrs	1100			29.63	21.48	27.13	10.34	19.75	17.37	19.46	20.24	19.82	20.8	23.98	16.03
	290 hrs	1300			29.47	21.51	27.02	10.36	19.76	17.36	19.47	20.25	19.84	20.81	23.98	16.04
	292 hrs	1500			29.44	21.52	27.01	10.36	19.76	17.36	19.48	20.26	19.84	20.83	23.99	16.05
	294 hrs	1700	10, 10, 10, 10		29.45	21.52	27.02	10.36	19.74	17.38	19.48	20.26	19.84	20.82	24	16.06
	296 hrs	1900			29.46	21.53	27.04	10.36	19.75	17.39	19.5	20.28	19.84	20.83	24	16.07
	298 hrs	2100			29.52	21.53	27.09	10.36	19.75	17.4	19.5	20.28	19.84	20.82	24	16.08
	300 hrs	2300			29.53	21.54	27.07	10.36	19.75	17.41	19.51	20.29	19.84	20.84	24.01	16.08
8/26/2018	302 hrs	0100			29.53	21.54	27.09	10.36	19.76	17.41	19.51	20.29	19.84	20.84	24.02	16.09
0.0"	304 hrs	0300			29.52	21.54	27.09	10.37	19.76	17.42	19.51	20.3	19.85	20.84	24.03	16.09
100 gpm	306 hrs	0500			29.53	21.55	27.11	10.37	19.77	17.43	19.52	20.31	19.87	20.85	24.03	16.1
	308 hrs	0700	10, 10, 10, 10		29.59	21.55	27.12	10.38	19.81	17.44	19.54	20.31	19.9	20.86	24.05	16.11
	310 hrs	0900			29.55	21.56	27.12	10.39	19.84	17.45	19.56	20.31	19.89	20.89	24.06	16.12
	312 hrs	1100			29.55	21.56	27.11	10.39	19.81	17.46	19.56	20.31	19.9	20.89	24.06	16.12
	314 hrs	1300			29.54	21.58	27.1	10.4	19.8	17.47	19.56	20.33	19.91	20.89	24.07	16.14
	316 hrs	1500			29.5	21.59	27.05	10.41	19.83	17.46	19.56	20.34	19.92	20.89	24.07	16.14
	318 hrs	1700	10, 10, 10.25, 10		29.58	21.59	27.07	10.42	19.81	17.45	19.56	20.34	19.91	20.9	24.07	16.12
	320 hrs	1900			29.53	21.61	27.1	10.41	19.84	17.47	19.59	20.36	19.92	20.91	24.08	16.14
	322 hrs	2100			29.51	21.62	27.08	10.41	19.83	17.48	19.6	20.37	19.92	20.9	24.09	16.15
	324 hrs	2300			29.5	21.66	27.08	10.42	19.87	17.52	19.61	20.4	19.96	20.94	24.11	16.16
8/27/2018	326 hrs	0100			29.28	21.69	26.86	10.42	19.87	17.52	19.64	20.41	19.95	20.95	24.12	16.17
0.0"	328 hrs	0300			29.3	21.69	26.92	10.42	19.88	17.53	19.64	20.42	19.97	20.97	24.13	16.18
100 gpm	330 hrs	0500			29.35	21.7	26.96	10.43	19.9	17.54	19.65	20.43	20	20.97	24.14	16.19
	332 hrs	0700	10, 10, 10, 10		29.61	21.67	27.18	10.43	19.9	17.54	19.66	20.43	20.02	20.98	24.15	16.19
	334 hrs	0900			29.81	21.79	27.42	10.43	20.03	17.64	19.72	20.52	20.1	21.09	24.19	16.23
	336 hrs	1100														
	338 hrs	1300			29.61	21.7	27.15	10.45	19.93	17.55	19.69	20.46	20.04	21.03	24.19	16.24
	340 hrs	1500			29.61	21.7	27.18	10.45	19.94	17.55	19.69	20.47	20.04	21	24.18	16.23
	342 hrs	1700	10, 10, 10.25, 10.5		29.65	21.71	27.2	10.46	19.95	17.58	19.69	20.47	20.04	21.02	24.18	16.23
	344 hrs	1900			29.66	21.72	27.23	10.46	19.94	17.58	19.71	20.48	20.04	21.02	24.2	16.24
	346 hrs	2100			29.68	21.74	27.25	10.47	19.95	17.6	19.71	20.49	20.08	21.03	24.21	16.25
	348 hrs	2300			29.68	21.74	27.24	10.47	19.96	17.62	19.71	20.49	20.05	21.03	24.21	16.25
8/28/2018	350 hrs	0100			29.69	21.74	27.26	10.47	19.96	17.62	19.72	20.5	20.05	21.04	24.22	16.26
0.0"	352 hrs	0300			29.69	21.74	27.26	10.47	19.96	17.62	19.73	20.51	20.06	21.04	24.22	16.26
75 gpm	354 hrs	0500			29.69	21.76	27.26	10.48	19.98	17.63	19.74	20.52	20.06	21.04	24.23	16.28
	356 hrs	0700			29.72	21.75	27.26	10.48	19.99	17.64	19.75	20.51	20.03	21.08	24.25	16.28
	358 hrs	0900	Richards Pond = 0"		29.77	21.77	27.34	10.48	20.00	17.64	19.75	20.52	20.08	21.08	24.25	16.29
	360 hrs	1100														

15-Day Pumping T W-13, TW-14, TW-15, TW-16
Lynch Property, L. ok Road, Ipswich, MA
Two-hour readings

Date/Rainfall/Bull Brook Flow	Time Elapsed	Time	Orifice (inches)/Flow (gpm)	Meter Flow (gpm)	TW-13 8-in	TW-13-16	TW-17-16	OW-13S	TW-14 8-in	TW-14-16	TW-15 8-in	TW-15-16	TW-16 8-in	TW-16-16	OW-13A	OW-13B
Recovery Readings																
8/29/2018		0800	Brk = 50 gpm, Richards Pond = 4"		11.7	12.64	10.31	10.55	11.41	10	11.51	13.16	11.14	12.29	18.04	12.19
8/31/2018		0800	Brk = 50 gpm, Richards Pond = 14.5"		10.85	11.8	9.48	10.63	10.61	9.19	10.69	12.35	10.31	12.14	17.21	11.47
9/2/2018		1300	Brk = 30 gpm, Richards Pond = 18.5"		10.54	11.51	9.18	10.66	10.23	8.88	10.39	12.06	10.02	11.86	16.91	11.2
9/4/2018		0800	Brk = 30 gpm, Richards Pond = 25.5"		10.35	11.29	8.98	10.69	10.02	8.7	10.19	11.82	9.85	11.67	16.71	11.04
9/7/2018		0800	Brk = 30 gpm, Richards Pond = 29.5"													
9/12/2018		1000	Rain 1.60" Sept 10-12		9.83	10.79	8.49	10.52	9.50	8.18	9.69	11.35	9.33	11.18	16.22	10.61
			Bull Brk = 100-150 gpm													
			Richards Pond = 35.35"													
9/17/2018		0800			LOCKED	10.72	10.93	10.52	LOCKED	8.1	LOCKED	11.26	LOCKED	11.08	16.14	10.52

15-Day Pumping TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

			Four-hour readings		Six-hour readings					Twice Daily								Once Daily						
			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7	TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out							
Antecedent Readings																								
8/6/2018			18.36	18.76	9.92	13.13	12.31												21.17	8.62	13.05	12.93	13.42	13.21
8/8/2018			18.36															9.53	21.29					
8/10/2018			18.44	15.65	9.93	13.18	12.37	7.54	12.34									8.96	21.32	8.5	11.6	11.5	11.91	11.76
8/13/2018	0 hrs	1100																						
Pumping Test Readings																								
8/13/2018	2 hrs																							
	3 hrs																							
	4 hrs																							
	5 hrs																							
	6 hrs	1700	19.46	15.16					12.11									8.85	21.32					
	7 hrs																							
	8 hrs	1900								1.95	2.04	1.53	1.86	2.57	2.81	2.45	2.71							
	10 hrs																							
	12 hrs	2300	20.15	15.13					12.09															
8/14/2018	14 hrs																							
	16 hrs																							
	18 hrs	0500	20.42	15.08					12.02															
	20 hrs																							
	22 hrs	0900								1.85	2.04	1.44	1.74	2.44	2.71	2.39	2.59							
	24 hrs	1100	20.63						12.00									8.64	21.32					
	26 hrs	1300		15.03																				
	28 hrs																							
	30 hrs	1700	20.83	14.96					11.89															
	32 hrs	1800								1.76	1.82	1.17	1.29	2.34	2.62	2.14	2.38							
	34 hrs																							
	36 hrs	2300	20.97	14.90					11.82															
8/15/2018	38 hrs																							
	40 hrs																							
	42 hrs	0500	21.11	14.84					11.75															
	44 hrs																							
	46 hrs																							
	48 hrs																							
	50 hrs																							
	52 hrs	1500	21.32	14.75																				
	54 hrs	1700			9.76	13.09	12.41											8.41	21.32					
	55 hrs	1800								1.82	1.89	1.27	1.53	2.51	2.69	2.32	2.49							
	56 hrs	1900	21.4	14.76																				
	58 hrs																							
	60 hrs	2300	21.51	14.77	9.72	13.09	12.44	7.1	11.62															
8/16/2018	62 hrs																							
	64 hrs	0300	21.58	14.75																				
	66 hrs	0500			9.74	13.08	12.46	7.07	11.56															
	67 hrs	0600																8.41	21.31					
	68 hrs	0700	21.61	14.76						1.85	1.92	1.36	1.58	2.61	2.77	2.40	2.51							
	69 hrs	0800																						
	70 hrs																							
	72 hrs	1100	21.73	14.74	9.79	13.06	12.45	7.08	11.54															
	74 hrs	1300																8.40	21.31	8.1	11.36	11.27	11.66	11.45
	76 hrs	1500	21.82	14.74																				
	78 hrs	1700			9.77	13.06	12.49	7.06	11.5															
	79 hrs	1800								1.89	1.96	1.46	1.72	2.69	2.82	2.49	2.65							
	80 hrs	1900	21.90	14.76																				
	82 hrs																							
	84 hrs	2300	21.97	14.75	9.76	13.06	12.52	7.08	11.48															
8/17/2018	85 hrs	0000																8.43	21.31					
	86 hrs																							
	88 hrs	0300	22.04	14.76																				
	90 hrs	0500			9.74	13.05	12.53	7.05	11.43															
	92 hrs	0700	22.1	14.75																				
	94 hrs	0900	22.15	14.73	9.79	13.05	12.52	7.06	11.4											8.09	11.35	11.2	11.62	11.44
	96 hrs	1100																						
	98 hrs																							
	100 hrs	1500	22.22	14.73																				
	102 hrs	1700																						
	103 hrs	1800								1.89	2.01	1.56	1.88	2.69	2.81	2.57	2.75							
	104 hrs	1900	22.26	14.71																				
	106 hrs																							
	108 hrs	2300	22.31	14.71	9.75	13.04	12.58	7.08	11.39															

15-Day Pumping TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Three Times Total

DATE	Time Elapsed	Time	Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
Antecedent Readings													
8/6/2018													
8/8/2018													
8/10/2018			12.97	12.05	11.34	10.51	8.01	11.11	12.02	3.74	11.82		26.19
8/13/2018	0 hrs	1100											
Pumping Test Readings													
8/13/2018	2 hrs												
	3 hrs												
	4 hrs												
	5 hrs												
	6 hrs	1700											
	7 hrs												
	8 hrs	1900											
	10 hrs												
	12 hrs	2300											
8/14/2018	14 hrs												
	16 hrs												
	18 hrs	0500											
	20 hrs												
	22 hrs	0900											
	24 hrs	1100											
	26 hrs	1300											
	28 hrs												
	30 hrs	1700											
	32 hrs	1800											
	34 hrs												
	36 hrs	2300											
8/15/2018	38 hrs												
	40 hrs												
	42 hrs	0500											
	44 hrs												
	46 hrs												
	48 hrs												
	50 hrs												
	52 hrs	1500											
	54 hrs	1700											
	55 hrs	1800											
	56 hrs	1900											
	58 hrs												
	60 hrs	2300											
8/16/2018	62 hrs												
	64 hrs	0300											
	66 hrs	0500											
	67 hrs	0600											
	68 hrs	0700											
	69 hrs	0800											
	70 hrs												
	72 hrs	1100											
	74 hrs	1300											
	76 hrs	1500											
	78 hrs	1700											
	79 hrs	1800											
	80 hrs	1900											
	82 hrs												
	84 hrs	2300											
8/17/2018	85 hrs	0000											
	86 hrs												
	88 hrs	0300											
	90 hrs	0500											
	92 hrs	0700											
	94 hrs	0900	11.91	11.94	11.32	10.44	7.89	10.97	11.75	3.63	11.55		25.89
	96 hrs	1100											
	98 hrs												
	100 hrs	1500											
	102 hrs	1700											
	103 hrs	1800											
	104 hrs	1900											
	106 hrs												
	108 hrs	2300											

15-Day Pumping TW-13, TW-14, TW-15, TW-16

Lynch Property, Linebrook Road, Ipswich, MA

			Four-hour readings		Six-hour readings					Twice Daily								Once Daily					
			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7	TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out							
8/18/2018	109 hrs	0000																8.39	21.33					
	110 hrs																							
	112 hrs	0300	22.37	14.7																				
	114 hrs	0500			9.76	13.05	12.59	7.06	11.41															
	116 hrs	0700	22.41	14.7																				
	117 hrs	0800								1.90	2.02	1.58	1.84	2.65	2.69	2.56	2.70							
	118 hrs	0900																		8.11	11.3	11.19	11.59	11.39
	119 hrs	1000																8.33	21.33					
	120 hrs	1100	22.45	14.71	9.78	13.04	12.59	7.08	11.46															
	122 hrs																							
	124 hrs	1500	22.49	14.7																				
	126 hrs	1700			9.79	13.04	12.6	7.07	11.43															
	127 hrs	1800								1.83	1.89	1.41	1.71	2.72	2.83	2.50	2.73							
	128 hrs	1900	22.53	14.73																				
	130 hrs																							
	132 hrs	2300	22.58	14.71	9.75	13.04	12.64	7.07	11.41															
8/19/2018	133 hrs	0000																						
	134 hrs																	8.37	27.65					
	136 hrs	0300	22.63	14.69																				
	138 hrs	0500			9.75	13.04	12.64	7.04	11.43															
	140 hrs	0700	22.65	14.7						1.99	2.08	1.74	2.08	2.85	3.05	2.59	2.90							
	142 hrs																							
	144 hrs	1100	22.68	14.72	9.79		12.67	7.05	11.47									8.36	27.58	8.06	11.31	11.15	11.6	11.36
	146 hrs																							
	148 hrs	1500	22.71	14.71																				
	150 hrs	1700			9.79	13.05	12.67	7.04	11.5															
	151 hrs	1800								1.95	2.07	1.69	2.03	2.80	2.90	2.59	2.84							
	152 hrs	1900	22.74	14.71																				
	154 hrs																							
	156 hrs	2300	22.78	14.74	9.8	13.05	12.71	7.03	11.56															
8/20/2018	157 hrs	0000																8.37	27.55					
	158 hrs																							
	160 hrs	0300	22.8	14.75																				
	162 hrs	0500			9.81	13.06	12.73	7.02	11.6															
	164 hrs	0700	22.83	14.76						1.92	2.05	1.66	2.02	2.79	2.89	2.61	2.79							
	166 hrs																							
	168 hrs	1100	22.85	14.77	9.82	13.05	12.71	7.02	11.63															
	170 hrs	1300																8.38	27.49	8.05	11.25	11.41	11.58	11.37
	172 hrs	1500	22.88	14.8																				
	174 hrs	1700			9.86	13.06	12.72	7.02	11.69															
	175 hrs	1800								1.90	2.02	1.67	1.96	2.84	2.91	2.65	2.85							
	176 hrs	1900	22.92	14.83																				
	178 hrs																							
	180 hrs	2300	22.93	14.85	9.85	13.06	12.74	7.02	11.71															
8/21/2018	181 hrs	0000																8.39	27.43					
	182 hrs																							
	184 hrs	0300	22.96	14.86																				
	186 hrs	0500			9.86	13.06	12.78	7.02	11.77															
	188 hrs	0700	22.91	14.87						1.97	2.03	1.68	2.03	2.35	2.93	2.71	2.88							
	190 hrs																	8.35	27.35	8.01	11.19	11.08	11.51	11.26
	192 hrs	1100	22.94	14.83	9.8	13.00	12.72	7.00	11.72															
	194 hrs																							
	196 hrs	1500	22.95	14.8																				
	198 hrs	1700			9.79	13	12.7	6.95	11.7															
	199 hrs	1800								1.88	1.93	1.66	1.94	2.84	2.86	2.65	2.79							
	200 hrs	1900	22.97	14.81																				
	202 hrs																							
	204 hrs	2300	22.99	14.83	9.79	12.99	12.73	6.95	11.7															
	205 hrs	0000																8.31	27.27					
8/22/2018	206 hrs																							
	208 hrs	0300	23.02	14.83																				
	210 hrs	0500			9.79	12.98	12.74	6.95	11.67															
	212 hrs	0700	23.05	14.84						1.89	1.94	1.65	1.93	2.86	2.87	2.67	2.81	8.06	27.21					
	214 hrs																							
	216 hrs	1100	23.06	14.74	9.72	12.99	12.74	6.96	11.51															
	218 hrs																			7.86	11.07	10.94	11.41	11.14
	220 hrs	1500	23.09	14.7																				
	222 hrs	1700			9.7	12.99	12.75	6.93	11.46															
	223 hrs	1800								1.75	1.80	1.40	1.60	2.64	2.69	2.37	2.62							
	224 hrs	1900	23.1	14.67														8.06	27.2					

15-Day Pumping TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Three Times Total

			Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time											
8/18/2018	109 hrs	0000											
	110 hrs												
	112 hrs	0300											
	114 hrs	0500											
	116 hrs	0700											
	117 hrs	0800											
	118 hrs	0900											
	119 hrs	1000											
	120 hrs	1100											
	122 hrs												
	124 hrs	1500											
	126 hrs	1700											
	127 hrs	1800											
	128 hrs	1900											
	130 hrs												
	132 hrs	2300											
8/19/2018	133 hrs	0000											
	134 hrs												
	136 hrs	0300											
	138 hrs	0500											
	140 hrs	0700											
	142 hrs												
	144 hrs	1100											
	146 hrs												
	148 hrs	1500											
	150 hrs	1700											
	151 hrs	1800											
	152 hrs	1900											
	154 hrs												
	156 hrs	2300											
8/20/2018	157 hrs	0000											
	158 hrs												
	160 hrs	0300											
	162 hrs	0500											
	164 hrs	0700											
	166 hrs												
	168 hrs	1100											
	170 hrs	1300											
	172 hrs	1500											
	174 hrs	1700											
	175 hrs	1800											
	176 hrs	1900											
	178 hrs												
	180 hrs	2300											
8/21/2018	181 hrs	0000											
	182 hrs												
	184 hrs	0300											
	186 hrs	0500											
	188 hrs	0700											
	190 hrs												
	192 hrs	1100											
	194 hrs												
	196 hrs	1500											
	198 hrs	1700											
	199 hrs	1800											
	200 hrs	1900											
	202 hrs												
	204 hrs	2300											
	205 hrs	0000											
8/22/2018	206 hrs												
	208 hrs	0300											
	210 hrs	0500											
	212 hrs	0700											
	214 hrs												
	216 hrs	1100											
	218 hrs												
	220 hrs	1500											
	222 hrs	1700											
	223 hrs	1800											
	224 hrs	1900											

15-Day Pumping TW-13, TW-14, TW-15, TW-16

Lynch Property, Linebrook Road, Ipswich, MA

			Four-hour readings		Six-hour readings					Twice Daily								Once Daily						
			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7	TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out							
8/22/2018	226 hrs																							
(continued)	228 hrs	2300	23.12	14.66	9.72	12.98	12.77	6.91	11.43															
	230 hrs																							
	232 hrs	0300	23.15	14.65																				
	234 hrs	0500			9.73	12.98	12.77	6.9	11.39															
	236 hrs	0700								1.74	1.81	1.34	1.61	2.64	2.64	2.36	2.60							
	238 hrs	0900	23.16	14.66														8.1	27.12					
	240 hrs	1100			9.75	12.98	12.79	6.86	11.37											7.87	11.07	10.96	11.41	11.15
	242 hrs																							
	244 hrs	1500	23.19	14.65																				
	246 hrs	1700			9.75	12.97	12.79	6.84	11.31															
	247 hrs	1800								1.75	1.80	1.35	1.49	2.71	2.67	2.44	2.56							
	248 hrs	1900	23.21	14.66														8.11	27.11					
	250 hrs																							
	252 hrs	2300	23.23	14.67	9.78	12.98	12.81	6.85	11.3															
	254 hrs																							
8/24/2018	256 hrs	0300	23.24	14.67																				
	258 hrs	0500			9.78	12.98	12.81	6.85	11.26															
	260 hrs	0700	23.26	14.68						1.81	1.87	1.43	1.66	2.74	2.71	2.50	2.67							
	262 hrs																							
	264 hrs	1100	23.27	14.69	9.81	12.98	12.83	6.86	11.22															
	265 hrs	1200																		7.89	11.1	11	11.4	11.2
	266 hrs	1300																8.15	27.02					
	268 hrs	1500	23.28	14.68																				
	270 hrs	1700			9.8	12.97	12.82	6.86	11.2															
	271 hrs	1800								1.81	1.84	1.50	1.71	2.81	2.77	2.59	2.70							
	272 hrs	1900	23.31	14.66														8.18	27.01					
	274 hrs																							
	276 hrs	2300	23.32	14.67	9.8	12.99	12.87	6.85	11.17															
	278 hrs																							
8/25/2018	280 hrs	0300	23.35	14.67																				
	282 hrs	0500			9.81	13	12.87	6.85	11.16															
	284 hrs	0700	23.37	14.66						1.85	1.90	1.56	1.84	2.76	2.77	2.61	2.76							
	286 hrs																	8.21	26.95	7.94	11.14	11.02	11.44	11.24
	288 hrs	1100	23.37	14.66	9.87	13.02	12.87	6.86	11.14															
	290 hrs																							
	292 hrs	1500	23.39	14.65																				
	294 hrs	1700			9.82	13.01	12.88	6.87	11.15															
	295 hrs	1800								1.87	1.91	1.62	1.84	2.83	2.77	2.68	2.76							
	296 hrs	1900	23.4	14.65														8.2	27.07					
	298 hrs																							
	300 hrs	2300	23.41	14.67	9.83	13.01	12.9	6.88	11.16															
8/26/2018	302 hrs																							
	304 hrs	0300	23.43	14.66																				
	306 hrs	0500			9.85	13.02	12.91	6.87	11.16															
	308 hrs	0700	23.45	14.67						1.87	1.93	1.65	1.96	2.84	2.84	2.71	2.85							
	310 hrs	0900																8.23	26.87	7.96	13.07	12.97	12.03	11.18
	312 hrs	1100	23.46	14.66	9.84	13.02	12.91	6.89	11.16															
	314 hrs																							
	316 hrs	1500	23.49	14.66																				
	318 hrs	1700			9.86	13.02	12.92	6.89	11.18															
	319 hrs	1800								1.91	1.93	1.71	1.95	2.88	2.84	2.76	2.86							
	320 hrs	1900	23.49	14.66														8.36	26.83					
	322 hrs																							
	324 hrs	2300	23.49	14.67	9.86	13.02	12.95	6.9	11.2															
8/27/2018	326 hrs																							
	328 hrs	0300	23.52	14.68																				
	330 hrs	0500			9.86	13.02	12.96	6.92	11.21															
	332 hrs	0700	23.53	14.69						1.90	1.95	1.74	2.03	2.88	2.88	2.78	2.90							
	334 hrs	0900																8.6	26.74	8.36	12.79	12.66	13.37	13.15
	336 hrs	1100	23.53	14.7	9.85	13.02	12.94	6.92	11.23															
	338 hrs																							
	340 hrs	1500	23.56	14.71																				
	342 hrs	1700			9.87	13.02	12.99	6.92	11.25															
	343 hrs	1800								1.91	1.94	1.79	2.06	2.97	2.94	2.89	2.91							
	344 hrs	1900	23.58	14.72														8.62	26.73					
	346 hrs																							
	348 hrs	2300	23.59	14.73	9.88	13.04	12.99	6.95	11.27															

15-Day Pumping TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Three Times Total

			Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time											
8/22/2018	226 hrs												
(continued)	228 hrs	2300											
	230 hrs												
	232 hrs	0300											
	234 hrs	0500											
	236 hrs	0700											
	238 hrs	0900											
	240 hrs	1100											
	242 hrs												
	244 hrs	1500											
	246 hrs	1700											
	247 hrs	1800											
	248 hrs	1900											
	250 hrs												
	252 hrs	2300											
	254 hrs												
8/24/2018	256 hrs	0300											
	258 hrs	0500											
	260 hrs	0700											
	262 hrs												
	264 hrs	1100											
	265 hrs	1200											
	266 hrs	1300											
	268 hrs	1500											
	270 hrs	1700											
	271 hrs	1800											
	272 hrs	1900											
	274 hrs												
	276 hrs	2300											
	278 hrs												
8/25/2018	280 hrs	0300											
	282 hrs	0500											
	284 hrs	0700											
	286 hrs												
	288 hrs	1100											
	290 hrs												
	292 hrs	1500											
	294 hrs	1700											
	295 hrs	1800											
	296 hrs	1900											
	298 hrs												
	300 hrs	2300											
8/26/2018	302 hrs												
	304 hrs	0300											
	306 hrs	0500											
	308 hrs	0700											
	310 hrs	0900											
	312 hrs	1100											
	314 hrs												
	316 hrs	1500											
	318 hrs	1700											
	319 hrs	1800											
	320 hrs	1900											
	322 hrs												
	324 hrs	2300											
8/27/2018	326 hrs												
	328 hrs	0300											
	330 hrs	0500											
	332 hrs	0700											
	334 hrs	0900											
	336 hrs	1100											
	338 hrs												
	340 hrs	1500											
	342 hrs	1700											
	343 hrs	1800											
	344 hrs	1900											
	346 hrs												
	348 hrs	2300											

15-Day Pumping TW-13, TW-14, TW-15, TW-16

Lynch Property, Linebrook Road, Ipswich, MA

Four-hour readings **Six-hour readings** **Twice Daily** **Once Daily**

			OW-13F	TW-11-16	OW-13G	OW-13H	OW-13K	OW-13D	TW-7-16	DP-1		DP-2		DP-3		DP-4		MW-6	MW-7	TW-21-17	TW-1-16	TW-1A-16	TW-2-16	TW-2B-16
DATE	Time Elapsed	Time								In	Out	In	Out	In	Out	In	Out							
8/28/2018	350 hrs																							
	352 hrs	0300	23.6	14.75																				
	354 hrs	0500			9.88	13.04	13	6.96	11.26															
	356 hrs	0700	23.62	14.74																				
	358 hrs																							
	360 hrs																							
Recovery Readings																								
8/29/2018			21.97	14.76					11.26	2.10	2.18	1.84	2.13	2.82	2.93	2.90	3.00	8.59	26.66					
8/31/2018			19.8	14.81					11.4	2.19	2.26	1.89	2.23	2.76	3.00	2.98	3.05	8.69	26.45					
9/2/2018		1300	19.23	22.66					12.69	2.20	2.30	1.94	2.27	2.73	2.96	3.04	3.05							
9/4/2018			19.08	20.9						2.25	2.36	1.93	2.28	2.72	2.98	3.06	3.04	9.66	26.15					
9/6/2018																								
9/12/2018		1000	18.63	20.66			12.78		12.23	1.97	2.05	1.65	1.92	2.41	2.72	2.65	2.88							
9/17/2018		0800	18.5	24.2	10.19	13.29	12.71	7.38	13.26	2.03	2.12	1.76	2.11	2.48	2.83	2.84	2.99	9.4	25.26	9.4	14.32	14.19	14.91	14.7

15-Day Pumping TW-13, TW-14, TW-15, TW-16
Lynch Property, Linebrook Road, Ipswich, MA

Three Times Total

			Doyon MW-1	Doyon MW-2	Doyon MW-3	Doyon MW-4	Doyon MW-5	Doyon MW-6	Town MW-1	Town MW-2	Town OW-3	Town MW-3	Town MW-5
DATE	Time Elapsed	Time											
8/28/2018	350 hrs												
	352 hrs	0300											
	354 hrs	0500											
	356 hrs	0700											
	358 hrs												
	360 hrs												
Recovery Readings													
8/29/2018													
8/31/2018													
9/2/2018		1300											
9/4/2018													
9/6/2018													
9/12/2018		1000											
9/17/2018		0800	13.36	12.45	11.76	10.92	8.39	11.33	13.82	3.93	14.4	11.81	NR

APPENDIX F

LABORATORY WATER-QUALITY TESTING REPORTS

ANALYTICAL REPORT

Lab Number:	L1831955
Client:	AECOM 250 Apollo Dr. Chelmsford, MA 01824
ATTN:	Doug DeNatale
Phone:	(978) 905-2180
Project Name:	LYNCH SITE
Project Number:	60567459
Report Date:	09/19/18

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

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

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1831955-01	LYNCH WELLFIELD DAY 1	DW	IPSWICH, MA	08/15/18 14:25	08/15/18

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Case Narrative

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

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

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

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

Please contact Client Services at 800-624-9220 with any questions.

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Case Narrative (continued)

Report Revision

September 19, 2018: All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

The sample collection time was provided by the client.

Total Metals

The WG1149270-4 Laboratory Duplicate RPD for iron (26%), performed on L1831955-01, is outside the acceptance criteria. The elevated RPD has been attributed to the non-homogeneous nature of the native sample.

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

Authorized Signature: Amita Naik

Title: Technical Director/Representative

Date: 09/19/18

METALS

Project Name: LYNCH SITE
Project Number: 60567459
Lab Number: L1831955
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1831955-01
Client ID: LYNCH WELLFIELD DAY 1
Sample Location: IPSWICH, MA
Date Collected: 08/15/18 14:25
Date Received: 08/15/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Aluminum, Total	0.037	J	mg/l	0.100	0.032	1	08/22/18 13:05	08/23/18 15:55	EPA 3005A	19,200.7	LC
Calcium, Total	54.2		mg/l	0.100	0.035	1	08/22/18 13:05	08/23/18 15:55	EPA 3005A	19,200.7	LC
Copper, Total	0.0035		mg/l	0.0010	0.0004	1	08/22/18 13:00	08/24/18 09:52	EPA 3005A	3,200.8	AM
Iron, Total	0.133		mg/l	0.050	0.009	1	08/22/18 13:05	08/23/18 15:55	EPA 3005A	19,200.7	LC
Magnesium, Total	5.71		mg/l	0.100	0.015	1	08/22/18 13:05	08/23/18 15:55	EPA 3005A	19,200.7	LC
Manganese, Total	0.006	J	mg/l	0.010	0.002	1	08/22/18 13:05	08/23/18 15:55	EPA 3005A	19,200.7	LC
Potassium, Total	3.52		mg/l	2.50	0.237	1	08/22/18 13:05	08/23/18 15:55	EPA 3005A	19,200.7	LC
Silver, Total	ND		mg/l	0.0004	0.0002	1	08/22/18 13:00	08/24/18 09:52	EPA 3005A	3,200.8	AM
Sodium, Total	79.9		mg/l	2.00	0.120	1	08/22/18 13:05	08/23/18 15:55	EPA 3005A	19,200.7	LC
Zinc, Total	0.0038	J	mg/l	0.0100	0.0034	1	08/22/18 13:00	08/24/18 09:52	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	159		mg/l	0.660	NA	1	08/22/18 13:05	08/23/18 15:55	EPA 3005A	19,200.7	LC
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.059		mg/l	0.050	0.009	1	08/23/18 13:20	08/24/18 18:42	EPA 3005A	19,200.7	AB
Manganese, Dissolved	0.002	J	mg/l	0.010	0.002	1	08/23/18 13:20	08/24/18 18:42	EPA 3005A	19,200.7	AB

Project Name: LYNCH SITE
Project Number: 60567459
Lab Number: L1831955
Report Date: 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01 Batch: WG1149270-1										
Aluminum, Total	ND		mg/l	0.100	0.032	1	08/22/18 13:05	08/23/18 15:46	19,200.7	LC
Calcium, Total	ND		mg/l	0.100	0.035	1	08/22/18 13:05	08/23/18 15:46	19,200.7	LC
Iron, Total	ND		mg/l	0.050	0.009	1	08/22/18 13:05	08/23/18 15:46	19,200.7	LC
Magnesium, Total	ND		mg/l	0.100	0.015	1	08/22/18 13:05	08/23/18 15:46	19,200.7	LC
Manganese, Total	ND		mg/l	0.010	0.002	1	08/22/18 13:05	08/23/18 15:46	19,200.7	LC
Potassium, Total	ND		mg/l	2.50	0.237	1	08/22/18 13:05	08/23/18 15:46	19,200.7	LC
Sodium, Total	ND		mg/l	2.00	0.120	1	08/22/18 13:05	08/23/18 15:46	19,200.7	LC

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Hardness by SM 2340B - Mansfield Lab for sample(s): 01 Batch: WG1149270-1										
Hardness	ND		mg/l	0.660	NA	1	08/22/18 13:05	08/23/18 15:46	19,200.7	LC

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01 Batch: WG1149287-1										
Copper, Total	ND		mg/l	0.0010	0.0004	1	08/22/18 13:00	08/24/18 09:39	3,200.8	AM
Silver, Total	ND		mg/l	0.0004	0.0002	1	08/22/18 13:00	08/24/18 09:39	3,200.8	AM
Zinc, Total	ND		mg/l	0.0100	0.0034	1	08/22/18 13:00	08/24/18 09:39	3,200.8	AM

Prep Information

Digestion Method: EPA 3005A

Project Name: LYNCH SITE
Project Number: 60567459
Lab Number: L1831955
Report Date: 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Mansfield Lab for sample(s): 01 Batch: WG1149852-1										
Iron, Dissolved	ND		mg/l	0.050	0.009	1	08/23/18 13:20	08/24/18 18:30	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/23/18 13:20	08/24/18 18:30	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1149270-2								
Aluminum, Total	104		-		85-115	-		
Calcium, Total	102		-		85-115	-		
Iron, Total	104		-		85-115	-		
Magnesium, Total	104		-		85-115	-		
Manganese, Total	101		-		85-115	-		
Potassium, Total	99		-		85-115	-		
Sodium, Total	100		-		85-115	-		
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 Batch: WG1149270-2								
Hardness	103		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1149287-2								
Copper, Total	102		-		85-115	-		
Silver, Total	111		-		85-115	-		
Zinc, Total	111		-		85-115	-		
Dissolved Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1149852-2								
Iron, Dissolved	105		-		85-115	-		
Manganese, Dissolved	101		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149270-3 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1												
Aluminum, Total	0.037J	2	2.06	103		-	-		75-125	-		20
Calcium, Total	54.2	10	62.8	86		-	-		75-125	-		20
Iron, Total	0.133	1	1.12	99		-	-		75-125	-		20
Magnesium, Total	5.71	10	15.7	100		-	-		75-125	-		20
Manganese, Total	0.006J	0.5	0.492	98		-	-		75-125	-		20
Potassium, Total	3.52	10	13.6	101		-	-		75-125	-		20
Sodium, Total	79.9	10	88.6	87		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149270-3 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1												
Hardness	159.	66.2	222	95		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149270-7 QC Sample: L1832916-01 Client ID: MS Sample												
Aluminum, Total	0.069J	2	2.12	106		-	-		75-125	-		20
Calcium, Total	0.517	10	10.6	101		-	-		75-125	-		20
Iron, Total	0.349	1	1.40	105		-	-		75-125	-		20
Magnesium, Total	0.247	10	10.0	98		-	-		75-125	-		20
Manganese, Total	0.015	0.5	0.509	99		-	-		75-125	-		20
Potassium, Total	ND	10	10.7	107		-	-		75-125	-		20
Sodium, Total	217.	10	219	**20**	Q	-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149270-7 QC Sample: L1832916-01 Client ID: MS Sample												
Hardness	2.31	66.2	67.7	99		-	-		75-125	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149287-3 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1									
Copper, Total	0.0035	0.25	0.2587	102	-	-	70-130	-	20
Silver, Total	ND	0.05	0.0531	106	-	-	70-130	-	20
Zinc, Total	0.0038J	0.5	0.5597	112	-	-	70-130	-	20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149287-5 QC Sample: L1832916-01 Client ID: MS Sample									
Copper, Total	0.1652	0.25	0.4442	112	-	-	70-130	-	20
Silver, Total	ND	0.05	0.0576	115	-	-	70-130	-	20
Zinc, Total	0.0231	0.5	0.6037	116	-	-	70-130	-	20
Dissolved Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149852-3 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1									
Iron, Dissolved	0.059	1	1.13	107	-	-	75-125	-	20
Manganese, Dissolved	0.002J	0.5	0.493	99	-	-	75-125	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH SITE

Project Number: 60567459

Lab Number: L1831955

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149270-4 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1						
Aluminum, Total	0.037J	0.047J	mg/l	NC		20
Calcium, Total	54.2	53.3	mg/l	2		20
Iron, Total	0.133	0.102	mg/l	**26**	Q	20
Magnesium, Total	5.71	5.65	mg/l	1		20
Manganese, Total	0.006J	0.004J	mg/l	NC		20
Potassium, Total	3.52	3.43	mg/l	3		20
Sodium, Total	79.9	78.3	mg/l	2		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149270-4 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1						
Hardness	159.	156	mg/l	2		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149270-8 QC Sample: L1832916-01 Client ID: DUP Sample						
Calcium, Total	0.517	0.499	mg/l	4		20
Iron, Total	0.349	0.345	mg/l	1		20
Magnesium, Total	0.247	0.250	mg/l	1		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149287-4 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1						
Copper, Total	0.0035	0.0035	mg/l	0		20
Silver, Total	ND	ND	mg/l	NC		20
Zinc, Total	0.0038J	0.0037J	mg/l	NC		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH SITE

Project Number: 60567459

Lab Number: L1831955

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149287-6 QC Sample: L1832916-01 Client ID: DUP Sample					
Copper, Total	0.1652	0.1623	mg/l	2	20
Zinc, Total	0.0231	0.0221	mg/l	5	20
Dissolved Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1149852-4 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1					
Iron, Dissolved	0.059	0.062	mg/l	5	20
Manganese, Dissolved	0.002J	0.002J	mg/l	NC	20

INORGANICS
&
MISCELLANEOUS

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1831955-01
Client ID: LYNCH WELLFIELD DAY 1
Sample Location: IPSWICH, MA

Date Collected: 08/15/18 14:25
Date Received: 08/15/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Turbidity	0.96		NTU	0.20	0.20	1	-	08/16/18 01:53	44,180.1	UN
Odor @ 60 C	NO ODOR		TON	1	1.0	1	-	08/15/18 18:45	121,2150B	AS
Color, Apparent	ND		A.P.C.U.	5.0	5.0	1	-	08/15/18 19:26	121,2120B	AS
Alkalinity, Total	132.		mg CaCO3/L	2.00	NA	1	-	08/16/18 05:39	121,2320B	BR
Specific Conductance @ 25 C	620		umhos/cm	10	10.	1	-	08/15/18 18:29	121,2510B	AS
Solids, Total Dissolved	380		mg/l	10	3.1	1	-	08/17/18 15:05	121,2540C	DW
pH (H)	7.5		SU	-	NA	1	-	08/15/18 19:33	121,4500H+-B	AS
Nitrogen, Ammonia	0.044	J	mg/l	0.075	0.024	1	08/20/18 12:20	08/21/18 23:09	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.014	1	-	08/16/18 19:32	44,353.2	MR
Nitrogen, Nitrate	4.3		mg/l	0.10	0.033	1	-	08/16/18 19:32	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	136.		mg/l	2.50	0.420	5	-	08/20/18 03:09	44,300.0	JR
Sulfate	16.7		mg/l	1.00	0.160	1	-	08/20/18 02:33	44,300.0	JR

Project Name: LYNCH SITE **Lab Number:** L1831955

Project Number: 60567459 **Report Date:** 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1146974-1										
Odor	NO ODOR		TON	1	1.0	1	-	08/15/18 18:45	121,2150B	AS
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1147014-1										
Turbidity	ND		NTU	0.20	0.20	1	-	08/16/18 01:53	44,180.1	UN
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1147135-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	08/16/18 05:39	121,2320B	BR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1147467-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.033	1	-	08/16/18 19:18	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1147468-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.014	1	-	08/16/18 19:24	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1147591-1										
Solids, Total Dissolved	ND		mg/l	10	3.1	1	-	08/17/18 15:05	121,2540C	DW
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1148370-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.024	1	08/20/18 12:20	08/21/18 23:00	44,350.1	AT
Anions by Ion Chromatography - Westborough Lab for sample(s): 01 Batch: WG1148580-1										
Chloride	ND		mg/l	0.500	0.083	1	-	08/19/18 18:07	44,300.0	JR
Sulfate	0.184	J	mg/l	1.00	0.160	1	-	08/19/18 18:07	44,300.0	JR

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1146961-1								
Specific Conductance	99		-		99-101	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1146975-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1147014-2								
Turbidity	102		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1147135-2								
Alkalinity, Total	100		-		90-110	-		10
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1147467-2								
Nitrogen, Nitrate	102		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1147468-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1147591-2								
Solids, Total Dissolved	90		-		80-120	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1148370-2					
Nitrogen, Ammonia	98	-	90-110	-	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 Batch: WG1148580-2					
Chloride	102	-	90-110	-	
Sulfate	102	-	90-110	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1147135-4 QC Sample: L1831827-05 Client ID: MS Sample												
Alkalinity, Total	271.	100	365	94		-	-		86-116	-		10
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1147467-4 QC Sample: L1831862-01 Client ID: MS Sample												
Nitrogen, Nitrate	0.12	4	4.0	97		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1147468-4 QC Sample: L1831862-01 Client ID: MS Sample												
Nitrogen, Nitrite	0.025J	4	3.9	98		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1148370-4 QC Sample: L1831825-01 Client ID: MS Sample												
Nitrogen, Ammonia	147.	4	226	**1980**	Q	-	-		90-110	-		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1148580-3 QC Sample: L1832068-06 Client ID: MS Sample												
Chloride	11.5	4	15.4	96		-	-		90-110	-		18
Sulfate	3.12	8	11.5	104		-	-		90-110	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH SITE

Project Number: 60567459

Lab Number: L1831955

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1146961-2 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1						
Specific Conductance @ 25 C	620	620	umhos/cm	0		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1146962-1 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1						
Color, Apparent	ND	ND	A.P.C.U.	NC		
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1146974-2 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1						
Odor	NO ODOR	NO ODOR	TON	NC		
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1146975-2 QC Sample: L1831758-01 Client ID: DUP Sample						
pH	7.1	7.1	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1147014-3 QC Sample: L1831955-01 Client ID: LYNCH WELLFIELD DAY 1						
Turbidity	0.96	0.99	NTU	3		13
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1147135-3 QC Sample: L1831827-05 Client ID: DUP Sample						
Alkalinity, Total	271.	272	mg CaCO3/L	0		10
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1147467-3 QC Sample: L1831862-01 Client ID: DUP Sample						
Nitrogen, Nitrate	0.12	0.097J	mg/l	NC		6
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1147468-3 QC Sample: L1831862-01 Client ID: DUP Sample						
Nitrogen, Nitrite	0.025J	ND	mg/l	NC		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH SITE

Project Number: 60567459

Lab Number: L1831955

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD		RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1147591-3 QC Sample: L1832347-01 Client ID: DUP Sample						
Solids, Total Dissolved	300	280	mg/l	7		10
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1148370-3 QC Sample: L1831825-01 Client ID: DUP Sample						
Nitrogen, Ammonia	147.	218	mg/l	**39**	Q	20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1148580-4 QC Sample: L1832068-06 Client ID: DUP Sample						
Chloride	11.5	11.7	mg/l	2		18
Sulfate	3.12	3.11	mg/l	0		20

Project Name: LYNCH SITE
Project Number: 60567459

Lab Number: L1831955
Report Date: 09/19/18

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1831955-01A	Plastic 250ml unpreserved/No Headspace	A	NA		2.8	Y	Absent		ALK-T-2320(14)
L1831955-01B	Plastic 500ml HNO3 preserved	A	<2	<2	2.8	Y	Absent		FE-RI(180),MN-RI(180)
L1831955-01C	Plastic 500ml H2SO4 preserved	A	<2	<2	2.8	Y	Absent		NH3-350(28)
L1831955-01D	Plastic 950ml HNO3 preserved	A	<2	<2	2.8	Y	Absent		CA-UI(180),K-UI(180),ZN-2008T(180),CU-2008T(180),FE-UI(180),HARDU(180),MG-UI(180),AG-2008T(180),AL-UI(180),MN-UI(180),NA-UI(180)
L1831955-01E	Plastic 950ml unpreserved	A	7	7	2.8	Y	Absent		SO4-300(28),CL-300(28),NO2-353(2),TURB-180(2),COND-2510(1),NO3-353(2),PH-4500(.01),TDS-2540(7)
L1831955-01F	Amber 100ml unpreserved	A	7	7	2.8	Y	Absent		COLOR-A-2120(2),ODOR-2150(1)

*Values in parentheses indicate holding time in days

Project Name:	LYNCH SITE	**Lab Number:**	L1831955
Project Number:	60567459	**Report Date:**	09/19/18

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Report Format: DU Report with 'J' Qualifiers

Project Name:	LYNCH SITE	**Lab Number:**	L1831955
Project Number:	60567459	**Report Date:**	09/19/18

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

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

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

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

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

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: LYNCH SITE
Project Number: 60567459
Lab Number: L1831955
Report Date: 09/19/18

REFERENCES

3 Methods for the Determination of Metals in Environmental Samples, Supplement I. EPA/600/R-94/111. May 1994.

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

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

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

LIMITATION OF LIABILITIES

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

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

Certification Information

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

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.

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

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

Westborough Facility:

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

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

Mansfield Facility:

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

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

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

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 8/15/18

ALPHA Job #: L1831955

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

Client Information

Client: AECOM
Address: 250 Apollo Drive, Chelmsford, MA 01824
Phone: 978-905-2000
Email: erika.amir-lin@aecom.com, doug.denatale@aecom.com
Additional Project Information:

Project Information

Project Name: Lynch site
Project Location: Ipswich, MA
Project #: 60467459
Project Manager: Doug DeNatale
ALPHA Quote #:

Turn-Around Time

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

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

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

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Color + odor	Conductivity, pH, TDS, SO4, Turb, Cl, NO3, NO2	Dissolved Metals - Fe, Mn	Total Metals - Al, Ca, Cu, Fe, Mn, Mg, K, Na, Pb, Zn	Hardness	NH3	Alkalinity	Sample Comments	TOTAL # BOTTLES
		08/15/18	1430	DW	EAL	X	X	X	X	X	X			6
31955-01	Lynch Wellfield Day 1													
Container Type						A	P	P	P	P	P			
Preservative						A	A	C	C	D	A			

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

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

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	08/15/18-1429	[signature]	8/15/18 1429
[signature]	8/15/18 1708	[signature]	8/15/18 1708

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

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

ANALYTICAL REPORT

Lab Number:	L1832809
Client:	AECOM 250 Apollo Dr. Chelmsford, MA 01824
ATTN:	Doug DeNatale
Phone:	(978) 905-2180
Project Name:	LYNCH NEW SOURCE
Project Number:	60567459
Report Date:	09/19/18

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

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

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1832809-01	TW-15	DW	IPSWICH, MA	08/20/18 16:00	08/21/18
L1832809-02	TW-13	DW	IPSWICH, MA	08/20/18 16:10	08/21/18
L1832809-03	TW-14	DW	IPSWICH, MA	08/20/18 16:20	08/21/18
L1832809-04	TW-16	DW	IPSWICH, MA	08/20/18 16:30	08/21/18

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1832809
Report Date: 09/19/18

Case Narrative

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

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

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

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

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1832809
Project Number:	60567459	**Report Date:**	09/19/18

Case Narrative (continued)

Report Revision

September 19, 2018: All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

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

Authorized Signature: Amita Naik

Title: Technical Director/Representative Date: 09/19/18

METALS

Project Name: LYNCH NEW SOURCE
Lab Number: L1832809
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832809-01
Client ID: TW-15
Sample Location: IPSWICH, MA

Date Collected: 08/20/18 16:00
Date Received: 08/21/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.029	J	mg/l	0.050	0.009	1	08/25/18 11:00	08/27/18 02:25	EPA 3005A	19,200.7	PE
Manganese, Total	ND		mg/l	0.010	0.002	1	08/25/18 11:00	08/27/18 02:25	EPA 3005A	19,200.7	PE
Sodium, Total	65.3		mg/l	2.00	0.120	1	08/25/18 11:00	08/27/18 02:25	EPA 3005A	19,200.7	PE
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.024	J	mg/l	0.050	0.009	1	08/27/18 15:30	08/30/18 03:02	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/27/18 15:30	08/30/18 03:02	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE
Lab Number: L1832809
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832809-02
Client ID: TW-13
Sample Location: IPSWICH, MA

Date Collected: 08/20/18 16:10
Date Received: 08/21/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.099		mg/l	0.050	0.009	1	08/25/18 11:00	08/27/18 02:30	EPA 3005A	19,200.7	PE
Manganese, Total	0.002	J	mg/l	0.010	0.002	1	08/25/18 11:00	08/27/18 02:30	EPA 3005A	19,200.7	PE
Sodium, Total	61.6		mg/l	2.00	0.120	1	08/25/18 11:00	08/27/18 02:30	EPA 3005A	19,200.7	PE
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.014	J	mg/l	0.050	0.009	1	08/27/18 15:30	08/30/18 03:20	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/27/18 15:30	08/30/18 03:20	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE
Lab Number: L1832809
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832809-03
Client ID: TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/20/18 16:20
Date Received: 08/21/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.038	J	mg/l	0.050	0.009	1	08/25/18 11:00	08/27/18 02:34	EPA 3005A	19,200.7	PE
Manganese, Total	ND		mg/l	0.010	0.002	1	08/25/18 11:00	08/27/18 02:34	EPA 3005A	19,200.7	PE
Sodium, Total	33.8		mg/l	2.00	0.120	1	08/25/18 11:00	08/27/18 02:34	EPA 3005A	19,200.7	PE
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.015	J	mg/l	0.050	0.009	1	08/27/18 15:30	08/30/18 03:24	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/27/18 15:30	08/30/18 03:24	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE
Lab Number: L1832809
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832809-04
Client ID: TW-16
Sample Location: IPSWICH, MA

Date Collected: 08/20/18 16:30
Date Received: 08/21/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.037	J	mg/l	0.050	0.009	1	08/25/18 11:00	08/27/18 02:38	EPA 3005A	19,200.7	PE
Manganese, Total	ND		mg/l	0.010	0.002	1	08/25/18 11:00	08/27/18 02:38	EPA 3005A	19,200.7	PE
Sodium, Total	116		mg/l	2.00	0.120	1	08/25/18 11:00	08/27/18 02:38	EPA 3005A	19,200.7	PE
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.025	J	mg/l	0.050	0.009	1	08/27/18 15:30	08/30/18 03:29	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/27/18 15:30	08/30/18 03:29	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE **Lab Number:** L1832809

Project Number: 60567459 **Report Date:** 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1150590-1										
Iron, Total	ND		mg/l	0.050	0.009	1	08/25/18 11:00	08/27/18 01:26	19,200.7	PE
Manganese, Total	ND		mg/l	0.010	0.002	1	08/25/18 11:00	08/27/18 01:26	19,200.7	PE
Sodium, Total	ND		mg/l	2.00	0.120	1	08/25/18 11:00	08/27/18 01:26	19,200.7	PE

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1151056-1										
Iron, Dissolved	ND		mg/l	0.050	0.009	1	08/27/18 15:30	08/30/18 02:53	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/27/18 15:30	08/30/18 02:53	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1150590-2								
Iron, Total	103		-		85-115	-		
Manganese, Total	103		-		85-115	-		
Sodium, Total	104		-		85-115	-		
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1151056-2								
Iron, Dissolved	102		-		85-115	-		
Manganese, Dissolved	96		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1150590-3 QC Sample: L1833471-01 Client ID: MS Sample												
Iron, Total	3.81	1	3.13	**0**	Q	-	-		75-125	-		20
Manganese, Total	2.42	0.5	2.80	76		-	-		75-125	-		20
Sodium, Total	1810	10	1700	**0**	Q	-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1150590-7 QC Sample: L1833471-02 Client ID: MS Sample												
Iron, Total	1.45	1	2.45	100		-	-		75-125	-		20
Manganese, Total	0.150	0.5	0.646	99		-	-		75-125	-		20
Sodium, Total	622.	10	622	**0**	Q	-	-		75-125	-		20
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151056-3 QC Sample: L1832809-01 Client ID: TW-15												
Iron, Dissolved	0.024J	1	1.07	107		-	-		75-125	-		20
Manganese, Dissolved	ND	0.5	0.496	99		-	-		75-125	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1832809

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1150590-4 QC Sample: L1833471-01 Client ID: DUP Sample						
Iron, Total	3.81	3.17	mg/l	18		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1150590-8 QC Sample: L1833471-02 Client ID: DUP Sample						
Iron, Total	1.45	1.50	mg/l	3		20
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151056-4 QC Sample: L1832809-01 Client ID: TW-15						
Iron, Dissolved	0.024J	0.026J	mg/l	NC		20
Manganese, Dissolved	ND	ND	mg/l	NC		20

INORGANICS
&
MISCELLANEOUS

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832809-01
Client ID: TW-15
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/20/18 16:00
Date Received: 08/21/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	4.9		mg/l	0.10	0.033	1	-	08/21/18 20:39	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	113.		mg/l	5.00	0.839	10	-	08/23/18 20:24	44,300.0	AU

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832809-02
Client ID: TW-13
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/20/18 16:10
Date Received: 08/21/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	5.9		mg/l	0.10	0.033	1	-	08/21/18 20:40	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	102.		mg/l	5.00	0.839	10	-	08/23/18 20:36	44,300.0	AU

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832809-03
Client ID: TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/20/18 16:20
Date Received: 08/21/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	6.1		mg/l	0.10	0.033	1	-	08/21/18 20:42	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	49.9		mg/l	5.00	0.839	10	-	08/23/18 20:48	44,300.0	AU

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832809-04
Client ID: TW-16
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/20/18 16:30
Date Received: 08/21/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	4.0		mg/l	0.10	0.033	1	-	08/21/18 20:43	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	203.		mg/l	5.00	0.839	10	-	08/23/18 21:12	44,300.0	AU

Project Name: LYNCH NEW SOURCE **Lab Number:** L1832809

Project Number: 60567459 **Report Date:** 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG1148991-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.033	1	-	08/21/18 20:06	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-04 Batch: WG1150407-1										
Chloride	ND		mg/l	0.500	0.083	1	-	08/23/18 18:00	44,300.0	AU

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG1148991-2								
Nitrogen, Nitrate	102		-		90-110	-		
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 Batch: WG1150407-2								
Chloride	100		-		90-110	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1148991-4 QC Sample: L1832689-02 Client ID: MS Sample												
Nitrogen, Nitrate	4.4	4	7.8	85		-	-		83-113	-		6
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1150407-3 QC Sample: L1833057-01 Client ID: MS Sample												
Chloride	45.3	4	47.5	**54**	Q	-	-		90-110	-		18

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1832809

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1148991-3 QC Sample: L1832689-02 Client ID: DUP Sample						
Nitrogen, Nitrate	4.4	4.4	mg/l	0		6
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1150407-4 QC Sample: L1833057-01 Client ID: DUP Sample						
Chloride	45.3	45.2	mg/l	0		18

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832809
Report Date: 09/19/18

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1832809-01A	Plastic 120ml unpreserved	A	7	7	2.3	Y	Absent		CL-300(28),NO3-353(2)
L1832809-01B	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-RI(180),MN-RI(180)
L1832809-01C	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1832809-02A	Plastic 120ml unpreserved	A	7	7	2.3	Y	Absent		CL-300(28),NO3-353(2)
L1832809-02B	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-RI(180),MN-RI(180)
L1832809-02C	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1832809-03A	Plastic 120ml unpreserved	A	7	7	2.3	Y	Absent		CL-300(28),NO3-353(2)
L1832809-03B	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-RI(180),MN-RI(180)
L1832809-03C	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1832809-04A	Plastic 120ml unpreserved	A	7	7	2.3	Y	Absent		CL-300(28),NO3-353(2)
L1832809-04B	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-RI(180),MN-RI(180)
L1832809-04C	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)

*Values in parentheses indicate holding time in days

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1832809
Project Number:	60567459	**Report Date:**	09/19/18

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Report Format: DU Report with 'J' Qualifiers

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1832809
Project Number:	60567459	**Report Date:**	09/19/18

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

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

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

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

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

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

REFERENCES

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

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

LIMITATION OF LIABILITIES

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

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

Certification Information

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

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.

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

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

Westborough Facility:

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

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

Mansfield Facility:

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

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

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

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 8/21/18

ALPHA Job #: L1832809

ALPHA ANALYTICAL
8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Client Information

Client: AECOM
Address: 250 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-2000
Email: erika.amirtin@aecom.com
doug.denatale@aecom.com

Additional Project Information:

Project Information

Project Name: Lynch New Source
Project Location: Ipswich, MA
Project #: 60567459
Project Manager: Doug DeNatale
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

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

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO
Filtration
☒ Field
☐ Lab to do
Preservation
☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Total Fe, Mn, Na	Dissolved Fe, Mn	Chloride, ~~Sulfate~~, NO3	Sample Comments	Total # Bottles
32809-01	TW-15	08/20/18	1600	DW	EAL	X	X	X		3
-02	TW-13	08/20/18	1610	DW	EAL	X	X	X		3
-03	TW-14	08/20/18	1620	DW	EAL	X	X	X		3
-04	TW-16	08/20/18	1630	DW	EAL	X	X	X		3

Container Type	P	P	P
Preservative	C	C	A

(12)

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

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

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	08/21/18 1350	[signature]	8-21-18 13:50
[signature]	8-21-18 15:55	[signature]	8/21/18 15:55

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

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

ANALYTICAL REPORT

Lab Number:	L1832812
Client:	AECOM 250 Apollo Dr. Chelmsford, MA 01824
ATTN:	Doug DeNatale
Phone:	(978) 905-2180
Project Name:	LYNCH NEW SOURCE
Project Number:	60567459
Report Date:	09/19/18

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

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

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1832812-01	LYNCH WELLS MIDPOINT	DW	IPSWICH, MA	08/21/18 13:40	08/21/18
L1832812-02	TW-13	DW	IPSWICH, MA	08/21/18 12:40	08/21/18
L1832812-03	TW-14	DW	IPSWICH, MA	08/21/18 10:45	08/21/18
L1832812-04	TW-15	DW	IPSWICH, MA	08/21/18 13:25	08/21/18
L1832812-05	TW-16	DW	IPSWICH, MA	08/21/18 08:50	08/21/18

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1832812
Report Date: 09/19/18

Case Narrative

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

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

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

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

Please contact Client Services at 800-624-9220 with any questions.

Project Name: LYNCH NEW SOURCE **Lab Number:** L1832812
Project Number: 60567459 **Report Date:** 09/19/18

Case Narrative (continued)

Report Revision

September 19, 2018: All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Total Metals

The WG1150280-2 LCS recovery, associated with L1832812-01, is above the acceptance criteria for silver (117%); however, the associated sample is non-detect to the RL for this target analyte. The results of the original analysis are reported.

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

Authorized Signature: Amita Naik

Title: Technical Director/Representative Date: 09/19/18

METALS

Project Name: LYNCH NEW SOURCE
Lab Number: L1832812
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832812-01
Client ID: LYNCH WELLS MIDPOINT
Sample Location: IPSWICH, MA
Date Collected: 08/21/18 13:40
Date Received: 08/21/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Aluminum, Total	ND		mg/l	0.100	0.032	1	08/24/18 12:30	08/27/18 23:01	EPA 3005A	19,200.7	AB
Calcium, Total	58.7		mg/l	0.100	0.035	1	08/24/18 12:30	08/27/18 23:01	EPA 3005A	19,200.7	AB
Copper, Total	0.0004	J	mg/l	0.0010	0.0004	1	08/24/18 12:30	08/27/18 10:53	EPA 3005A	3,200.8	AM
Iron, Total	0.036	J	mg/l	0.050	0.009	1	08/24/18 12:30	08/27/18 23:01	EPA 3005A	19,200.7	AB
Magnesium, Total	6.62		mg/l	0.100	0.015	1	08/24/18 12:30	08/27/18 23:01	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/24/18 12:30	08/27/18 23:01	EPA 3005A	19,200.7	AB
Potassium, Total	3.47		mg/l	2.50	0.237	1	08/24/18 12:30	08/27/18 23:01	EPA 3005A	19,200.7	AB
Silver, Total	ND		mg/l	0.0004	0.0002	1	08/24/18 12:30	08/27/18 10:53	EPA 3005A	3,200.8	AM
Sodium, Total	68.7		mg/l	2.00	0.120	1	08/24/18 12:30	08/27/18 23:01	EPA 3005A	19,200.7	AB
Zinc, Total	ND		mg/l	0.0100	0.0034	1	08/24/18 12:30	08/27/18 10:53	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	174		mg/l	0.660	NA	1	08/24/18 12:30	08/27/18 23:01	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.019	J	mg/l	0.050	0.009	1	08/27/18 15:30	08/30/18 03:56	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/27/18 15:30	08/30/18 03:56	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE **Lab Number:** L1832812

Project Number: 60567459 **Report Date:** 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01 Batch: WG1150280-1										
Copper, Total	ND		mg/l	0.0010	0.0004	1	08/24/18 12:30	08/27/18 10:33	3,200.8	AM
Silver, Total	ND		mg/l	0.0004	0.0002	1	08/24/18 12:30	08/27/18 10:33	3,200.8	AM
Zinc, Total	ND		mg/l	0.0100	0.0034	1	08/24/18 12:30	08/27/18 10:33	3,200.8	AM

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01 Batch: WG1150281-1										
Aluminum, Total	ND		mg/l	0.100	0.032	1	08/24/18 12:30	08/27/18 21:36	19,200.7	AB
Calcium, Total	ND		mg/l	0.100	0.035	1	08/24/18 12:30	08/27/18 21:36	19,200.7	AB
Iron, Total	ND		mg/l	0.050	0.009	1	08/24/18 12:30	08/27/18 21:36	19,200.7	AB
Magnesium, Total	ND		mg/l	0.100	0.015	1	08/24/18 12:30	08/27/18 21:36	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/24/18 12:30	08/27/18 21:36	19,200.7	AB
Potassium, Total	ND		mg/l	2.50	0.237	1	08/24/18 12:30	08/27/18 21:36	19,200.7	AB
Sodium, Total	0.212	J	mg/l	2.00	0.120	1	08/24/18 12:30	08/27/18 21:36	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Hardness by SM 2340B - Mansfield Lab for sample(s): 01 Batch: WG1150281-1										
Hardness	ND		mg/l	0.660	NA	1	08/24/18 12:30	08/27/18 21:36	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Project Name: LYNCH NEW SOURCE **Lab Number:** L1832812

Project Number: 60567459 **Report Date:** 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Mansfield Lab for sample(s): 01 Batch: WG1151056-1										
Iron, Dissolved	ND		mg/l	0.050	0.009	1	08/27/18 15:30	08/30/18 02:53	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/27/18 15:30	08/30/18 02:53	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1150280-2								
Copper, Total	105		-		85-115	-		
Silver, Total	**117**	Q	-		85-115	-		
Zinc, Total	113		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1150281-2								
Aluminum, Total	108		-		85-115	-		
Calcium, Total	105		-		85-115	-		
Iron, Total	109		-		85-115	-		
Magnesium, Total	108		-		85-115	-		
Manganese, Total	102		-		85-115	-		
Potassium, Total	104		-		85-115	-		
Sodium, Total	108		-		85-115	-		
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 Batch: WG1150281-2								
Hardness	107		-		85-115	-		
Dissolved Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1151056-2								
Iron, Dissolved	102		-		85-115	-		
Manganese, Dissolved	96		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1150280-3 WG1150280-4 QC Sample: L1832164-01 Client ID: MS Sample												
Copper, Total	ND	0.25	0.2564	102		0.2548	102		70-130	1		20
Silver, Total	ND	0.05	0.0573	115		0.0558	112		70-130	3		20
Zinc, Total	ND	0.5	0.5592	112		0.5409	108		70-130	3		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1150281-3 QC Sample: L1832669-01 Client ID: MS Sample												
Aluminum, Total	ND	2	2.14	107		-	-		75-125	-		20
Calcium, Total	27.9	10	37.9	100		-	-		75-125	-		20
Iron, Total	0.013J	1	1.08	108		-	-		75-125	-		20
Magnesium, Total	7.30	10	17.8	105		-	-		75-125	-		20
Manganese, Total	ND	0.5	0.502	100		-	-		75-125	-		20
Potassium, Total	2.44J	10	13.0	**130**	Q	-	-		75-125	-		20
Sodium, Total	77.8	10	87.8	100		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1150281-3 QC Sample: L1832669-01 Client ID: MS Sample												
Hardness	99.6	66.2	168	103		-	-		75-125	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery		MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1150281-7 QC Sample: L1832669-02 Client ID: MS Sample										
Aluminum, Total	ND	2	2.11	106		-	-	75-125	-	20
Calcium, Total	5.14	10	10.4	**53**	Q	-	-	75-125	-	20
Iron, Total	ND	1	1.06	106		-	-	75-125	-	20
Magnesium, Total	1.43	10	10.8	94		-	-	75-125	-	20
Manganese, Total	ND	0.5	0.494	99		-	-	75-125	-	20
Potassium, Total	0.452J	10	10.3	103		-	-	75-125	-	20
Sodium, Total	14.4	10	10.6	**0**	Q	-	-	75-125	-	20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1150281-7 QC Sample: L1832669-02 Client ID: MS Sample										
Hardness	18.7	66.2	70.6	78		-	-	75-125	-	20
Dissolved Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1151056-3 QC Sample: L1832809-01 Client ID: MS Sample										
Iron, Dissolved	0.024J	1	1.07	107		-	-	75-125	-	20
Manganese, Dissolved	ND	0.5	0.496	99		-	-	75-125	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1832812

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1151056-4 QC Sample: L1832809-01 Client ID: DUP Sample						
Iron, Dissolved	0.024J	0.026J	mg/l	NC		20
Manganese, Dissolved	ND	ND	mg/l	NC		20

INORGANICS
&
MISCELLANEOUS

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832812-01
Client ID: LYNCH WELLS MIDPOINT
Sample Location: IPSWICH, MA

Date Collected: 08/21/18 13:40
Date Received: 08/21/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Turbidity	0.39		NTU	0.20	0.20	1	-	08/22/18 04:53	44,180.1	UN
Odor @ 60 C	NO ODOR		TON	1	1.0	1	-	08/21/18 18:34	121,2150B	AS
Color, Apparent	ND		A.P.C.U.	5.0	5.0	1	-	08/21/18 18:45	121,2120B	AS
Alkalinity, Total	149.		mg CaCO3/L	2.00	NA	1	-	08/23/18 05:00	121,2320B	BR
Specific Conductance @ 25 C	690		umhos/cm	10	10.	1	-	08/21/18 19:12	121,2510B	AS
Solids, Total Dissolved	330		mg/l	10	3.1	1	-	08/22/18 13:25	121,2540C	DW
pH (H)	7.6		SU	-	NA	1	-	08/21/18 18:10	121,4500H+-B	AS
Nitrogen, Ammonia	0.031	J	mg/l	0.075	0.024	1	08/27/18 15:05	08/27/18 21:34	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.014	1	-	08/22/18 18:24	44,353.2	MR
Nitrogen, Nitrate	5.1		mg/l	0.10	0.033	1	-	08/22/18 18:24	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	116.		mg/l	5.00	0.839	10	-	08/23/18 22:00	44,300.0	AU
Sulfate	17.9		mg/l	5.00	0.800	5	-	08/26/18 02:14	44,300.0	JR

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832812-02
Client ID: TW-13
Sample Location: IPSWICH, MA

Date Collected: 08/21/18 12:40
Date Received: 08/21/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Coliform, Fecal (MF)	ND		col/100ml	1.0	NA	1	-	08/21/18 16:40	121,9222D	AJ
Bacteria in Water - Westborough Lab										
Coliform, Total	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832812-03
Client ID: TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/21/18 10:45
Date Received: 08/21/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Coliform, Fecal (MF)	ND		col/100ml	1.0	NA	1	-	08/21/18 16:40	121,9222D	AJ
Bacteria in Water - Westborough Lab										
Coliform, Total	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832812-04
Client ID: TW-15
Sample Location: IPSWICH, MA

Date Collected: 08/21/18 13:25
Date Received: 08/21/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Coliform, Fecal (MF)	ND		col/100ml	1.0	NA	1	-	08/21/18 16:40	121,9222D	AJ
Bacteria in Water - Westborough Lab										
Coliform, Total	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1832812-05
Client ID: TW-16
Sample Location: IPSWICH, MA

Date Collected: 08/21/18 08:50
Date Received: 08/21/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Coliform, Fecal (MF)	ND		col/100ml	1.0	NA	1	-	08/21/18 16:40	121,9222D	AJ
Bacteria in Water - Westborough Lab										
Coliform, Total	Positive		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ

Project Name: LYNCH NEW SOURCE **Lab Number:** L1832812

Project Number: 60567459 **Report Date:** 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1148998-1										
Odor	NO ODOR		TON	1	1.0	1	-	08/21/18 18:34	121,2150B	AS
Bacteria in Water - Westborough Lab for sample(s): 02-05 Batch: WG1149004-1										
Coliform, Total	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/21/18 17:30	121,9223B	AJ
Microbiological Analysis - Westborough Lab for sample(s): 02-05 Batch: WG1149006-1										
Coliform, Fecal (MF)	ND		col/100ml	1.0	NA	1	-	08/21/18 16:40	121,9222D	AJ
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1149136-1										
Solids, Total Dissolved	ND		mg/l	10	3.1	1	-	08/22/18 13:25	121,2540C	DW
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1149156-1										
Turbidity	ND		NTU	0.20	0.20	1	-	08/22/18 04:53	44,180.1	UN
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1149435-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.033	1	-	08/22/18 17:51	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1149439-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.014	1	-	08/22/18 17:57	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1149620-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	08/23/18 05:00	121,2320B	BR
Anions by Ion Chromatography - Westborough Lab for sample(s): 01 Batch: WG1150407-1										
Chloride	ND		mg/l	0.500	0.083	1	-	08/23/18 18:00	44,300.0	AU
Anions by Ion Chromatography - Westborough Lab for sample(s): 01 Batch: WG1150796-1										
Sulfate	ND		mg/l	1.00	0.160	1	-	08/25/18 17:49	44,300.0	JR
Anions by Ion Chromatography - Westborough Lab for sample(s): 01 Batch: WG1150796-1										
Chloride	ND		mg/l	0.500	0.083	1	-	08/25/18 17:49	44,300.0	JR
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1151054-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.024	1	08/27/18 15:05	08/27/18 21:05	44,350.1	AT

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1148993-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1149014-1								
Specific Conductance	99		-		99-101	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1149136-2								
Solids, Total Dissolved	92		-		80-120	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1149156-2								
Turbidity	102		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1149435-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1149439-2								
Nitrogen, Nitrite	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1149620-2								
Alkalinity, Total	103		-		90-110	-		10

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 Batch: WG1150407-2					
Chloride	100	-	90-110	-	
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 Batch: WG1150796-2					
Chloride	100	-	90-110	-	
Sulfate	100	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1151054-2					
Nitrogen, Ammonia	97	-	90-110	-	20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149435-4 QC Sample: L1832811-01 Client ID: MS Sample												
Nitrogen, Nitrate	8.8	4	12	**80**	Q	-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149439-4 QC Sample: L1832811-01 Client ID: MS Sample												
Nitrogen, Nitrite	0.018J	4	4.0	100		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149620-4 QC Sample: L1832916-02 Client ID: MS Sample												
Alkalinity, Total	46.3	100	155	109		-	-		86-116	-		10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1150407-3 QC Sample: L1833057-01 Client ID: MS Sample												
Chloride	45.3	4	47.5	**54**	Q	-	-		90-110	-		18
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1150796-3 QC Sample: L1833151-01 Client ID: MS Sample												
Chloride	147.	20	153	**32**	Q	-	-		90-110	-		18
Sulfate	15.0	40	60.0	**112**	Q	-	-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1151054-4 QC Sample: L1833214-01 Client ID: MS Sample												
Nitrogen, Ammonia	ND	4	4.07	102		-	-		90-110	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1832812

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1148993-2 QC Sample: L1832812-01 Client ID: LYNCH WELLS MIDPOINT						
pH (H)	7.6	7.5	SU	1		5
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1148998-2 QC Sample: L1832812-01 Client ID: LYNCH WELLS MIDPOINT						
Odor	NO ODOR	NO ODOR	TON	NC		
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1148999-1 QC Sample: L1832812-01 Client ID: LYNCH WELLS MIDPOINT						
Color, Apparent	ND	ND	A.P.C.U.	NC		
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149014-2 QC Sample: L1832812-01 Client ID: LYNCH WELLS MIDPOINT						
Specific Conductance @ 25 C	690	680	umhos/cm	1		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149136-3 QC Sample: L1832924-01 Client ID: DUP Sample						
Solids, Total Dissolved	1400	1400	mg/l	0		10
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149156-3 QC Sample: L1832812-01 Client ID: LYNCH WELLS MIDPOINT						
Turbidity	0.39	0.39	NTU	0		13
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149435-3 QC Sample: L1832811-01 Client ID: DUP Sample						
Nitrogen, Nitrate	8.8	9.5	mg/l	**8**	Q	6
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149439-3 QC Sample: L1832811-01 Client ID: DUP Sample						
Nitrogen, Nitrite	0.018J	ND	mg/l	NC		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1832812

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1149620-3 QC Sample: L1832916-01 Client ID: DUP Sample					
Alkalinity, Total	58.8	59.5	mg CaCO3/L	1	10
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1150407-4 QC Sample: L1833057-01 Client ID: DUP Sample					
Chloride	45.3	45.2	mg/l	0	18
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1150796-4 QC Sample: L1833151-01 Client ID: DUP Sample					
Chloride	147.	140	mg/l	5	18
Sulfate	15.0	14.6	mg/l	3	20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1151054-3 QC Sample: L1833214-01 Client ID: DUP Sample					
Nitrogen, Ammonia	ND	0.029J	mg/l	NC	20

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1832812-01A	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		FE-RI(180),MN-RI(180)
L1832812-01B	Plastic 250ml HNO3 preserved	A	<2	<2	2.3	Y	Absent		CA-UI(180),K-UI(180),ZN-2008T(180),CU-2008T(180),FE-UI(180),HARDU(180),MG-UI(180),AG-2008T(180),AL-UI(180),MN-UI(180),NA-UI(180)
L1832812-01C	Plastic 250ml unpreserved/No Headspace	A	NA		2.3	Y	Absent		ALK-T-2320(14)
L1832812-01D	Plastic 500ml H2SO4 preserved	A	<2	<2	2.3	Y	Absent		NH3-350(28)
L1832812-01E	Plastic 950ml unpreserved	A	7	7	2.3	Y	Absent		SO4-300(28),CL-300(28),NO2-353(2),TURB-180(2),COND-2510(1),NO3-353(2),PH-4500(.01),TDS-2540(7)
L1832812-01F	Amber 1000ml unpreserved	A	7	7	2.3	Y	Absent		COLOR-A-2120(2),ODOR-2150(1)
L1832812-02A	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		F-COLI-MF(.33)
L1832812-02B	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		F-COLI-MF(.33)
L1832812-02C	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		T-COLI-C(1.25)
L1832812-02D	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		T-COLI-C(1.25)
L1832812-03A	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		F-COLI-MF(.33)
L1832812-03B	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		F-COLI-MF(.33)
L1832812-03C	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		T-COLI-C(1.25)
L1832812-03D	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		T-COLI-C(1.25)
L1832812-04A	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		F-COLI-MF(.33)
L1832812-04B	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		F-COLI-MF(.33)
L1832812-04C	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		T-COLI-C(1.25)
L1832812-04D	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		T-COLI-C(1.25)
L1832812-05A	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		F-COLI-MF(.33)
L1832812-05B	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		F-COLI-MF(.33)
L1832812-05C	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		T-COLI-C(1.25)

*Values in parentheses indicate holding time in days

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1832812
Report Date: 09/19/18

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1832812-05D	Bacteria Cup Na2S2O3 preserved	A	NA		2.3	Y	Absent		T-COLI-C(1.25)

*Values in parentheses indicate holding time in days

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1832812
Project Number:	60567459	**Report Date:**	09/19/18

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Report Format: DU Report with 'J' Qualifiers

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1832812
Project Number:	60567459	**Report Date:**	09/19/18

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

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

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

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

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

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: LYNCH NEW SOURCE **Lab Number:** L1832812
Project Number: 60567459 **Report Date:** 09/19/18

REFERENCES

3 Methods for the Determination of Metals in Environmental Samples, Supplement I. EPA/600/R-94/111. May 1994.

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

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

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

LIMITATION OF LIABILITIES

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

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

Certification Information

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

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.

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

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

Westborough Facility:

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

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

Mansfield Facility:

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

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

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

CHAIN OF CUSTODY

PAGE 1 OF 1

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

Date Rec'd in Lab: 8/21/18

ALPHA Job #: L1832812

Client Information

Client: AECOM
Address: 250 Apollo Drive, Chelmsford, MA 01824
Phone: 978-905-2000
Email: erika.amir-lin@aecom.com, doug.denatale@aecom.com

Additional Project Information:

Project Information

Project Name: Lynch NewSource
Project Location: Ipswich, MA
Project #: 60567459
Project Manager: Doug DeNatale
ALPHA Quote #:

Turn-Around Time

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

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

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

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ~~PCB~~ ~~☐ PEST~~; ~~TPH: ☐ Silent Only ☐ Fingerprint~~; Color + odor; T-Coli; Cond, pH, TDS, SO4, Turb, Cl, NO3; Total metals - Al, Ca, Cu, Fe, Mg, Mn, Na, Ag, Na, Zn; Dissolved Metals - Fe, Mn; NH3; Alkalinity

SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	METALS	METALS	EPH	VPH	PCB	TPH	Color + odor	T-Coli	Cond, pH, TDS, SO4, Turb, Cl, NO3	Total metals	Dissolved Metals	NH3	Alkalinity	Sample Comments	Total # Bottles
32812 01	Lynch Wells Midpoint	08/21/18	1340	DW	EAL									X	X	X	X	X	X			6
02	TW-13	08/21/18	1240	DW	EAL							X	X									4
03	TW-14	08/21/18	1045	DW	EAL							X	X									4
04	TW-15	08/21/18	1325	DW	EAL							X	X									4
05	TW-16	08/21/18	0850	DW	EAL							X	X									4

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

22

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

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

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	08/21/18-1350	J Clement AAC	8-21-18 13:50
[signature]	8-21-18 1555	B Kelley	8/21/18 15:55

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

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

ANALYTICAL REPORT

Lab Number:	L1833313
Client:	AECOM 250 Apollo Dr. Chelmsford, MA 01824
ATTN:	Doug DeNatale
Phone:	(978) 905-2180
Project Name:	LYNCH NEW SOURCE
Project Number:	60567459
Report Date:	09/19/18

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

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

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833313
Report Date: 09/19/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1833313-01	TW-14	DW	IPSWICH, MA	08/23/18 11:55	08/23/18
L1833313-02	TW-16	DW	IPSWICH, MA	08/23/18 12:00	08/23/18
L1833313-03	TW-13	DW	IPSWICH, MA	08/23/18 12:05	08/23/18
L1833313-04	TW-15	DW	IPSWICH, MA	08/23/18 12:10	08/23/18

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833313
Report Date: 09/19/18

Case Narrative

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

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

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

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

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833313
Project Number:	60567459	**Report Date:**	09/19/18

Case Narrative (continued)

Report Revision

September 19, 2018: All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

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

Authorized Signature: Amita Naik

Title: Technical Director/Representative Date: 09/19/18

METALS

Project Name: LYNCH NEW SOURCE
Lab Number: L1833313
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1833313-01
Client ID: TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/23/18 11:55
Date Received: 08/23/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.012	J	mg/l	0.050	0.009	1	08/29/18 10:30	08/29/18 22:10	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/29/18 10:30	08/29/18 22:10	EPA 3005A	19,200.7	AB
Sodium, Total	28.8		mg/l	2.00	0.120	1	08/29/18 10:30	08/29/18 22:10	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.020	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 01:05	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 01:05	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE
Lab Number: L1833313
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1833313-02
Client ID: TW-16
Sample Location: IPSWICH, MA

Date Collected: 08/23/18 12:00
Date Received: 08/23/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.028	J	mg/l	0.050	0.009	1	08/29/18 10:30	08/29/18 22:15	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/29/18 10:30	08/29/18 22:15	EPA 3005A	19,200.7	AB
Sodium, Total	100		mg/l	2.00	0.120	1	08/29/18 10:30	08/29/18 22:15	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.035	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 01:40	EPA 3005A	19,200.7	AB
Manganese, Dissolved	0.002	J	mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 01:40	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE
Lab Number: L1833313
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1833313-03
Client ID: TW-13
Sample Location: IPSWICH, MA

Date Collected: 08/23/18 12:05
Date Received: 08/23/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.033	J	mg/l	0.050	0.009	1	08/29/18 10:30	08/29/18 22:19	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/29/18 10:30	08/29/18 22:19	EPA 3005A	19,200.7	AB
Sodium, Total	52.5		mg/l	2.00	0.120	1	08/29/18 10:30	08/29/18 22:19	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.027	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 01:45	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 01:45	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE
Lab Number: L1833313
Project Number: 60567459
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1833313-04
Client ID: TW-15
Sample Location: IPSWICH, MA

Date Collected: 08/23/18 12:10
Date Received: 08/23/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.020	J	mg/l	0.050	0.009	1	08/29/18 10:30	08/29/18 22:24	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/29/18 10:30	08/29/18 22:24	EPA 3005A	19,200.7	AB
Sodium, Total	60.3		mg/l	2.00	0.120	1	08/29/18 10:30	08/29/18 22:24	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.022	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 01:50	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 01:50	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833313

Project Number: 60567459 **Report Date:** 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1151669-1										
Iron, Total	ND		mg/l	0.050	0.009	1	08/29/18 10:30	08/30/18 02:31	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/29/18 10:30	08/30/18 02:31	19,200.7	AB
Sodium, Total	ND		mg/l	2.00	0.120	1	08/29/18 10:30	08/30/18 02:31	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1151752-1										
Iron, Dissolved	ND		mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 00:29	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 00:29	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1833313

Report Date: 09/19/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1151669-2								
Iron, Total	99		-		85-115	-		
Manganese, Total	94		-		85-115	-		
Sodium, Total	97		-		85-115	-		
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1151752-2								
Iron, Dissolved	100		-		85-115	-		
Manganese, Dissolved	96		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833313
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151669-3 QC Sample: L1833330-01 Client ID: MS Sample												
Iron, Total	0.286	1	1.26	97		-	-		75-125	-		20
Manganese, Total	0.0090J	0.5	0.469	94		-	-		75-125	-		20
Sodium, Total	2990	10	2950	**0**	Q	-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151669-7 QC Sample: L1833331-01 Client ID: MS Sample												
Iron, Total	1.28	1	2.21	93		-	-		75-125	-		20
Manganese, Total	0.031	0.5	0.481	90		-	-		75-125	-		20
Sodium, Total	1320	10	1310	**0**	Q	-	-		75-125	-		20
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151752-3 QC Sample: L1833313-01 Client ID: TW-14												
Iron, Dissolved	0.020J	1	1.03	103		-	-		75-125	-		20
Manganese, Dissolved	ND	0.5	0.488	98		-	-		75-125	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1833313

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151669-4 QC Sample: L1833330-01 Client ID: DUP Sample						
Iron, Total	0.286	0.274	mg/l	4		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151669-8 QC Sample: L1833331-01 Client ID: DUP Sample						
Iron, Total	1.28	1.26	mg/l	2		20
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151752-4 QC Sample: L1833313-01 Client ID: TW-14						
Iron, Dissolved	0.020J	0.016J	mg/l	NC		20
Manganese, Dissolved	ND	ND	mg/l	NC		20

INORGANICS
&
MISCELLANEOUS

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833313
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1833313-01
Client ID: TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/23/18 11:55
Date Received: 08/23/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	5.6		mg/l	0.10	0.033	1	-	08/23/18 22:32	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	55.6		mg/l	5.00	0.839	10	-	08/26/18 19:04	44,300.0	JR

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833313
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1833313-02
Client ID: TW-16
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/23/18 12:00
Date Received: 08/23/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	3.9		mg/l	0.10	0.033	1	-	08/23/18 22:00	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	190.		mg/l	5.00	0.839	10	-	08/26/18 19:16	44,300.0	JR

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833313
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1833313-03
Client ID: TW-13
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/23/18 12:05
Date Received: 08/23/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	5.9		mg/l	0.10	0.033	1	-	08/23/18 22:02	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	100.		mg/l	5.00	0.839	10	-	08/26/18 19:28	44,300.0	JR

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833313
Report Date: 09/19/18

SAMPLE RESULTS

Lab ID: L1833313-04
Client ID: TW-15
Sample Location: IPSWICH, MA

Date Collected: 08/23/18 12:10
Date Received: 08/23/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	4.7		mg/l	0.10	0.033	1	-	08/23/18 22:07	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	112.		mg/l	5.00	0.839	10	-	08/26/18 19:40	44,300.0	JR

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833313

Project Number: 60567459 **Report Date:** 09/19/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG1149965-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.033	1	-	08/23/18 18:58	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-04 Batch: WG1150834-1										
Chloride	0.130	J	mg/l	0.500	0.083	1	-	08/26/18 18:28	44,300.0	JR

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833313
Report Date: 09/19/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG1149965-2								
Nitrogen, Nitrate	98		-		90-110	-		
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 Batch: WG1150834-2								
Chloride	101		-		90-110	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833313
Report Date: 09/19/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1149965-4 QC Sample: L1833057-01 Client ID: MS Sample												
Nitrogen, Nitrate	1.4	4	4.9	88		-	-		83-113	-		6
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1150834-3 QC Sample: L1833609-01 Client ID: MS Sample												
Chloride	680.	100	767	**88**	Q	-	-		90-110	-		18

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1833313

Report Date: 09/19/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1149965-3 QC Sample: L1833057-01 Client ID: DUP Sample						
Nitrogen, Nitrate	1.4	1.3	mg/l	**7**	Q	6
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1150834-4 QC Sample: L1833609-01 Client ID: DUP Sample						
Chloride	680.	678	mg/l	0		18

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833313
Report Date: 09/19/18

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1833313-01A	Plastic 120ml unpreserved	A	7	7	3.6	Y	Absent		CL-300(28),NO3-353(2)
L1833313-01B	Plastic 250ml HNO3 preserved	A	<2	<2	3.6	Y	Absent		FE-RI(180),MN-RI(180)
L1833313-01C	Plastic 250ml HNO3 preserved	A	<2	<2	3.6	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1833313-02A	Plastic 120ml unpreserved	A	7	7	3.6	Y	Absent		CL-300(28),NO3-353(2)
L1833313-02B	Plastic 250ml HNO3 preserved	A	<2	<2	3.6	Y	Absent		FE-RI(180),MN-RI(180)
L1833313-02C	Plastic 250ml HNO3 preserved	A	<2	<2	3.6	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1833313-03A	Plastic 120ml unpreserved	A	7	7	3.6	Y	Absent		CL-300(28),NO3-353(2)
L1833313-03B	Plastic 250ml HNO3 preserved	A	<2	<2	3.6	Y	Absent		FE-RI(180),MN-RI(180)
L1833313-03C	Plastic 250ml HNO3 preserved	A	<2	<2	3.6	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1833313-04A	Plastic 120ml unpreserved	A	7	7	3.6	Y	Absent		CL-300(28),NO3-353(2)
L1833313-04B	Plastic 250ml HNO3 preserved	A	<2	<2	3.6	Y	Absent		FE-RI(180),MN-RI(180)
L1833313-04C	Plastic 250ml HNO3 preserved	A	<2	<2	3.6	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)

*Values in parentheses indicate holding time in days

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833313
Project Number:	60567459	**Report Date:**	09/19/18

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Report Format: DU Report with 'J' Qualifiers

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833313
Project Number:	60567459	**Report Date:**	09/19/18

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

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

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

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

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

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

REFERENCES

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

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

LIMITATION OF LIABILITIES

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

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

Certification Information

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

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.

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

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

Westborough Facility:

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

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

Mansfield Facility:

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

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

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

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL

8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Date Rec'd in Lab: 8/23/18

ALPHA Job #: L1833313

Client Information

Client: AECOM
Address: 250 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-2000
Email: erika.amir-lin@aecom.com
doug.denatale@aecom.com

Additional Project Information:

Project Information

Project Name: Lynch New Source
Project Location: Ipswich, MA
Project #: 60567459
Project Manager: Doug DeNatale
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

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

ANALYSIS

VOC: ☐ 8260 ☐ 624 ☐ 524.2
SVOC: ☐ ABN ☐ PAH
METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15
METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13
EPH: ☐ Ranges & Targets ☐ Ranges Only
VPH: ☐ Ranges & Targets ☐ Ranges Only
☐ PCB ☐ PEST
TPH: ☐ Quant Only ☐ Fingerprint
TOTAL Fe, Mn, Na
Dissolved Fe, Mn
Cl, NO3

SAMPLE INFO
Filtration
☒ Field
☐ Lab to do
Preservation
☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	TOTAL Fe, Mn, Na	Dissolved Fe, Mn	Cl, NO3	Sample Comments	TOTAL # BOTTLES
33313-01	TW-14	08/23/18	1155	DW	EAL	X	X	X		3
02	TW-16	08/23/18	1200	DW	EAL	X	X	X		3
03	TW-13	08/23/18	1205	DW	EAL	X	X	X		3
04	TW-15	08/23/18	1210	DW	EAL	X	X	X		3

Container Type	P	P	P
Preservative	C	C	A

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

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

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	08/23/18 1431	[signature]	8/23/18 1431
[signature] AAI	8/23/18 17:00	[signature]	8/23/18 1700

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

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

ANALYTICAL REPORT

Lab Number:	L1833724
Client:	AECOM 250 Apollo Dr. Chelmsford, MA 01824
ATTN:	Doug DeNatale
Phone:	(978) 905-2180
Project Name:	LYNCH NSA
Project Number:	60567459
Report Date:	09/05/18

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

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

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1833724-01	TW-14	DW	IPSWICH, MA	08/26/18 08:05	08/27/18
L1833724-02	TW-16	DW	IPSWICH, MA	08/26/18 08:10	08/27/18
L1833724-03	TW-13	DW	IPSWICH, MA	08/26/18 08:15	08/27/18
L1833724-04	TW-15	DW	IPSWICH, MA	08/26/18 08:20	08/27/18

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

Case Narrative

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

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

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

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

Please contact Client Services at 800-624-9220 with any questions.

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

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

Authorized Signature: Amita Naik

Title: Technical Director/Representative

Date: 09/05/18

METALS

Project Name: LYNCH NSA
Project Number: 60567459
Lab Number: L1833724
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1833724-01
Client ID: TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/26/18 08:05
Date Received: 08/27/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.015	J	mg/l	0.050	0.009	1	08/31/18 09:30	08/31/18 16:15	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/31/18 09:30	08/31/18 16:15	EPA 3005A	19,200.7	AB
Sodium, Total	29.1		mg/l	2.00	0.120	1	08/31/18 09:30	08/31/18 16:15	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.021	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 01:55	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 01:55	EPA 3005A	19,200.7	AB

Project Name: LYNCH NSA
Project Number: 60567459
Lab Number: L1833724
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1833724-02
Client ID: TW-16
Sample Location: IPSWICH, MA

Date Collected: 08/26/18 08:10
Date Received: 08/27/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.032	J	mg/l	0.050	0.009	1	08/31/18 09:30	08/31/18 16:19	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/31/18 09:30	08/31/18 16:19	EPA 3005A	19,200.7	AB
Sodium, Total	107		mg/l	2.00	0.120	1	08/31/18 09:30	08/31/18 16:19	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.032	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 02:00	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 02:00	EPA 3005A	19,200.7	AB

Project Name: LYNCH NSA
Project Number: 60567459
Lab Number: L1833724
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1833724-03
Client ID: TW-13
Sample Location: IPSWICH, MA

Date Collected: 08/26/18 08:15
Date Received: 08/27/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.028	J	mg/l	0.050	0.009	1	08/31/18 09:30	08/31/18 16:24	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/31/18 09:30	08/31/18 16:24	EPA 3005A	19,200.7	AB
Sodium, Total	52.7		mg/l	2.00	0.120	1	08/31/18 09:30	08/31/18 16:24	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.025	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 02:05	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 02:05	EPA 3005A	19,200.7	AB

Project Name: LYNCH NSA
Project Number: 60567459
Lab Number: L1833724
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1833724-04
Client ID: TW-15
Sample Location: IPSWICH, MA
Sample Depth:
Matrix: Dw

Date Collected: 08/26/18 08:20
Date Received: 08/27/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Iron, Total	0.035	J	mg/l	0.050	0.009	1	08/31/18 09:30	08/31/18 16:55	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/31/18 09:30	08/31/18 16:55	EPA 3005A	19,200.7	AB
Sodium, Total	64.8		mg/l	2.00	0.120	1	08/31/18 09:30	08/31/18 16:55	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.022	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 02:10	EPA 3005A	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 02:10	EPA 3005A	19,200.7	AB

Project Name: LYNCH NSA **Lab Number:** L1833724

Project Number: 60567459 **Report Date:** 09/05/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1151752-1										
Iron, Dissolved	ND		mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 00:29	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 00:29	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1152534-1										
Iron, Total	ND		mg/l	0.050	0.009	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB
Sodium, Total	ND		mg/l	2.00	0.120	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1151752-2								
Iron, Dissolved	100		-		85-115	-		
Manganese, Dissolved	96		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1152534-2								
Iron, Total	101		-		85-115	-		
Manganese, Total	91		-		85-115	-		
Sodium, Total	99		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151752-3 QC Sample: L1833313-01 Client ID: MS Sample												
Iron, Dissolved	0.020J	1	1.03	103		-	-		75-125	-		20
Manganese, Dissolved	ND	0.5	0.488	98		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1152534-3 QC Sample: L1834122-01 Client ID: MS Sample												
Iron, Total	0.828	1	1.78	95		-	-		75-125	-		20
Manganese, Total	0.019	0.5	0.484	93		-	-		75-125	-		20
Sodium, Total	497.	10	492	**0**	Q	-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1152534-7 QC Sample: L1834122-02 Client ID: MS Sample												
Iron, Total	0.278	1	1.30	102		-	-		75-125	-		20
Manganese, Total	0.096	0.5	0.548	90		-	-		75-125	-		20
Sodium, Total	360.	10	361	**10**	Q	-	-		75-125	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NSA

Project Number: 60567459

Lab Number: L1833724

Report Date: 09/05/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1151752-4 QC Sample: L1833313-01 Client ID: DUP Sample						
Iron, Dissolved	0.020J	0.016J	mg/l	NC		20
Manganese, Dissolved	ND	ND	mg/l	NC		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1152534-4 QC Sample: L1834122-01 Client ID: DUP Sample						
Iron, Total	0.828	0.765	mg/l	8		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1152534-8 QC Sample: L1834122-02 Client ID: DUP Sample						
Iron, Total	0.278	0.272	mg/l	2		20

INORGANICS
&
MISCELLANEOUS

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1833724-01
Client ID: TW-14
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/26/18 08:05
Date Received: 08/27/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	6.0		mg/l	0.10	0.033	1	-	08/27/18 21:27	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	54.2		mg/l	5.00	0.839	10	-	08/27/18 20:37	44,300.0	JR

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1833724-02
Client ID: TW-16
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/26/18 08:10
Date Received: 08/27/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	4.2		mg/l	0.10	0.033	1	-	08/27/18 21:28	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	172.		mg/l	5.00	0.839	10	-	08/27/18 20:49	44,300.0	JR

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1833724-03
Client ID: TW-13
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/26/18 08:15
Date Received: 08/27/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	6.9		mg/l	0.10	0.033	1	-	08/27/18 21:34	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	94.6		mg/l	5.00	0.839	10	-	08/27/18 21:01	44,300.0	JR

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1833724-04
Client ID: TW-15
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw

Date Collected: 08/26/18 08:20
Date Received: 08/27/18
Field Prep: Refer to COC

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Nitrate	5.4		mg/l	0.10	0.033	1	-	08/27/18 21:35	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab										
Chloride	113.		mg/l	5.00	0.839	10	-	08/27/18 21:13	44,300.0	JR

Project Name: LYNCH NSA **Lab Number:** L1833724

Project Number: 60567459 **Report Date:** 09/05/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG1151115-1										
Nitrogen, Nitrate	0.061	J	mg/l	0.10	0.033	1	-	08/27/18 21:25	44,353.2	MR
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-04 Batch: WG1151168-1										
Chloride	ND		mg/l	0.500	0.083	1	-	08/27/18 16:37	44,300.0	JR

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG1151115-2								
Nitrogen, Nitrate	102		-		90-110	-		
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 Batch: WG1151168-2								
Chloride	100		-		90-110	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1151115-4 QC Sample: L1833724-04 Client ID: TW-15												
Nitrogen, Nitrate	5.4	4	8.9	88		-	-		83-113	-		6
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1151168-3 QC Sample: L1833490-01 Client ID: MS Sample												
Chloride	10400	1000	10900	**54**	Q	-	-		90-110	-		18

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NSA

Project Number: 60567459

Lab Number: L1833724

Report Date: 09/05/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1151115-3 QC Sample: L1833724-04 Client ID: TW-15						
Nitrogen, Nitrate	5.4	5.4	mg/l	0		6
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1151168-4 QC Sample: L1833490-01 Client ID: DUP Sample						
Chloride	10400	10000	mg/l	3		18

Project Name: LYNCH NSA
Project Number: 60567459

Lab Number: L1833724
Report Date: 09/05/18

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
B	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1833724-01A	Plastic 120ml unpreserved	B	7	7	4.0	Y	Absent		CL-300(28),NO3-353(2)
L1833724-01B	Plastic 250ml HNO3 preserved	B	<2	<2	4.0	Y	Absent		FE-RI(180),MN-RI(180)
L1833724-01C	Plastic 250ml HNO3 preserved	B	<2	<2	4.0	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1833724-02A	Plastic 120ml unpreserved	B	7	7	4.0	Y	Absent		CL-300(28),NO3-353(2)
L1833724-02B	Plastic 250ml HNO3 preserved	B	<2	<2	4.0	Y	Absent		FE-RI(180),MN-RI(180)
L1833724-02C	Plastic 250ml HNO3 preserved	B	<2	<2	4.0	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1833724-03A	Plastic 120ml unpreserved	B	7	7	4.0	Y	Absent		CL-300(28),NO3-353(2)
L1833724-03B	Plastic 250ml HNO3 preserved	B	<2	<2	4.0	Y	Absent		FE-RI(180),MN-RI(180)
L1833724-03C	Plastic 250ml HNO3 preserved	B	<2	<2	4.0	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)
L1833724-04A	Plastic 120ml unpreserved	B	7	7	4.0	Y	Absent		CL-300(28),NO3-353(2)
L1833724-04B	Plastic 250ml HNO3 preserved	B	<2	<2	4.0	Y	Absent		FE-RI(180),MN-RI(180)
L1833724-04C	Plastic 250ml HNO3 preserved	B	<2	<2	4.0	Y	Absent		FE-UI(180),MN-UI(180),NA-UI(180)

*Values in parentheses indicate holding time in days

Project Name:	LYNCH NSA	**Lab Number:**	L1833724
Project Number:	60567459	**Report Date:**	09/05/18

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Report Format: DU Report with 'J' Qualifiers

Project Name:	LYNCH NSA	**Lab Number:**	L1833724
Project Number:	60567459	**Report Date:**	09/05/18

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

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

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

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

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

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: LYNCH NSA
Project Number: 60567459
Lab Number: L1833724
Report Date: 09/05/18

REFERENCES

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

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

LIMITATION OF LIABILITIES

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

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

Certification Information

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

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.

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

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

Westborough Facility:

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

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

Mansfield Facility:

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

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

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

CHAIN OF CUSTODY

PAGE 1 OF 1

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

Date Rec'd in Lab: 08/27/18

ALPHA Job #: L1833724

Project Information

Project Name: Lynch NSA
Project Location: Ipswich, MA
Project #: 60567459
Project Manager: Doug DeNatale
ALPHA Quote #:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: AECOM
Address: 250 Apollo Dr
Chelmsford, MA 01824
Phone: 978-905-2000
Email: erika.amir-lin@aecom.com
doug.denatale@aecom.com

Regulatory Requirements & Project Information Requirements

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

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; TOTAL Fe, Mn, Na; Dissolved Fe, Mn; Cl, NO3

SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	TOTAL Fe, Mn, Na	Dissolved Fe, Mn	Cl, NO3	Sample Comments	TOTAL # BOTTLES
33724-01	TW-14	08/26/18	0805	DW	EAL	X	X	X		3
02	TW-16	08/26/18	0810	DW	EAL	X	X	X		3
03	TW-13	08/26/18	0815	DW	EAL	X	X	X		3
04	TW-15	08/26/18	0820	DW	EAL	X	X	X		3

Container Type	P	P	P
Preservative	C	C	A

12

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

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

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	08/27/18 1305	[signature] AAL	8/27/18 13:05
[signature] AAL	8/27/18 17:15		8/27/18 1715

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

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

ANALYTICAL REPORT

Lab Number:	L1833725
Client:	AECOM 250 Apollo Dr. Chelmsford, MA 01824
ATTN:	Doug DeNatale
Phone:	(978) 905-2180
Project Name:	LYNCH NEW SOURCE
Project Number:	60567459
Report Date:	11/01/18

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

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

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1833725-01	FINAL TW-14	DW	IPSWICH, MA	08/27/18 09:00	08/27/18
L1833725-02	FINAL TW-16	DW	IPSWICH, MA	08/27/18 09:10	08/27/18
L1833725-03	FINAL TW-13	DW	IPSWICH, MA	08/27/18 09:20	08/27/18
L1833725-04	FINAL TW-15	DW	IPSWICH, MA	08/27/18 09:30	08/27/18
L1833725-05	FINAL DAY ALL WELLS	DW	IPSWICH, MA	08/27/18 10:00	08/27/18

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833725
Report Date: 11/01/18

Case Narrative

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

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

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

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

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833725
Project Number:	60567459	**Report Date:**	11/01/18

Case Narrative (continued)

Report Revision

November 01, 2018: The Gross Alpha and Gross Beta results are included as an addendum.

Report Submission

October 12, 2018: This final report includes the results of all requested analyses.

September 07, 2018: This is a preliminary report.

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

The SOC and Radiological analyses were subcontracted. Copies of the laboratory reports are included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

Sample Receipt

L1833725-05: The analysis of Hardness was performed at the client's request.

Volatile Organics by Method 524

The WG1152278-9 LCS recovery, associated with L1833725-01 and -02, is above the acceptance criteria for dichlorodifluoromethane (135%); however, the associated samples are non-detect to the RL for this target analyte. The results of the original analysis are reported.

The WG1152705-3 LCS recovery, associated with L1833725-03 and -04, is above the acceptance criteria for dichlorodifluoromethane (135%); however, the associated samples are non-detect to the RL for this target analyte. The results of the original analysis are reported.

Coliform, Fecal (MF)

L1833725-01 through 04 were analyzed with the method required holding time exceeded.

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833725
Project Number:	60567459	**Report Date:**	11/01/18

Case Narrative (continued)

Bacteria in Water

L1833725-04: The sample results are reported as negative for Total Coliform and E.Coli; however, a duplicate analysis yielded positive results for Total Coliform and E.Coli. The results of the original analysis are reported.

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

Authorized Signature: Amita Naik

Title: Technical Director/Representative

Date: 11/01/18

ORGANICS

VOLATILES

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-01
Client ID: FINAL TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:00
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 16,524.2
Analytical Date: 08/30/18 21:55
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Dichlorodifluoromethane	ND		ug/l	0.50	0.12	1
Chloromethane	ND		ug/l	0.50	0.15	1
Vinyl chloride	ND		ug/l	0.50	0.11	1
Bromomethane	ND		ug/l	0.50	0.17	1
Chloroethane	ND		ug/l	0.50	0.15	1
Trichlorofluoromethane	ND		ug/l	0.50	0.14	1
1,1-Dichloroethene	ND		ug/l	0.50	0.12	1
Methylene chloride	ND		ug/l	0.50	0.17	1
Methyl tert butyl ether	ND		ug/l	0.50	0.10	1
trans-1,2-Dichloroethene	ND		ug/l	0.50	0.15	1
1,1-Dichloroethane	ND		ug/l	0.50	0.14	1
2,2-Dichloropropane	ND		ug/l	0.50	0.11	1
cis-1,2-Dichloroethene	ND		ug/l	0.50	0.11	1
Chloroform	ND		ug/l	0.50	0.12	1
Bromochloromethane	ND		ug/l	0.50	0.14	1
1,1,1-Trichloroethane	ND		ug/l	0.50	0.13	1
1,1-Dichloropropene	ND		ug/l	0.50	0.14	1
Carbon tetrachloride	ND		ug/l	0.50	0.10	1
1,2-Dichloroethane	ND		ug/l	0.50	0.13	1
Benzene	ND		ug/l	0.50	0.16	1
Trichloroethene	ND		ug/l	0.50	0.14	1
1,2-Dichloropropane	ND		ug/l	0.50	0.14	1
Bromodichloromethane	ND		ug/l	0.50	0.12	1
Dibromomethane	ND		ug/l	0.50	0.09	1
cis-1,3-Dichloropropene	ND		ug/l	0.50	0.10	1
Toluene	ND		ug/l	0.50	0.16	1
trans-1,3-Dichloropropene	ND		ug/l	0.50	0.09	1
1,1,2-Trichloroethane	ND		ug/l	0.50	0.13	1

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-01
Client ID: FINAL TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:00
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichloropropane	ND		ug/l	0.50	0.11	1
Tetrachloroethene	ND		ug/l	0.50	0.15	1
Dibromochloromethane	ND		ug/l	0.50	0.10	1
1,2-Dibromoethane	ND		ug/l	0.50	0.09	1
Chlorobenzene	ND		ug/l	0.50	0.15	1
1,1,1,2-Tetrachloroethane	ND		ug/l	0.50	0.09	1
Ethylbenzene	ND		ug/l	0.50	0.09	1
p/m-Xylene	ND		ug/l	0.50	0.30	1
o-Xylene	ND		ug/l	0.50	0.19	1
Styrene	ND		ug/l	0.50	0.16	1
Isopropylbenzene	ND		ug/l	0.50	0.13	1
Bromoform	ND		ug/l	0.50	0.14	1
1,1,2,2-Tetrachloroethane	ND		ug/l	0.50	0.11	1
1,2,3-Trichloropropane	ND		ug/l	0.50	0.11	1
n-Propylbenzene	ND		ug/l	0.50	0.08	1
Bromobenzene	ND		ug/l	0.50	0.13	1
Xylenes, Total[1]	ND		ug/l	0.50	0.19	1
1,3,5-Trimethylbenzene	ND		ug/l	0.50	0.15	1
o-Chlorotoluene	ND		ug/l	0.50	0.17	1
p-Chlorotoluene	ND		ug/l	0.50	0.15	1
tert-Butylbenzene	ND		ug/l	0.50	0.14	1
1,2,4-Trimethylbenzene	ND		ug/l	0.50	0.13	1
sec-Butylbenzene	ND		ug/l	0.50	0.11	1
p-Isopropyltoluene	ND		ug/l	0.50	0.12	1
1,3-Dichlorobenzene	ND		ug/l	0.50	0.17	1
1,4-Dichlorobenzene	ND		ug/l	0.50	0.14	1
n-Butylbenzene	ND		ug/l	0.50	0.12	1
1,2-Dichlorobenzene	ND		ug/l	0.50	0.12	1
1,2-Dibromo-3-chloropropane	ND		ug/l	0.50	0.16	1
1,2,4-Trichlorobenzene	ND		ug/l	0.50	0.09	1
Hexachlorobutadiene	ND		ug/l	0.50	0.15	1
Naphthalene	ND		ug/l	0.50	0.06	1
1,2,3-Trichlorobenzene	ND		ug/l	0.50	0.10	1

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

SAMPLE RESULTS

Lab ID:	L1833725-01	Date Collected:	08/27/18 09:00
Client ID:	FINAL TW-14	Date Received:	08/27/18
Sample Location:	IPSWICH, MA	Field Prep:	Not Specified

Sample Depth:

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

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	112		80-120
4-Bromofluorobenzene	89		80-120

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-02
Client ID: FINAL TW-16
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:10
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 16,524.2
Analytical Date: 08/30/18 22:28
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Dichlorodifluoromethane	ND		ug/l	0.50	0.12	1
Chloromethane	ND		ug/l	0.50	0.15	1
Vinyl chloride	ND		ug/l	0.50	0.11	1
Bromomethane	ND		ug/l	0.50	0.17	1
Chloroethane	ND		ug/l	0.50	0.15	1
Trichlorofluoromethane	ND		ug/l	0.50	0.14	1
1,1-Dichloroethene	ND		ug/l	0.50	0.12	1
Methylene chloride	ND		ug/l	0.50	0.17	1
Methyl tert butyl ether	ND		ug/l	0.50	0.10	1
trans-1,2-Dichloroethene	ND		ug/l	0.50	0.15	1
1,1-Dichloroethane	ND		ug/l	0.50	0.14	1
2,2-Dichloropropane	ND		ug/l	0.50	0.11	1
cis-1,2-Dichloroethene	ND		ug/l	0.50	0.11	1
Chloroform	0.17	J	ug/l	0.50	0.12	1
Bromochloromethane	ND		ug/l	0.50	0.14	1
1,1,1-Trichloroethane	ND		ug/l	0.50	0.13	1
1,1-Dichloropropene	ND		ug/l	0.50	0.14	1
Carbon tetrachloride	ND		ug/l	0.50	0.10	1
1,2-Dichloroethane	ND		ug/l	0.50	0.13	1
Benzene	ND		ug/l	0.50	0.16	1
Trichloroethene	ND		ug/l	0.50	0.14	1
1,2-Dichloropropane	ND		ug/l	0.50	0.14	1
Bromodichloromethane	ND		ug/l	0.50	0.12	1
Dibromomethane	ND		ug/l	0.50	0.09	1
cis-1,3-Dichloropropene	ND		ug/l	0.50	0.10	1
Toluene	ND		ug/l	0.50	0.16	1
trans-1,3-Dichloropropene	ND		ug/l	0.50	0.09	1
1,1,2-Trichloroethane	ND		ug/l	0.50	0.13	1

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-02 Date Collected: 08/27/18 09:10

Client ID: FINAL TW-16 Date Received: 08/27/18

Sample Location: IPSWICH, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichloropropane	ND		ug/l	0.50	0.11	1
Tetrachloroethene	ND		ug/l	0.50	0.15	1
Dibromochloromethane	ND		ug/l	0.50	0.10	1
1,2-Dibromoethane	ND		ug/l	0.50	0.09	1
Chlorobenzene	ND		ug/l	0.50	0.15	1
1,1,1,2-Tetrachloroethane	ND		ug/l	0.50	0.09	1
Ethylbenzene	ND		ug/l	0.50	0.09	1
p/m-Xylene	ND		ug/l	0.50	0.30	1
o-Xylene	ND		ug/l	0.50	0.19	1
Styrene	ND		ug/l	0.50	0.16	1
Isopropylbenzene	ND		ug/l	0.50	0.13	1
Bromoform	ND		ug/l	0.50	0.14	1
1,1,2,2-Tetrachloroethane	ND		ug/l	0.50	0.11	1
1,2,3-Trichloropropane	ND		ug/l	0.50	0.11	1
n-Propylbenzene	ND		ug/l	0.50	0.08	1
Bromobenzene	ND		ug/l	0.50	0.13	1
Xylenes, Total[1]	ND		ug/l	0.50	0.19	1
1,3,5-Trimethylbenzene	ND		ug/l	0.50	0.15	1
o-Chlorotoluene	ND		ug/l	0.50	0.17	1
p-Chlorotoluene	ND		ug/l	0.50	0.15	1
tert-Butylbenzene	ND		ug/l	0.50	0.14	1
1,2,4-Trimethylbenzene	ND		ug/l	0.50	0.13	1
sec-Butylbenzene	ND		ug/l	0.50	0.11	1
p-Isopropyltoluene	ND		ug/l	0.50	0.12	1
1,3-Dichlorobenzene	ND		ug/l	0.50	0.17	1
1,4-Dichlorobenzene	ND		ug/l	0.50	0.14	1
n-Butylbenzene	ND		ug/l	0.50	0.12	1
1,2-Dichlorobenzene	ND		ug/l	0.50	0.12	1
1,2-Dibromo-3-chloropropane	ND		ug/l	0.50	0.16	1
1,2,4-Trichlorobenzene	ND		ug/l	0.50	0.09	1
Hexachlorobutadiene	ND		ug/l	0.50	0.15	1
Naphthalene	ND		ug/l	0.50	0.06	1
1,2,3-Trichlorobenzene	ND		ug/l	0.50	0.10	1

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

SAMPLE RESULTS

Lab ID:	L1833725-02	Date Collected:	08/27/18 09:10
Client ID:	FINAL TW-16	Date Received:	08/27/18
Sample Location:	IPSWICH, MA	Field Prep:	Not Specified

Sample Depth:

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

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	111		80-120
4-Bromofluorobenzene	91		80-120

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-03
Client ID: FINAL TW-13
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:20
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 16,524.2
Analytical Date: 08/30/18 23:01
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Dichlorodifluoromethane	ND		ug/l	0.50	0.12	1
Chloromethane	ND		ug/l	0.50	0.15	1
Vinyl chloride	ND		ug/l	0.50	0.11	1
Bromomethane	ND		ug/l	0.50	0.17	1
Chloroethane	ND		ug/l	0.50	0.15	1
Trichlorofluoromethane	ND		ug/l	0.50	0.14	1
1,1-Dichloroethene	ND		ug/l	0.50	0.12	1
Methylene chloride	ND		ug/l	0.50	0.17	1
Methyl tert butyl ether	ND		ug/l	0.50	0.10	1
trans-1,2-Dichloroethene	ND		ug/l	0.50	0.15	1
1,1-Dichloroethane	ND		ug/l	0.50	0.14	1
2,2-Dichloropropane	ND		ug/l	0.50	0.11	1
cis-1,2-Dichloroethene	ND		ug/l	0.50	0.11	1
Chloroform	ND		ug/l	0.50	0.12	1
Bromochloromethane	ND		ug/l	0.50	0.14	1
1,1,1-Trichloroethane	ND		ug/l	0.50	0.13	1
1,1-Dichloropropene	ND		ug/l	0.50	0.14	1
Carbon tetrachloride	ND		ug/l	0.50	0.10	1
1,2-Dichloroethane	ND		ug/l	0.50	0.13	1
Benzene	ND		ug/l	0.50	0.16	1
Trichloroethene	ND		ug/l	0.50	0.14	1
1,2-Dichloropropane	ND		ug/l	0.50	0.14	1
Bromodichloromethane	ND		ug/l	0.50	0.12	1
Dibromomethane	ND		ug/l	0.50	0.09	1
cis-1,3-Dichloropropene	ND		ug/l	0.50	0.10	1
Toluene	ND		ug/l	0.50	0.16	1
trans-1,3-Dichloropropene	ND		ug/l	0.50	0.09	1
1,1,2-Trichloroethane	ND		ug/l	0.50	0.13	1

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-03 Date Collected: 08/27/18 09:20

Client ID: FINAL TW-13 Date Received: 08/27/18

Sample Location: IPSWICH, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichloropropane	ND		ug/l	0.50	0.11	1
Tetrachloroethene	ND		ug/l	0.50	0.15	1
Dibromochloromethane	ND		ug/l	0.50	0.10	1
1,2-Dibromoethane	ND		ug/l	0.50	0.09	1
Chlorobenzene	ND		ug/l	0.50	0.15	1
1,1,1,2-Tetrachloroethane	ND		ug/l	0.50	0.09	1
Ethylbenzene	ND		ug/l	0.50	0.09	1
p/m-Xylene	ND		ug/l	0.50	0.30	1
o-Xylene	ND		ug/l	0.50	0.19	1
Styrene	ND		ug/l	0.50	0.16	1
Isopropylbenzene	ND		ug/l	0.50	0.13	1
Bromoform	ND		ug/l	0.50	0.14	1
1,1,2,2-Tetrachloroethane	ND		ug/l	0.50	0.11	1
1,2,3-Trichloropropane	ND		ug/l	0.50	0.11	1
n-Propylbenzene	ND		ug/l	0.50	0.08	1
Bromobenzene	ND		ug/l	0.50	0.13	1
Xylenes, Total[1]	ND		ug/l	0.50	0.19	1
1,3,5-Trimethylbenzene	ND		ug/l	0.50	0.15	1
o-Chlorotoluene	ND		ug/l	0.50	0.17	1
p-Chlorotoluene	ND		ug/l	0.50	0.15	1
tert-Butylbenzene	ND		ug/l	0.50	0.14	1
1,2,4-Trimethylbenzene	ND		ug/l	0.50	0.13	1
sec-Butylbenzene	ND		ug/l	0.50	0.11	1
p-Isopropyltoluene	ND		ug/l	0.50	0.12	1
1,3-Dichlorobenzene	ND		ug/l	0.50	0.17	1
1,4-Dichlorobenzene	ND		ug/l	0.50	0.14	1
n-Butylbenzene	ND		ug/l	0.50	0.12	1
1,2-Dichlorobenzene	ND		ug/l	0.50	0.12	1
1,2-Dibromo-3-chloropropane	ND		ug/l	0.50	0.16	1
1,2,4-Trichlorobenzene	ND		ug/l	0.50	0.09	1
Hexachlorobutadiene	ND		ug/l	0.50	0.15	1
Naphthalene	ND		ug/l	0.50	0.06	1
1,2,3-Trichlorobenzene	ND		ug/l	0.50	0.10	1

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

SAMPLE RESULTS

Lab ID:	L1833725-03	Date Collected:	08/27/18 09:20
Client ID:	FINAL TW-13	Date Received:	08/27/18
Sample Location:	IPSWICH, MA	Field Prep:	Not Specified

Sample Depth:

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

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	111		80-120
4-Bromofluorobenzene	90		80-120

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-04
Client ID: FINAL TW-15
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:30
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 16,524.2
Analytical Date: 08/30/18 23:34
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Dichlorodifluoromethane	ND		ug/l	0.50	0.12	1
Chloromethane	ND		ug/l	0.50	0.15	1
Vinyl chloride	ND		ug/l	0.50	0.11	1
Bromomethane	ND		ug/l	0.50	0.17	1
Chloroethane	ND		ug/l	0.50	0.15	1
Trichlorofluoromethane	ND		ug/l	0.50	0.14	1
1,1-Dichloroethene	ND		ug/l	0.50	0.12	1
Methylene chloride	ND		ug/l	0.50	0.17	1
Methyl tert butyl ether	ND		ug/l	0.50	0.10	1
trans-1,2-Dichloroethene	ND		ug/l	0.50	0.15	1
1,1-Dichloroethane	ND		ug/l	0.50	0.14	1
2,2-Dichloropropane	ND		ug/l	0.50	0.11	1
cis-1,2-Dichloroethene	ND		ug/l	0.50	0.11	1
Chloroform	ND		ug/l	0.50	0.12	1
Bromochloromethane	ND		ug/l	0.50	0.14	1
1,1,1-Trichloroethane	ND		ug/l	0.50	0.13	1
1,1-Dichloropropene	ND		ug/l	0.50	0.14	1
Carbon tetrachloride	ND		ug/l	0.50	0.10	1
1,2-Dichloroethane	ND		ug/l	0.50	0.13	1
Benzene	ND		ug/l	0.50	0.16	1
Trichloroethene	ND		ug/l	0.50	0.14	1
1,2-Dichloropropane	ND		ug/l	0.50	0.14	1
Bromodichloromethane	ND		ug/l	0.50	0.12	1
Dibromomethane	ND		ug/l	0.50	0.09	1
cis-1,3-Dichloropropene	ND		ug/l	0.50	0.10	1
Toluene	ND		ug/l	0.50	0.16	1
trans-1,3-Dichloropropene	ND		ug/l	0.50	0.09	1
1,1,2-Trichloroethane	ND		ug/l	0.50	0.13	1

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-04 Date Collected: 08/27/18 09:30

Client ID: FINAL TW-15 Date Received: 08/27/18

Sample Location: IPSWICH, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichloropropane	ND		ug/l	0.50	0.11	1
Tetrachloroethene	ND		ug/l	0.50	0.15	1
Dibromochloromethane	ND		ug/l	0.50	0.10	1
1,2-Dibromoethane	ND		ug/l	0.50	0.09	1
Chlorobenzene	ND		ug/l	0.50	0.15	1
1,1,1,2-Tetrachloroethane	ND		ug/l	0.50	0.09	1
Ethylbenzene	ND		ug/l	0.50	0.09	1
p/m-Xylene	ND		ug/l	0.50	0.30	1
o-Xylene	ND		ug/l	0.50	0.19	1
Styrene	ND		ug/l	0.50	0.16	1
Isopropylbenzene	ND		ug/l	0.50	0.13	1
Bromoform	ND		ug/l	0.50	0.14	1
1,1,2,2-Tetrachloroethane	ND		ug/l	0.50	0.11	1
1,2,3-Trichloropropane	ND		ug/l	0.50	0.11	1
n-Propylbenzene	ND		ug/l	0.50	0.08	1
Bromobenzene	ND		ug/l	0.50	0.13	1
Xylenes, Total[1]	ND		ug/l	0.50	0.19	1
1,3,5-Trimethylbenzene	ND		ug/l	0.50	0.15	1
o-Chlorotoluene	ND		ug/l	0.50	0.17	1
p-Chlorotoluene	ND		ug/l	0.50	0.15	1
tert-Butylbenzene	ND		ug/l	0.50	0.14	1
1,2,4-Trimethylbenzene	ND		ug/l	0.50	0.13	1
sec-Butylbenzene	ND		ug/l	0.50	0.11	1
p-Isopropyltoluene	ND		ug/l	0.50	0.12	1
1,3-Dichlorobenzene	ND		ug/l	0.50	0.17	1
1,4-Dichlorobenzene	ND		ug/l	0.50	0.14	1
n-Butylbenzene	ND		ug/l	0.50	0.12	1
1,2-Dichlorobenzene	ND		ug/l	0.50	0.12	1
1,2-Dibromo-3-chloropropane	ND		ug/l	0.50	0.16	1
1,2,4-Trichlorobenzene	ND		ug/l	0.50	0.09	1
Hexachlorobutadiene	ND		ug/l	0.50	0.15	1
Naphthalene	ND		ug/l	0.50	0.06	1
1,2,3-Trichlorobenzene	ND		ug/l	0.50	0.10	1

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

SAMPLE RESULTS

Lab ID:	L1833725-04	Date Collected:	08/27/18 09:30
Client ID:	FINAL TW-15	Date Received:	08/27/18
Sample Location:	IPSWICH, MA	Field Prep:	Not Specified

Sample Depth:

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

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	110		80-120
4-Bromofluorobenzene	90		80-120

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 08/30/18 16:56
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01-02 Batch: WG1152278-10					
Dichlorodifluoromethane	ND		ug/l	0.50	0.12
Chloromethane	ND		ug/l	0.50	0.15
Vinyl chloride	ND		ug/l	0.50	0.11
Bromomethane	0.27	J	ug/l	0.50	0.17
Chloroethane	ND		ug/l	0.50	0.15
Trichlorofluoromethane	ND		ug/l	0.50	0.14
1,1-Dichloroethene	ND		ug/l	0.50	0.12
Methylene chloride	ND		ug/l	0.50	0.17
Methyl tert butyl ether	ND		ug/l	0.50	0.10
trans-1,2-Dichloroethene	ND		ug/l	0.50	0.15
1,1-Dichloroethane	ND		ug/l	0.50	0.14
2,2-Dichloropropane	ND		ug/l	0.50	0.11
cis-1,2-Dichloroethene	ND		ug/l	0.50	0.11
Chloroform	ND		ug/l	0.50	0.12
Bromochloromethane	ND		ug/l	0.50	0.14
1,1,1-Trichloroethane	ND		ug/l	0.50	0.13
1,1-Dichloropropene	ND		ug/l	0.50	0.14
Carbon tetrachloride	ND		ug/l	0.50	0.10
1,2-Dichloroethane	ND		ug/l	0.50	0.13
Benzene	ND		ug/l	0.50	0.16
Trichloroethene	ND		ug/l	0.50	0.14
1,2-Dichloropropane	ND		ug/l	0.50	0.14
Bromodichloromethane	ND		ug/l	0.50	0.12
Dibromomethane	ND		ug/l	0.50	0.09
cis-1,3-Dichloropropene	ND		ug/l	0.50	0.10
Toluene	ND		ug/l	0.50	0.16
trans-1,3-Dichloropropene	ND		ug/l	0.50	0.09
1,1,2-Trichloroethane	ND		ug/l	0.50	0.13
1,3-Dichloropropane	ND		ug/l	0.50	0.11

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 08/30/18 16:56
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01-02 Batch: WG1152278-10					
Tetrachloroethene	ND		ug/l	0.50	0.15
Dibromochloromethane	ND		ug/l	0.50	0.10
1,2-Dibromoethane	ND		ug/l	0.50	0.09
Chlorobenzene	ND		ug/l	0.50	0.15
1,1,1,2-Tetrachloroethane	ND		ug/l	0.50	0.09
Ethylbenzene	ND		ug/l	0.50	0.09
p/m-Xylene	ND		ug/l	0.50	0.30
o-Xylene	ND		ug/l	0.50	0.19
Styrene	ND		ug/l	0.50	0.16
Isopropylbenzene	ND		ug/l	0.50	0.13
Bromoform	ND		ug/l	0.50	0.14
1,1,2,2-Tetrachloroethane	ND		ug/l	0.50	0.11
1,2,3-Trichloropropane	ND		ug/l	0.50	0.11
n-Propylbenzene	ND		ug/l	0.50	0.08
Bromobenzene	ND		ug/l	0.50	0.13
Xylenes, Total[1]	ND		ug/l	0.50	0.19
1,3,5-Trimethylbenzene	ND		ug/l	0.50	0.15
o-Chlorotoluene	ND		ug/l	0.50	0.17
p-Chlorotoluene	ND		ug/l	0.50	0.15
tert-Butylbenzene	ND		ug/l	0.50	0.14
1,2,4-Trimethylbenzene	ND		ug/l	0.50	0.13
sec-Butylbenzene	ND		ug/l	0.50	0.11
p-Isopropyltoluene	ND		ug/l	0.50	0.12
1,3-Dichlorobenzene	ND		ug/l	0.50	0.17
1,4-Dichlorobenzene	ND		ug/l	0.50	0.14
n-Butylbenzene	ND		ug/l	0.50	0.12
1,2-Dichlorobenzene	ND		ug/l	0.50	0.12
1,2-Dibromo-3-chloropropane	ND		ug/l	0.50	0.16
1,2,4-Trichlorobenzene	ND		ug/l	0.50	0.09

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 08/30/18 16:56
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01-02 Batch: WG1152278-10					
Hexachlorobutadiene	ND		ug/l	0.50	0.15
Naphthalene	ND		ug/l	0.50	0.06
1,2,3-Trichlorobenzene	ND		ug/l	0.50	0.10

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	111		80-120
4-Bromofluorobenzene	92		80-120

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 08/30/18 16:56
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 03-04 Batch: WG1152705-4					
Dichlorodifluoromethane	ND		ug/l	0.50	0.12
Chloromethane	ND		ug/l	0.50	0.15
Vinyl chloride	ND		ug/l	0.50	0.11
Bromomethane	0.27	J	ug/l	0.50	0.17
Chloroethane	ND		ug/l	0.50	0.15
Trichlorofluoromethane	ND		ug/l	0.50	0.14
1,1-Dichloroethene	ND		ug/l	0.50	0.12
Methylene chloride	ND		ug/l	0.50	0.17
Methyl tert butyl ether	ND		ug/l	0.50	0.10
trans-1,2-Dichloroethene	ND		ug/l	0.50	0.15
1,1-Dichloroethane	ND		ug/l	0.50	0.14
2,2-Dichloropropane	ND		ug/l	0.50	0.11
cis-1,2-Dichloroethene	ND		ug/l	0.50	0.11
Chloroform	ND		ug/l	0.50	0.12
Bromochloromethane	ND		ug/l	0.50	0.14
1,1,1-Trichloroethane	ND		ug/l	0.50	0.13
1,1-Dichloropropene	ND		ug/l	0.50	0.14
Carbon tetrachloride	ND		ug/l	0.50	0.10
1,2-Dichloroethane	ND		ug/l	0.50	0.13
Benzene	ND		ug/l	0.50	0.16
Trichloroethene	ND		ug/l	0.50	0.14
1,2-Dichloropropane	ND		ug/l	0.50	0.14
Bromodichloromethane	ND		ug/l	0.50	0.12
Dibromomethane	ND		ug/l	0.50	0.09
cis-1,3-Dichloropropene	ND		ug/l	0.50	0.10
Toluene	ND		ug/l	0.50	0.16
trans-1,3-Dichloropropene	ND		ug/l	0.50	0.09
1,1,2-Trichloroethane	ND		ug/l	0.50	0.13
1,3-Dichloropropane	ND		ug/l	0.50	0.11

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 08/30/18 16:56
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 03-04 Batch: WG1152705-4					
Tetrachloroethene	ND		ug/l	0.50	0.15
Dibromochloromethane	ND		ug/l	0.50	0.10
1,2-Dibromoethane	ND		ug/l	0.50	0.09
Chlorobenzene	ND		ug/l	0.50	0.15
1,1,1,2-Tetrachloroethane	ND		ug/l	0.50	0.09
Ethylbenzene	ND		ug/l	0.50	0.09
p/m-Xylene	ND		ug/l	0.50	0.30
o-Xylene	ND		ug/l	0.50	0.19
Styrene	ND		ug/l	0.50	0.16
Isopropylbenzene	ND		ug/l	0.50	0.13
Bromoform	ND		ug/l	0.50	0.14
1,1,2,2-Tetrachloroethane	ND		ug/l	0.50	0.11
1,2,3-Trichloropropane	ND		ug/l	0.50	0.11
n-Propylbenzene	ND		ug/l	0.50	0.08
Xylenes, Total[1]	ND		ug/l	0.50	0.19
Bromobenzene	ND		ug/l	0.50	0.13
1,3,5-Trimethylbenzene	ND		ug/l	0.50	0.15
o-Chlorotoluene	ND		ug/l	0.50	0.17
p-Chlorotoluene	ND		ug/l	0.50	0.15
tert-Butylbenzene	ND		ug/l	0.50	0.14
1,2,4-Trimethylbenzene	ND		ug/l	0.50	0.13
sec-Butylbenzene	ND		ug/l	0.50	0.11
p-Isopropyltoluene	ND		ug/l	0.50	0.12
1,3-Dichlorobenzene	ND		ug/l	0.50	0.17
1,4-Dichlorobenzene	ND		ug/l	0.50	0.14
n-Butylbenzene	ND		ug/l	0.50	0.12
1,2-Dichlorobenzene	ND		ug/l	0.50	0.12
1,2-Dibromo-3-chloropropane	ND		ug/l	0.50	0.16
1,2,4-Trichlorobenzene	ND		ug/l	0.50	0.09

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 16,524.2
Analytical Date: 08/30/18 16:56
Analyst: AD/GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 03-04 Batch: WG1152705-4					
Hexachlorobutadiene	ND		ug/l	0.50	0.15
Naphthalene	ND		ug/l	0.50	0.06
1,2,3-Trichlorobenzene	ND		ug/l	0.50	0.10

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	111		80-120
4-Bromofluorobenzene	92		80-120

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 Batch: WG1152278-9								
Dichlorodifluoromethane	**135**	Q	-		70-130	-		20
Chloromethane	125		-		70-130	-		20
Vinyl chloride	120		-		70-130	-		20
Bromomethane	100		-		70-130	-		20
Chloroethane	122		-		70-130	-		20
Trichlorofluoromethane	122		-		70-130	-		20
1,1-Dichloroethene	122		-		70-130	-		20
Methylene chloride	128		-		70-130	-		20
Methyl tert butyl ether	115		-		70-130	-		20
trans-1,2-Dichloroethene	115		-		70-130	-		20
1,1-Dichloroethane	115		-		70-130	-		20
2,2-Dichloropropane	92		-		70-130	-		20
cis-1,2-Dichloroethene	112		-		70-130	-		20
Chloroform	115		-		70-130	-		20
Bromochloromethane	118		-		70-130	-		20
1,1,1-Trichloroethane	108		-		70-130	-		20
1,1-Dichloropropene	115		-		70-130	-		20
Carbon tetrachloride	102		-		70-130	-		20
1,2-Dichloroethane	118		-		70-130	-		20
Benzene	115		-		70-130	-		20
Trichloroethene	115		-		70-130	-		20
1,2-Dichloropropane	112		-		70-130	-		20
Bromodichloromethane	100		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 Batch: WG1152278-9								
Dibromomethane	110		-		70-130	-		20
cis-1,3-Dichloropropene	98		-		70-130	-		20
Toluene	110		-		70-130	-		20
trans-1,3-Dichloropropene	82		-		70-130	-		20
1,1,2-Trichloroethane	112		-		70-130	-		20
1,3-Dichloropropane	112		-		70-130	-		20
Tetrachloroethene	115		-		70-130	-		20
Dibromochloromethane	98		-		70-130	-		20
1,2-Dibromoethane	108		-		70-130	-		20
Chlorobenzene	108		-		70-130	-		20
1,1,1,2-Tetrachloroethane	98		-		70-130	-		20
Ethylbenzene	102		-		70-130	-		20
p/m-Xylene	109		-		70-130	-		20
o-Xylene	100		-		70-130	-		20
Styrene	105		-		70-130	-		20
Isopropylbenzene	102		-		70-130	-		20
Bromoform	88		-		70-130	-		20
1,1,2,2-Tetrachloroethane	100		-		70-130	-		20
1,2,3-Trichloropropane	105		-		70-130	-		20
n-Propylbenzene	102		-		70-130	-		20
Bromobenzene	110		-		70-130	-		20
1,3,5-Trimethylbenzene	105		-		70-130	-		20
o-Chlorotoluene	110		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 Batch: WG1152278-9								
p-Chlorotoluene	110		-		70-130	-		20
tert-Butylbenzene	102		-		70-130	-		20
1,2,4-Trimethylbenzene	108		-		70-130	-		20
sec-Butylbenzene	95		-		70-130	-		20
p-Isopropyltoluene	95		-		70-130	-		20
1,3-Dichlorobenzene	108		-		70-130	-		20
1,4-Dichlorobenzene	102		-		70-130	-		20
n-Butylbenzene	100		-		70-130	-		20
1,2-Dichlorobenzene	102		-		70-130	-		20
1,2-Dibromo-3-chloropropane	85		-		70-130	-		20
1,2,4-Trichlorobenzene	92		-		70-130	-		20
Hexachlorobutadiene	95		-		70-130	-		20
Naphthalene	90		-		70-130	-		20
1,2,3-Trichlorobenzene	95		-		70-130	-		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichlorobenzene-d4	105				80-120
4-Bromofluorobenzene	102				80-120

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 Batch: WG1152705-3								
Dichlorodifluoromethane	**135**	Q	-		70-130	-		20
Chloromethane	125		-		70-130	-		20
Vinyl chloride	120		-		70-130	-		20
Bromomethane	100		-		70-130	-		20
Chloroethane	122		-		70-130	-		20
Trichlorofluoromethane	122		-		70-130	-		20
1,1-Dichloroethene	122		-		70-130	-		20
Methylene chloride	128		-		70-130	-		20
Methyl tert butyl ether	115		-		70-130	-		20
trans-1,2-Dichloroethene	115		-		70-130	-		20
1,1-Dichloroethane	115		-		70-130	-		20
2,2-Dichloropropane	92		-		70-130	-		20
cis-1,2-Dichloroethene	112		-		70-130	-		20
Chloroform	115		-		70-130	-		20
Bromochloromethane	118		-		70-130	-		20
1,1,1-Trichloroethane	108		-		70-130	-		20
1,1-Dichloropropene	115		-		70-130	-		20
Carbon tetrachloride	102		-		70-130	-		20
1,2-Dichloroethane	118		-		70-130	-		20
Benzene	115		-		70-130	-		20
Trichloroethene	115		-		70-130	-		20
1,2-Dichloropropane	112		-		70-130	-		20
Bromodichloromethane	100		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 Batch: WG1152705-3								
Dibromomethane	110		-		70-130	-		20
cis-1,3-Dichloropropene	98		-		70-130	-		20
Toluene	110		-		70-130	-		20
trans-1,3-Dichloropropene	82		-		70-130	-		20
1,1,2-Trichloroethane	112		-		70-130	-		20
1,3-Dichloropropane	112		-		70-130	-		20
Tetrachloroethene	115		-		70-130	-		20
Dibromochloromethane	98		-		70-130	-		20
1,2-Dibromoethane	108		-		70-130	-		20
Chlorobenzene	108		-		70-130	-		20
1,1,1,2-Tetrachloroethane	98		-		70-130	-		20
Ethylbenzene	102		-		70-130	-		20
p/m-Xylene	109		-		70-130	-		20
o-Xylene	100		-		70-130	-		20
Styrene	105		-		70-130	-		20
Isopropylbenzene	102		-		70-130	-		20
Bromoform	88		-		70-130	-		20
1,1,2,2-Tetrachloroethane	100		-		70-130	-		20
1,2,3-Trichloropropane	105		-		70-130	-		20
n-Propylbenzene	102		-		70-130	-		20
Bromobenzene	110		-		70-130	-		20
1,3,5-Trimethylbenzene	105		-		70-130	-		20
o-Chlorotoluene	110		-		70-130	-		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 Batch: WG1152705-3								
p-Chlorotoluene	110		-		70-130	-		20
tert-Butylbenzene	102		-		70-130	-		20
1,2,4-Trimethylbenzene	108		-		70-130	-		20
sec-Butylbenzene	95		-		70-130	-		20
p-Isopropyltoluene	95		-		70-130	-		20
1,3-Dichlorobenzene	108		-		70-130	-		20
1,4-Dichlorobenzene	102		-		70-130	-		20
n-Butylbenzene	100		-		70-130	-		20
1,2-Dichlorobenzene	102		-		70-130	-		20
1,2-Dibromo-3-chloropropane	85		-		70-130	-		20
1,2,4-Trichlorobenzene	92		-		70-130	-		20
Hexachlorobutadiene	95		-		70-130	-		20
Naphthalene	90		-		70-130	-		20
1,2,3-Trichlorobenzene	95		-		70-130	-		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichlorobenzene-d4	105				80-120
4-Bromofluorobenzene	102				80-120

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1152278-6 QC Sample: L1833778-01 Client ID: MS Sample												
Dichlorodifluoromethane	ND	4	5.8	**145**	Q	-	-		70-130	-		20
Chloromethane	ND	4	5.6	**140**	Q	-	-		70-130	-		20
Vinyl chloride	ND	4	5.5	**138**	Q	-	-		70-130	-		20
Bromomethane	ND	4	3.6	90		-	-		70-130	-		20
Chloroethane	ND	4	5.3	**133**	Q	-	-		70-130	-		20
Trichlorofluoromethane	ND	4	5.4	**135**	Q	-	-		70-130	-		20
1,1-Dichloroethene	ND	4	5.5	**138**	Q	-	-		70-130	-		20
Methylene chloride	ND	4	5.1	128		-	-		70-130	-		20
Methyl tert butyl ether	ND	4	4.5	113		-	-		70-130	-		20
trans-1,2-Dichloroethene	ND	4	5.1	128		-	-		70-130	-		20
1,1-Dichloroethane	ND	4	5.1	128		-	-		70-130	-		20
2,2-Dichloropropane	ND	4	3.3	82		-	-		70-130	-		20
cis-1,2-Dichloroethene	ND	4	5.0	125		-	-		70-130	-		20
Chloroform	ND	4	5.3	**133**	Q	-	-		70-130	-		20
Bromochloromethane	ND	4	5.0	125		-	-		70-130	-		20
1,1,1-Trichloroethane	ND	4	4.9	123		-	-		70-130	-		20
1,1-Dichloropropene	ND	4	4.9	123		-	-		70-130	-		20
Carbon tetrachloride	ND	4	4.7	118		-	-		70-130	-		20
1,2-Dichloroethane	ND	4	5.0	125		-	-		70-130	-		20
Benzene	ND	4	5.0	125		-	-		70-130	-		20
Trichloroethene	ND	4	4.8	120		-	-		70-130	-		20
1,2-Dichloropropane	ND	4	4.7	118		-	-		70-130	-		20
Bromodichloromethane	ND	4	4.5	113		-	-		70-130	-		20
Dibromomethane	ND	4	4.9	123		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1152278-6 QC Sample: L1833778-01 Client ID: MS Sample												
cis-1,3-Dichloropropene	ND	4	4.1	103		-	-		70-130	-		20
Toluene	ND	4	4.6	115		-	-		70-130	-		20
trans-1,3-Dichloropropene	ND	4	3.4	85		-	-		70-130	-		20
1,1,2-Trichloroethane	ND	4	4.9	123		-	-		70-130	-		20
1,3-Dichloropropane	ND	4	4.7	118		-	-		70-130	-		20
Tetrachloroethene	ND	4	4.7	118		-	-		70-130	-		20
Dibromochloromethane	ND	4	4.3	108		-	-		70-130	-		20
1,2-Dibromoethane	ND	4	4.5	113		-	-		70-130	-		20
Chlorobenzene	ND	4	4.4	110		-	-		70-130	-		20
1,1,1,2-Tetrachloroethane	ND	4	4.4	110		-	-		70-130	-		20
Ethylbenzene	ND	4	4.2	105		-	-		70-130	-		20
p/m-Xylene	ND	8	8.9	111		-	-		70-130	-		20
o-Xylene	ND	4	4.0	100		-	-		70-130	-		20
Styrene	ND	4	4.3	108		-	-		70-130	-		20
Isopropylbenzene	ND	4	4.1	103		-	-		70-130	-		20
Bromoform	ND	4	3.7	92		-	-		70-130	-		20
1,1,2,2-Tetrachloroethane	ND	4	4.3	108		-	-		70-130	-		20
1,2,3-Trichloropropane	ND	4	4.5	113		-	-		70-130	-		20
n-Propylbenzene	ND	4	4.1	103		-	-		70-130	-		20
Bromobenzene	ND	4	4.5	113		-	-		70-130	-		20
1,3,5-Trimethylbenzene	ND	4	4.1	103		-	-		70-130	-		20
o-Chlorotoluene	ND	4	4.5	113		-	-		70-130	-		20
p-Chlorotoluene	ND	4	4.4	110		-	-		70-130	-		20
tert-Butylbenzene	ND	4	4.0	100		-	-		70-130	-		20

Matrix Spike Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1833725

Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1152278-6 QC Sample: L1833778-01 Client ID: MS Sample												
1,2,4-Trimethylbenzene	ND	4	4.2	105		-	-		70-130	-		20
sec-Butylbenzene	ND	4	3.9	98		-	-		70-130	-		20
p-Isopropyltoluene	ND	4	3.8	95		-	-		70-130	-		20
1,3-Dichlorobenzene	ND	4	4.3	108		-	-		70-130	-		20
1,4-Dichlorobenzene	ND	4	4.1	103		-	-		70-130	-		20
n-Butylbenzene	ND	4	3.9	98		-	-		70-130	-		20
1,2-Dichlorobenzene	ND	4	4.2	105		-	-		70-130	-		20
1,2-Dibromo-3-chloropropane	ND	4	3.5	88		-	-		70-130	-		20
1,2,4-Trichlorobenzene	ND	4	3.6	90		-	-		70-130	-		20
Hexachlorobutadiene	ND	4	3.9	98		-	-		70-130	-		20
Naphthalene	ND	4	3.5	88		-	-		70-130	-		20
1,2,3-Trichlorobenzene	ND	4	3.8	95		-	-		70-130	-		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	104				80-120
4-Bromofluorobenzene	101				80-120

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 QC Batch ID: WG1152705-6 QC Sample: L1833564-01 Client ID: MS Sample												
Dichlorodifluoromethane	ND	4	6.1	**153**	Q	-	-		70-130	-		20
Chloromethane	ND	4	5.6	**140**	Q	-	-		70-130	-		20
Vinyl chloride	ND	4	5.6	**140**	Q	-	-		70-130	-		20
Bromomethane	ND	4	3.8	95		-	-		70-130	-		20
Chloroethane	ND	4	5.5	**138**	Q	-	-		70-130	-		20
Trichlorofluoromethane	ND	4	5.8	**145**	Q	-	-		70-130	-		20
1,1-Dichloroethene	ND	4	5.6	**140**	Q	-	-		70-130	-		20
Methylene chloride	ND	4	5.2	130		-	-		70-130	-		20
Methyl tert butyl ether	ND	4	4.4	110		-	-		70-130	-		20
trans-1,2-Dichloroethene	ND	4	5.2	130		-	-		70-130	-		20
1,1-Dichloroethane	ND	4	5.2	130		-	-		70-130	-		20
2,2-Dichloropropane	ND	4	3.8	95		-	-		70-130	-		20
cis-1,2-Dichloroethene	ND	4	5.2	130		-	-		70-130	-		20
Chloroform	ND	4	5.1	128		-	-		70-130	-		20
Bromochloromethane	ND	4	5.3	**133**	Q	-	-		70-130	-		20
1,1,1-Trichloroethane	ND	4	5.0	125		-	-		70-130	-		20
1,1-Dichloropropene	ND	4	5.2	130		-	-		70-130	-		20
Carbon tetrachloride	ND	4	4.9	123		-	-		70-130	-		20
1,2-Dichloroethane	ND	4	5.2	130		-	-		70-130	-		20
Benzene	ND	4	5.1	128		-	-		70-130	-		20
Trichloroethene	ND	4	4.9	123		-	-		70-130	-		20
1,2-Dichloropropane	ND	4	5.0	125		-	-		70-130	-		20
Bromodichloromethane	ND	4	4.7	118		-	-		70-130	-		20
Dibromomethane	ND	4	4.8	120		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 QC Batch ID: WG1152705-6 QC Sample: L1833564-01 Client ID: MS Sample												
cis-1,3-Dichloropropene	ND	4	4.2	105		-	-		70-130	-		20
Toluene	ND	4	4.8	120		-	-		70-130	-		20
trans-1,3-Dichloropropene	ND	4	3.5	88		-	-		70-130	-		20
1,1,2-Trichloroethane	ND	4	4.8	120		-	-		70-130	-		20
1,3-Dichloropropane	ND	4	4.8	120		-	-		70-130	-		20
Tetrachloroethene	ND	4	5.3	**133**	Q	-	-		70-130	-		20
Dibromochloromethane	ND	4	4.4	110		-	-		70-130	-		20
1,2-Dibromoethane	ND	4	4.6	115		-	-		70-130	-		20
Chlorobenzene	ND	4	4.4	110		-	-		70-130	-		20
1,1,1,2-Tetrachloroethane	ND	4	4.3	108		-	-		70-130	-		20
Ethylbenzene	ND	4	4.4	110		-	-		70-130	-		20
p/m-Xylene	ND	8	9.4	118		-	-		70-130	-		20
o-Xylene	ND	4	4.3	108		-	-		70-130	-		20
Styrene	ND	4	4.6	115		-	-		70-130	-		20
Isopropylbenzene	ND	4	4.4	110		-	-		70-130	-		20
Bromoform	ND	4	3.8	95		-	-		70-130	-		20
1,1,2,2-Tetrachloroethane	ND	4	4.3	108		-	-		70-130	-		20
1,2,3-Trichloropropane	ND	4	4.3	108		-	-		70-130	-		20
n-Propylbenzene	ND	4	4.5	113		-	-		70-130	-		20
Bromobenzene	ND	4	4.7	118		-	-		70-130	-		20
1,3,5-Trimethylbenzene	ND	4	4.4	110		-	-		70-130	-		20
o-Chlorotoluene	ND	4	4.7	118		-	-		70-130	-		20
p-Chlorotoluene	ND	4	4.6	115		-	-		70-130	-		20
tert-Butylbenzene	ND	4	4.4	110		-	-		70-130	-		20

Matrix Spike Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1833725

Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 QC Batch ID: WG1152705-6 QC Sample: L1833564-01 Client ID: MS Sample												
1,2,4-Trimethylbenzene	ND	4	4.6	115		-	-		70-130	-		20
sec-Butylbenzene	ND	4	4.2	105		-	-		70-130	-		20
p-Isopropyltoluene	ND	4	4.1	103		-	-		70-130	-		20
1,3-Dichlorobenzene	ND	4	4.5	113		-	-		70-130	-		20
1,4-Dichlorobenzene	ND	4	4.1	103		-	-		70-130	-		20
n-Butylbenzene	ND	4	4.2	105		-	-		70-130	-		20
1,2-Dichlorobenzene	ND	4	4.1	103		-	-		70-130	-		20
1,2-Dibromo-3-chloropropane	ND	4	3.4	85		-	-		70-130	-		20
1,2,4-Trichlorobenzene	ND	4	3.6	90		-	-		70-130	-		20
Hexachlorobutadiene	ND	4	3.9	98		-	-		70-130	-		20
Naphthalene	ND	4	3.4	85		-	-		70-130	-		20
1,2,3-Trichlorobenzene	ND	4	3.7	92		-	-		70-130	-		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	103				80-120
4-Bromofluorobenzene	105				80-120

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1152278-5 QC Sample: L1833777-01 Client ID: DUP Sample						
Dichlorodifluoromethane	ND	ND	ug/l	NC		20
Chloromethane	ND	ND	ug/l	NC		20
Vinyl chloride	ND	ND	ug/l	NC		20
Bromomethane	ND	ND	ug/l	NC		20
Chloroethane	ND	ND	ug/l	NC		20
Trichlorofluoromethane	ND	ND	ug/l	NC		20
1,1-Dichloroethene	ND	ND	ug/l	NC		20
Methylene chloride	ND	ND	ug/l	NC		20
Methyl tert butyl ether	ND	ND	ug/l	NC		20
trans-1,2-Dichloroethene	ND	ND	ug/l	NC		20
1,1-Dichloroethane	ND	ND	ug/l	NC		20
2,2-Dichloropropane	ND	ND	ug/l	NC		20
cis-1,2-Dichloroethene	ND	ND	ug/l	NC		20
Chloroform	0.68	0.66	ug/l	3		20
Bromochloromethane	ND	ND	ug/l	NC		20
1,1,1-Trichloroethane	ND	ND	ug/l	NC		20
1,1-Dichloropropene	ND	ND	ug/l	NC		20
Carbon tetrachloride	ND	ND	ug/l	NC		20
1,2-Dichloroethane	ND	ND	ug/l	NC		20
Benzene	ND	ND	ug/l	NC		20
Trichloroethene	ND	ND	ug/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1152278-5 QC Sample: L1833777-01 Client ID: DUP Sample						
1,2-Dichloropropane	ND	ND	ug/l	NC		20
Bromodichloromethane	ND	ND	ug/l	NC		20
Dibromomethane	ND	ND	ug/l	NC		20
cis-1,3-Dichloropropene	ND	ND	ug/l	NC		20
Toluene	ND	ND	ug/l	NC		20
trans-1,3-Dichloropropene	ND	ND	ug/l	NC		20
1,1,2-Trichloroethane	ND	ND	ug/l	NC		20
1,3-Dichloropropane	ND	ND	ug/l	NC		20
Tetrachloroethene	ND	ND	ug/l	NC		20
Dibromochloromethane	ND	ND	ug/l	NC		20
1,2-Dibromoethane	ND	ND	ug/l	NC		20
Chlorobenzene	ND	ND	ug/l	NC		20
1,1,1,2-Tetrachloroethane	ND	ND	ug/l	NC		20
Ethylbenzene	ND	ND	ug/l	NC		20
p/m-Xylene	ND	ND	ug/l	NC		20
o-Xylene	ND	ND	ug/l	NC		20
Styrene	ND	ND	ug/l	NC		20
Isopropylbenzene	ND	ND	ug/l	NC		20
Bromoform	ND	ND	ug/l	NC		20
1,1,2,2-Tetrachloroethane	ND	ND	ug/l	NC		20
1,2,3-Trichloropropane	ND	ND	ug/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1152278-5 QC Sample: L1833777-01 Client ID: DUP Sample						
n-Propylbenzene	ND	ND	ug/l	NC		20
Bromobenzene	ND	ND	ug/l	NC		20
Xylene (Total)[1]	ND	ND	ug/l	NC		20
1,3,5-Trimethylbenzene	ND	ND	ug/l	NC		20
o-Chlorotoluene	ND	ND	ug/l	NC		20
Trihalomethanes, Total	0.68	0.66	ug/l	3		20
p-Chlorotoluene	ND	ND	ug/l	NC		20
tert-Butylbenzene	ND	ND	ug/l	NC		20
1,2,4-Trimethylbenzene	ND	ND	ug/l	NC		20
sec-Butylbenzene	ND	ND	ug/l	NC		20
p-Isopropyltoluene	ND	ND	ug/l	NC		20
1,3-Dichlorobenzene	ND	ND	ug/l	NC		20
1,4-Dichlorobenzene	ND	ND	ug/l	NC		20
n-Butylbenzene	ND	ND	ug/l	NC		20
1,2-Dichlorobenzene	ND	ND	ug/l	NC		20
1,2-Dibromo-3-chloropropane	ND	ND	ug/l	NC		20
1,2,4-Trichlorobenzene	ND	ND	ug/l	NC		20
Hexachlorobutadiene	ND	ND	ug/l	NC		20
Naphthalene	ND	ND	ug/l	NC		20
1,2,3-Trichlorobenzene	0.18J	0.15J	ug/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1152278-5 QC Sample: L1833777-01 Client ID: DUP Sample						

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	108		111		80-120
4-Bromofluorobenzene	90		90		80-120

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 QC Batch ID: WG1152705-5 QC Sample: L1833564-02 Client ID: DUP Sample						
Dichlorodifluoromethane	ND	ND	ug/l	NC		20
Chloromethane	ND	ND	ug/l	NC		20
Vinyl chloride	ND	ND	ug/l	NC		20
Bromomethane	ND	ND	ug/l	NC		20
Chloroethane	ND	ND	ug/l	NC		20
Trichlorofluoromethane	ND	ND	ug/l	NC		20
1,1-Dichloroethene	ND	ND	ug/l	NC		20
Methylene chloride	ND	ND	ug/l	NC		20
Methyl tert butyl ether	ND	ND	ug/l	NC		20
trans-1,2-Dichloroethene	ND	ND	ug/l	NC		20
1,1-Dichloroethane	ND	ND	ug/l	NC		20
2,2-Dichloropropane	ND	ND	ug/l	NC		20
cis-1,2-Dichloroethene	ND	ND	ug/l	NC		20
Chloroform	ND	ND	ug/l	NC		20
Bromochloromethane	ND	ND	ug/l	NC		20
1,1,1-Trichloroethane	ND	ND	ug/l	NC		20
1,1-Dichloropropene	ND	ND	ug/l	NC		20
Carbon tetrachloride	ND	ND	ug/l	NC		20
1,2-Dichloroethane	ND	ND	ug/l	NC		20
Benzene	ND	ND	ug/l	NC		20
Trichloroethene	ND	ND	ug/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 QC Batch ID: WG1152705-5 QC Sample: L1833564-02 Client ID: DUP Sample						
1,2-Dichloropropane	ND	ND	ug/l	NC		20
Bromodichloromethane	ND	ND	ug/l	NC		20
Dibromomethane	ND	ND	ug/l	NC		20
cis-1,3-Dichloropropene	ND	ND	ug/l	NC		20
Toluene	ND	ND	ug/l	NC		20
trans-1,3-Dichloropropene	ND	ND	ug/l	NC		20
1,1,2-Trichloroethane	ND	ND	ug/l	NC		20
1,3-Dichloropropane	ND	ND	ug/l	NC		20
Tetrachloroethene	ND	ND	ug/l	NC		20
Dibromochloromethane	ND	ND	ug/l	NC		20
1,2-Dibromoethane	ND	ND	ug/l	NC		20
Chlorobenzene	ND	ND	ug/l	NC		20
1,1,1,2-Tetrachloroethane	ND	ND	ug/l	NC		20
Ethylbenzene	ND	ND	ug/l	NC		20
p/m-Xylene	ND	ND	ug/l	NC		20
o-Xylene	ND	ND	ug/l	NC		20
Styrene	ND	ND	ug/l	NC		20
Isopropylbenzene	ND	ND	ug/l	NC		20
Bromoform	ND	ND	ug/l	NC		20
1,1,2,2-Tetrachloroethane	ND	ND	ug/l	NC		20
1,2,3-Trichloropropane	ND	ND	ug/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 QC Batch ID: WG1152705-5 QC Sample: L1833564-02 Client ID: DUP Sample						
n-Propylbenzene	ND	ND	ug/l	NC		20
Xylene (Total)[1]	ND	ND	ug/l	NC		20
Bromobenzene	ND	ND	ug/l	NC		20
1,3,5-Trimethylbenzene	ND	ND	ug/l	NC		20
o-Chlorotoluene	ND	ND	ug/l	NC		20
Trihalomethanes, Total	ND	ND	ug/l	NC		20
p-Chlorotoluene	ND	ND	ug/l	NC		20
tert-Butylbenzene	ND	ND	ug/l	NC		20
1,2,4-Trimethylbenzene	ND	ND	ug/l	NC		20
sec-Butylbenzene	ND	ND	ug/l	NC		20
p-Isopropyltoluene	ND	ND	ug/l	NC		20
1,3-Dichlorobenzene	ND	ND	ug/l	NC		20
1,4-Dichlorobenzene	ND	ND	ug/l	NC		20
n-Butylbenzene	ND	ND	ug/l	NC		20
1,2-Dichlorobenzene	ND	ND	ug/l	NC		20
1,2-Dibromo-3-chloropropane	ND	ND	ug/l	NC		20
1,2,4-Trichlorobenzene	ND	ND	ug/l	NC		20
Hexachlorobutadiene	ND	ND	ug/l	NC		20
Naphthalene	ND	ND	ug/l	NC		20
1,2,3-Trichlorobenzene	ND	ND	ug/l	NC		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 03-04 QC Batch ID: WG1152705-5 QC Sample: L1833564-02 Client ID: DUP Sample						

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichlorobenzene-d4	111		110		80-120
4-Bromofluorobenzene	91		90		80-120

METALS

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-05
Client ID: FINAL DAY ALL WELLS
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 10:00
Date Received: 08/27/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Aluminum, Total	ND		mg/l	0.100	0.032	1	08/31/18 09:30	08/31/18 16:59	EPA 3005A	19,200.7	AB
Antimony, Total	ND		mg/l	0.0040	0.0004	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Arsenic, Total	ND		mg/l	0.0010	0.0002	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Barium, Total	0.0200		mg/l	0.0010	0.0002	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Beryllium, Total	ND		mg/l	0.0010	0.0001	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Cadmium, Total	ND		mg/l	0.0002	0.0001	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Calcium, Total	55.5		mg/l	0.100	0.035	1	08/31/18 09:30	08/31/18 16:59	EPA 3005A	19,200.7	AB
Chromium, Total	0.0007	J	mg/l	0.0010	0.0002	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Copper, Total	ND		mg/l	0.0010	0.0004	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Iron, Total	0.054		mg/l	0.050	0.009	1	08/31/18 09:30	08/31/18 16:59	EPA 3005A	19,200.7	AB
Lead, Total	ND		mg/l	0.0010	0.0003	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Magnesium, Total	6.02		mg/l	0.100	0.015	1	08/31/18 09:30	08/31/18 16:59	EPA 3005A	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/31/18 09:30	08/31/18 16:59	EPA 3005A	19,200.7	AB
Mercury, Total	ND		mg/l	0.0002	0.0001	1	08/28/18 15:21	08/30/18 19:24	EPA 245.1	3,245.1	EA
Nickel, Total	ND		mg/l	0.0020	0.0006	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Potassium, Total	3.59		mg/l	2.50	0.237	1	08/31/18 09:30	08/31/18 16:59	EPA 3005A	19,200.7	AB
Selenium, Total	ND		mg/l	0.0050	0.0017	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Silver, Total	ND		mg/l	0.0004	0.0002	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Sodium, Total	77.6		mg/l	2.00	0.120	1	08/31/18 09:30	08/31/18 16:59	EPA 3005A	19,200.7	AB
Thallium, Total	0.0004	J	mg/l	0.0010	0.0001	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Zinc, Total	ND		mg/l	0.0100	0.0034	1	09/05/18 09:15	09/05/18 13:36	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	167		mg/l	0.660	NA	1	09/05/18 09:15	09/05/18 22:45	EPA 3005A	19,200.7	AB
Dissolved Metals - Mansfield Lab											
Iron, Dissolved	0.021	J	mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 02:15	EPA 3005A	19,200.7	AB
Manganese, Dissolved	0.002	J	mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 02:15	EPA 3005A	19,200.7	AB

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 05 Batch: WG1151457-1										
Mercury, Total	ND		mg/l	0.0002	0.0001	1	08/28/18 15:21	08/30/18 18:45	3,245.1	EA

Prep Information

Digestion Method: EPA 245.1

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Dissolved Metals - Mansfield Lab for sample(s): 05 Batch: WG1151752-1										
Iron, Dissolved	ND		mg/l	0.050	0.009	1	08/29/18 12:25	08/31/18 00:29	19,200.7	AB
Manganese, Dissolved	ND		mg/l	0.010	0.002	1	08/29/18 12:25	08/31/18 00:29	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 05 Batch: WG1152534-1										
Aluminum, Total	ND		mg/l	0.100	0.032	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB
Calcium, Total	ND		mg/l	0.100	0.035	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB
Iron, Total	ND		mg/l	0.050	0.009	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB
Magnesium, Total	ND		mg/l	0.100	0.015	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB
Manganese, Total	ND		mg/l	0.010	0.002	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB
Potassium, Total	ND		mg/l	2.50	0.237	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB
Sodium, Total	ND		mg/l	2.00	0.120	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Hardness by SM 2340B - Mansfield Lab for sample(s): 05 Batch: WG1152534-1										
Hardness	ND		mg/l	0.660	NA	1	08/31/18 09:30	08/31/18 14:52	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 05 Batch: WG1153647-1										
Antimony, Total	ND		mg/l	0.0040	0.0004	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Arsenic, Total	ND		mg/l	0.0010	0.0002	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Barium, Total	0.0002	J	mg/l	0.0010	0.0002	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Beryllium, Total	ND		mg/l	0.0010	0.0001	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Cadmium, Total	ND		mg/l	0.0002	0.0001	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Chromium, Total	ND		mg/l	0.0010	0.0002	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Copper, Total	ND		mg/l	0.0010	0.0004	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Lead, Total	ND		mg/l	0.0010	0.0003	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Nickel, Total	ND		mg/l	0.0020	0.0006	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Selenium, Total	ND		mg/l	0.0050	0.0017	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Silver, Total	ND		mg/l	0.0004	0.0002	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Thallium, Total	0.0004	J	mg/l	0.0010	0.0001	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM
Zinc, Total	ND		mg/l	0.0100	0.0034	1	09/05/18 09:15	09/05/18 12:57	3,200.8	AM

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 05 Batch: WG1153648-1										
Iron, Total	ND		mg/l	0.050	0.009	1	09/05/18 09:15	09/05/18 21:41	19,200.7	AB
Sodium, Total	ND		mg/l	2.00	0.120	1	09/05/18 09:15	09/05/18 21:41	19,200.7	AB

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Hardness by SM 2340B - Mansfield Lab for sample(s): 05 Batch: WG1153648-1										
Hardness	ND		mg/l	0.660	NA	1	09/05/18 09:15	09/05/18 21:41	19,200.7	AB

Prep Information

Digestion Method: EPA 3005A

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 05 Batch: WG1151457-2								
Mercury, Total	107		-		85-115	-		
Dissolved Metals - Mansfield Lab Associated sample(s): 05 Batch: WG1151752-2								
Iron, Dissolved	100		-		85-115	-		
Manganese, Dissolved	96		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 05 Batch: WG1152534-2								
Aluminum, Total	100		-		85-115	-		
Calcium, Total	101		-		85-115	-		
Iron, Total	101		-		85-115	-		
Magnesium, Total	98		-		85-115	-		
Manganese, Total	91		-		85-115	-		
Potassium, Total	100		-		85-115	-		
Sodium, Total	99		-		85-115	-		
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 05 Batch: WG1152534-2								
Hardness	99		-		85-115	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 05 Batch: WG1153647-2					
Antimony, Total	100	-	85-115	-	
Arsenic, Total	103	-	85-115	-	
Barium, Total	98	-	85-115	-	
Beryllium, Total	102	-	85-115	-	
Cadmium, Total	108	-	85-115	-	
Chromium, Total	99	-	85-115	-	
Copper, Total	99	-	85-115	-	
Lead, Total	102	-	85-115	-	
Nickel, Total	102	-	85-115	-	
Selenium, Total	106	-	85-115	-	
Silver, Total	101	-	85-115	-	
Thallium, Total	101	-	85-115	-	
Zinc, Total	109	-	85-115	-	
Total Metals - Mansfield Lab Associated sample(s): 05 Batch: WG1153648-2					
Iron, Total	104	-	85-115	-	
Sodium, Total	108	-	85-115	-	
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 05 Batch: WG1153648-2					
Hardness	103	-	85-115	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1151457-3 QC Sample: L1833475-01 Client ID: MS Sample												
Mercury, Total	ND	0.005	0.0052	103		-	-		70-130	-		20
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1151457-5 QC Sample: L1833475-02 Client ID: MS Sample												
Mercury, Total	ND	0.005	0.0050	101		-	-		70-130	-		20
Dissolved Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1151752-3 QC Sample: L1833313-01 Client ID: MS Sample												
Iron, Dissolved	0.020J	1	1.03	103		-	-		75-125	-		20
Manganese, Dissolved	ND	0.5	0.488	98		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1152534-3 QC Sample: L1834122-01 Client ID: MS Sample												
Aluminum, Total	3.49	2	5.44	98		-	-		75-125	-		20
Calcium, Total	22.1	10	31.9	98		-	-		75-125	-		20
Iron, Total	0.828	1	1.78	95		-	-		75-125	-		20
Magnesium, Total	1.63	10	10.7	91		-	-		75-125	-		20
Manganese, Total	0.019	0.5	0.484	93		-	-		75-125	-		20
Potassium, Total	90.7	10	98.8	81		-	-		75-125	-		20
Sodium, Total	497.	10	492	**0**	Q	-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1152534-3 QC Sample: L1834122-01 Client ID: MS Sample												
Hardness	61.9	66.2	124	94		-	-		75-125	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery		MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1152534-7 QC Sample: L1834122-02 Client ID: MS Sample										
Aluminum, Total	0.174	2	2.19	101		-	-	75-125	-	20
Calcium, Total	52.4	10	61.2	88		-	-	75-125	-	20
Iron, Total	0.278	1	1.30	102		-	-	75-125	-	20
Magnesium, Total	4.33	10	13.4	91		-	-	75-125	-	20
Manganese, Total	0.096	0.5	0.548	90		-	-	75-125	-	20
Potassium, Total	73.2	10	81.2	80		-	-	75-125	-	20
Sodium, Total	360.	10	361	**10**	Q	-	-	75-125	-	20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1152534-7 QC Sample: L1834122-02 Client ID: MS Sample										
Hardness	149.	66.2	208	89		-	-	75-125	-	20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1153647-3 QC Sample: L1833299-01 Client ID: MS Sample									
Antimony, Total	0.0007J	0.5	0.5320	106	-	-	70-130	-	20
Arsenic, Total	ND	0.12	0.1311	109	-	-	70-130	-	20
Barium, Total	0.0783	2	2.110	102	-	-	70-130	-	20
Beryllium, Total	ND	0.05	0.0520	104	-	-	70-130	-	20
Cadmium, Total	ND	0.051	0.0571	112	-	-	70-130	-	20
Chromium, Total	0.0077	0.2	0.2128	102	-	-	70-130	-	20
Copper, Total	0.1601	0.25	0.4154	102	-	-	70-130	-	20
Lead, Total	0.0043	0.51	0.5421	105	-	-	70-130	-	20
Nickel, Total	0.0126	0.5	0.5248	102	-	-	70-130	-	20
Selenium, Total	ND	0.12	0.1379	115	-	-	70-130	-	20
Silver, Total	ND	0.05	0.0508	102	-	-	70-130	-	20
Thallium, Total	0.0004J	0.12	0.1251	104	-	-	70-130	-	20
Zinc, Total	0.2254	0.5	0.8056	116	-	-	70-130	-	20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery		MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1153647-5 WG1153647-6 QC Sample: L1834286-01 Client ID: MS Sample										
Antimony, Total	ND	0.5	0.5166	103		0.5153	103	70-130	0	20
Arsenic, Total	ND	0.12	0.1305	109		0.1267	106	70-130	3	20
Barium, Total	0.0292	2	2.003	99		1.992	98	70-130	1	20
Beryllium, Total	ND	0.05	0.0506	101		0.0509	102	70-130	1	20
Cadmium, Total	ND	0.051	0.0558	109		0.0553	108	70-130	1	20
Chromium, Total	0.0005J	0.2	0.2003	100		0.1988	99	70-130	1	20
Copper, Total	0.1157	0.25	0.3622	99		0.3576	97	70-130	1	20
Lead, Total	0.0079	0.51	0.5359	104		0.5236	101	70-130	2	20
Nickel, Total	0.0016J	0.5	0.5080	102		0.5098	102	70-130	0	20
Selenium, Total	ND	0.12	0.1361	113		0.1364	114	70-130	0	20
Silver, Total	ND	0.05	0.0507	101		0.0502	100	70-130	1	20
Thallium, Total	0.0004J	0.12	0.1241	103		0.1217	101	70-130	2	20
Zinc, Total	0.0769	0.5	0.6283	110		0.6268	110	70-130	0	20
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1153648-3 QC Sample: L1833299-01 Client ID: MS Sample										
Iron, Total	4.83	1	5.60	77		-	-	75-125	-	20
Sodium, Total	250.	10	254	**40**	Q	-	-	75-125	-	20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1153648-3 QC Sample: L1833299-01 Client ID: MS Sample										
Hardness	98.4	66.2	159	92		-	-	75-125	-	20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1153648-7 WG1153648-8 QC Sample: L1834286-01 Client ID: MS Sample									
Iron, Total	0.448	1	1.47	102	1.52	107	75-125	3	20
Sodium, Total	9.50	10	19.7	102	20.1	106	75-125	2	20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1153648-7 WG1153648-8 QC Sample: L1834286-01 Client ID: MS Sample									
Hardness	59.1	66.2	122	95	125	100	75-125	2	20

Lab Duplicate Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1151457-4 QC Sample: L1833475-01 Client ID: DUP Sample						
Mercury, Total	ND	ND	mg/l	NC		20
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1151457-6 QC Sample: L1833475-02 Client ID: DUP Sample						
Mercury, Total	ND	ND	mg/l	NC		20
Dissolved Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1151752-4 QC Sample: L1833313-01 Client ID: DUP Sample						
Iron, Dissolved	0.020J	0.016J	mg/l	NC		20
Manganese, Dissolved	ND	ND	mg/l	NC		20
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1152534-4 QC Sample: L1834122-01 Client ID: DUP Sample						
Iron, Total	0.828	0.765	mg/l	8		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1152534-4 QC Sample: L1834122-01 Client ID: DUP Sample						
Hardness	61.9	60.3	mg/l	3		20
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1152534-8 QC Sample: L1834122-02 Client ID: DUP Sample						
Iron, Total	0.278	0.272	mg/l	2		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1152534-8 QC Sample: L1834122-02 Client ID: DUP Sample						
Hardness	149.	149	mg/l	0		20
Total Metals - Mansfield Lab Associated sample(s): 05 QC Batch ID: WG1153648-4 QC Sample: L1833299-01 Client ID: DUP Sample						
Iron, Total	4.83	4.73	mg/l	2		20

INORGANICS
&
MISCELLANEOUS

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-01
Client ID: FINAL TW-14
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:00
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Coliform, Fecal (MF)	6.0		col/100ml	1.0	NA	1	-	08/27/18 20:10	121,9222D	AJ
Bacteria in Water - Westborough Lab										
Coliform, Total	Positive		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-02
Client ID: FINAL TW-16
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:10
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Coliform, Fecal (MF)	ND		col/100ml	1.0	NA	1	-	08/27/18 20:10	121,9222D	AJ
Bacteria in Water - Westborough Lab										
Coliform, Total	Positive		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-03
Client ID: FINAL TW-13
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:20
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Coliform, Fecal (MF)	ND		col/100ml	1.0	NA	1	-	08/27/18 20:10	121,9222D	AJ
Bacteria in Water - Westborough Lab										
Coliform, Total	Positive		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-04
Client ID: FINAL TW-15
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 09:30
Date Received: 08/27/18
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Coliform, Fecal (MF)	5.0		col/100ml	1.0	NA	1	-	08/27/18 20:10	121,9222D	AJ
Bacteria in Water - Westborough Lab										
Coliform, Total	Negative		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

SAMPLE RESULTS

Lab ID: L1833725-05
Client ID: FINAL DAY ALL WELLS
Sample Location: IPSWICH, MA

Date Collected: 08/27/18 10:00
Date Received: 08/27/18
Field Prep: Refer to COC

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Perchlorate by IC-MS-MS - Westborough Lab										
Perchlorate	0.531		ug/l	0.050	0.013	1	-	08/30/18 03:09	71,332.0	SL
General Chemistry - Westborough Lab										
Odor @ 60 C	NO ODOR		TON	1	1.0	1	-	08/27/18 19:43	121,2150B	AS
Color, Apparent	ND		A.P.C.U.	5.0	5.0	1	-	08/27/18 21:00	121,2120B	AS
Alkalinity, Total	149.		mg CaCO3/L	2.00	NA	1	-	08/29/18 09:38	121,2320B	BR
Specific Conductance @ 25 C	640		umhos/cm	10	10.	1	-	08/27/18 22:17	121,2510B	AS
Solids, Total Dissolved	370		mg/l	10	3.1	1	-	08/28/18 10:10	121,2540C	DR
Cyanide, Total	ND		mg/l	0.005	0.001	1	08/28/18 12:40	08/28/18 15:26	121,4500CN-CE	LH
Fluoride	0.07	J	mg/l	0.20	0.02	1	-	09/05/18 04:00	121,4500F-C	SB
pH (H)	7.6		SU	-	NA	1	-	08/27/18 21:04	121,4500H+-B	AS
Nitrogen, Ammonia	ND		mg/l	0.075	0.024	1	08/29/18 14:32	08/29/18 21:56	44,350.1	AT
Nitrogen, Nitrite	ND		mg/l	0.050	0.014	1	-	08/28/18 19:21	44,353.2	MR
Nitrogen, Nitrate	5.6		mg/l	0.10	0.033	1	-	08/28/18 19:21	44,353.2	MR
Phosphorus, Total	ND		mg/l	0.010	0.003	1	08/30/18 12:15	08/31/18 09:30	121,4500P-E	SD
Total Organic Carbon	1.14		mg/l	0.500	0.114	1	-	08/28/18 09:08	121,5310C	DW
Oxidation/Reduction Potential	200		mv	-	NA	1	-	08/27/18 19:49	12,1498	AS
Anions by Ion Chromatography - Westborough Lab										
Chloride	96.4		mg/l	2.50	0.420	5	-	08/27/18 21:49	44,300.0	JR
Sulfate	21.2		mg/l	1.00	0.160	1	-	08/27/18 20:25	44,300.0	JR

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1151119-1										
Odor	NO ODOR		TON	1	1.0	1	-	08/27/18 19:43	121,2150B	AS
Microbiological Analysis - Westborough Lab for sample(s): 01-04 Batch: WG1151133-1										
Coliform, Fecal (MF)	ND		col/100ml	1.0	NA	1	-	08/27/18 20:10	121,9222D	AJ
Bacteria in Water - Westborough Lab for sample(s): 01-04 Batch: WG1151135-1										
Coliform, Total	Negative		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ
Escherichia Coli	Negative		col/100ml	-	NA	1	-	08/27/18 20:20	121,9223B	AJ
Anions by Ion Chromatography - Westborough Lab for sample(s): 05 Batch: WG1151168-1										
Sulfate	0.405	J	mg/l	1.00	0.160	1	-	08/27/18 16:37	44,300.0	JR
Anions by Ion Chromatography - Westborough Lab for sample(s): 05 Batch: WG1151168-1										
Chloride	ND		mg/l	0.500	0.083	1	-	08/27/18 16:37	44,300.0	JR
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1151209-1										
Total Organic Carbon	ND		mg/l	0.500	0.114	1	-	08/28/18 09:08	121,5310C	DW
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1151256-1										
Solids, Total Dissolved	ND		mg/l	10	3.1	1	-	08/28/18 10:10	121,2540C	DR
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1151390-1										
Cyanide, Total	ND		mg/l	0.005	0.001	1	08/28/18 12:40	08/28/18 14:58	121,4500CN-CE	LH
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1151494-1										
Nitrogen, Nitrate	ND		mg/l	0.10	0.033	1	-	08/28/18 19:05	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1151496-1										
Nitrogen, Nitrite	ND		mg/l	0.050	0.014	1	-	08/28/18 19:11	44,353.2	MR
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1151687-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.024	1	08/29/18 14:32	08/29/18 21:40	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1151688-1										
Alkalinity, Total	ND		mg CaCO3/L	2.00	NA	1	-	08/29/18 09:38	121,2320B	BR
Perchlorate by IC-MS-MS - Westborough Lab for sample(s): 05 Batch: WG1151899-1										
Perchlorate	ND		ug/l	0.050	0.013	1	-	08/30/18 00:46	71,332.0	SL
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1152145-1										
Phosphorus, Total	ND		mg/l	0.010	0.003	1	08/30/18 12:15	08/31/18 09:13	121,4500P-E	SD

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725

Project Number: 60567459 **Report Date:** 11/01/18

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 05 Batch: WG1153574-1										
Fluoride	ND		mg/l	0.20	0.02	1	-	09/05/18 04:00	121,4500F-C	SB

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151118-1								
Oxidation/Reduction Potential	101		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151124-1								
pH	100		-		99-101	-		5
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151141-1								
Specific Conductance	100		-		99-101	-		
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 05 Batch: WG1151168-2								
Chloride	100		-		90-110	-		
Sulfate	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151209-2								
Total Organic Carbon	99		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151256-2								
Solids, Total Dissolved	103		-		80-120	-		
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151390-2								
Cyanide, Total	100		-		90-110	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151494-2					
Nitrogen, Nitrate	104	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151496-2					
Nitrogen, Nitrite	106	-	90-110	-	20
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151687-2					
Nitrogen, Ammonia	106	-	90-110	-	20
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1151688-2					
Alkalinity, Total	100	-	90-110	-	10
Perchlorate by IC-MS-MS - Westborough Lab Associated sample(s): 05 Batch: WG1151899-2					
Perchlorate	108	-	80-120	-	20
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1152145-2					
Phosphorus, Total	99	-	80-120	-	
General Chemistry - Westborough Lab Associated sample(s): 05 Batch: WG1153574-2					
Fluoride	97	-	78-115	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151168-3 QC Sample: L1833490-01 Client ID: MS Sample												
Chloride	10400	1000	10900	**54**	Q	-	-		90-110	-		18
Sulfate	5730	2000	7760	102		-	-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151209-4 QC Sample: L1832757-01 Client ID: MS Sample												
Total Organic Carbon	13.8	80	89.8	95		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151390-4 QC Sample: L1833711-02 Client ID: MS Sample												
Cyanide, Total	0.066	0.2	0.249	91		-	-		90-110	-		30
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151494-4 QC Sample: L1833692-01 Client ID: MS Sample												
Nitrogen, Nitrate	0.63	4	4.2	89		-	-		83-113	-		6
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151496-4 QC Sample: L1833692-01 Client ID: MS Sample												
Nitrogen, Nitrite	0.042J	4	4.3	108		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151687-4 QC Sample: L1834023-02 Client ID: MS Sample												
Nitrogen, Ammonia	6.11	4	10.2	102		-	-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151688-4 QC Sample: L1834023-02 Client ID: MS Sample												
Alkalinity, Total	490.	100	590	100		-	-		86-116	-		10
Perchlorate by IC-MS-MS - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151899-3 QC Sample: L1833712-01 Client ID: MS Sample												
Perchlorate	6.06	1	7.23	117		-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1152145-3 QC Sample: L1833605-01 Client ID: MS Sample												
Phosphorus, Total	0.012	0.5	0.515	101		-	-		75-125	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1153574-4 QC Sample: L1833725-05 Client ID: FINAL DAY ALL WELLS									
Fluoride	0.07J	1	1.0	101	-	-	69-124	-	13

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1833725

Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151118-2 QC Sample: L1833725-05 Client ID: FINAL DAY ALL WELLS						
Oxidation/Reduction Potential	200	200	mv	0		20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151119-2 QC Sample: L1833725-05 Client ID: FINAL DAY ALL WELLS						
Odor	NO ODOR	NO ODOR	TON	NC		
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151123-1 QC Sample: L1833725-05 Client ID: FINAL DAY ALL WELLS						
Color, Apparent	ND	ND	A.P.C.U.	NC		
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151124-2 QC Sample: L1833725-05 Client ID: FINAL DAY ALL WELLS						
pH (H)	7.6	7.6	SU	0		5
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151141-2 QC Sample: L1833725-05 Client ID: FINAL DAY ALL WELLS						
Specific Conductance @ 25 C	640	650	umhos/cm	2		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151168-4 QC Sample: L1833490-01 Client ID: DUP Sample						
Chloride	10400	10000	mg/l	3		18
Sulfate	5730	5790	mg/l	1		20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151209-3 QC Sample: L1832757-01 Client ID: DUP Sample						
Total Organic Carbon	13.8	14.1	mg/l	2		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: LYNCH NEW SOURCE

Project Number: 60567459

Lab Number: L1833725

Report Date: 11/01/18

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151256-3 QC Sample: L1833490-01 Client ID: DUP Sample					
Solids, Total Dissolved	21000	21000	mg/l	0	10
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151390-3 QC Sample: L1833711-01 Client ID: DUP Sample					
Cyanide, Total	ND	ND	mg/l	NC	30
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151494-3 QC Sample: L1833692-01 Client ID: DUP Sample					
Nitrogen, Nitrate	0.63	0.62	mg/l	2	6
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151496-3 QC Sample: L1833692-01 Client ID: DUP Sample					
Nitrogen, Nitrite	0.042J	0.032J	mg/l	NC	20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151687-3 QC Sample: L1834023-02 Client ID: DUP Sample					
Nitrogen, Ammonia	6.11	6.28	mg/l	3	20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151688-3 QC Sample: L1834023-02 Client ID: DUP Sample					
Alkalinity, Total	490.	493	mg CaCO3/L	1	10
Perchlorate by IC-MS-MS - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1151899-4 QC Sample: L1833712-01 Client ID: DUP Sample					
Perchlorate	6.06	6.07	ug/l	0	20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1152145-4 QC Sample: L1833605-01 Client ID: DUP Sample					
Phosphorus, Total	0.012	0.013	mg/l	8	20
General Chemistry - Westborough Lab Associated sample(s): 05 QC Batch ID: WG1153574-3 QC Sample: L1833725-05 Client ID: FINAL DAY ALL WELLS					
Fluoride	0.07J	0.06J	mg/l	NC	13

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1833725-01A	Vial Ascorbic Acid/HCl preserved	A	NA		4.0	Y	Absent		524.2(14)
L1833725-01B	Vial Ascorbic Acid/HCl preserved	A	NA		4.0	Y	Absent		524.2(14)
L1833725-01C	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		T-COLI-C(1.25)
L1833725-01D	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		T-COLI-C(1.25)
L1833725-01E	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		F-COLI-MF(.33)
L1833725-01F	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		F-COLI-MF(.33)
L1833725-02A	Vial Ascorbic Acid/HCl preserved	A	NA		4.0	Y	Absent		524.2(14)
L1833725-02B	Vial Ascorbic Acid/HCl preserved	A	NA		4.0	Y	Absent		524.2(14)
L1833725-02C	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		T-COLI-C(1.25)
L1833725-02D	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		T-COLI-C(1.25)
L1833725-02E	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		F-COLI-MF(.33)
L1833725-02F	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		F-COLI-MF(.33)
L1833725-03A	Vial Ascorbic Acid/HCl preserved	A	NA		4.0	Y	Absent		524.2(14)
L1833725-03B	Vial Ascorbic Acid/HCl preserved	A	NA		4.0	Y	Absent		524.2(14)
L1833725-03C	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		T-COLI-C(1.25)
L1833725-03D	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		T-COLI-C(1.25)
L1833725-03E	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		F-COLI-MF(.33)
L1833725-03F	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		F-COLI-MF(.33)
L1833725-04A	Vial Ascorbic Acid/HCl preserved	A	NA		4.0	Y	Absent		524.2(14)
L1833725-04B	Vial Ascorbic Acid/HCl preserved	A	NA		4.0	Y	Absent		524.2(14)
L1833725-04C	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		T-COLI-C(1.25)
L1833725-04D	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		T-COLI-C(1.25)

*Values in parentheses indicate holding time in days

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1833725-04E	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		F-COLI-MF(.33)
L1833725-04F	Bacteria Cup Na2S2O3 preserved	B	NA		3.7	Y	Absent		F-COLI-MF(.33)
L1833725-05A	Vial H2SO4 preserved	A	NA		4.0	Y	Absent		TOC-5310(28)
L1833725-05B	Vial H2SO4 preserved	A	NA		4.0	Y	Absent		TOC-5310(28)
L1833725-05C	Vial Na2S2O3 preserved	A	NA		4.0	Y	Absent		SUB-515.3(14)
L1833725-05D	Vial Na2S2O3 preserved	A	NA		4.0	Y	Absent		SUB-515.3(14)
L1833725-05E	Vial Na2S2O3 preserved	A	NA		4.0	Y	Absent		SUB-515.3(14)
L1833725-05F	Vial Na2S2O3 preserved	A	NA		4.0	Y	Absent		SUB-505(14),SUB-504.1(14)
L1833725-05G	Vial Na2S2O3 preserved	A	NA		4.0	Y	Absent		SUB-505(14),SUB-504.1(14)
L1833725-05H	Vial Na2S2O3 preserved	A	NA		4.0	Y	Absent		SUB-505(14),SUB-504.1(14)
L1833725-05J	Vial MCAA/Na2S2O3 preserved	A	NA		4.0	Y	Absent		SUB-531.1(28)
L1833725-05J1	Vial Na2S2O3 preserved	A	NA		4.0	Y	Absent		SUB-531.1(28)
L1833725-05K	Vial unpreserved	A	NA		4.0	Y	Absent		SUB-RADON(4)
L1833725-05L	Vial unpreserved	A	NA		4.0	Y	Absent		SUB-RADON(4)
L1833725-05M	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		SUB-RA228(180),SUB-ALPHA/BETA(180),SUB-RA226(180)
L1833725-05M1	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		SUB-RA228(180),SUB-ALPHA/BETA(180),SUB-RA226(180)
L1833725-05M2	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		SUB-RA228(180),SUB-ALPHA/BETA(180),SUB-RA226(180)
L1833725-05M3	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		SUB-RA228(180),SUB-ALPHA/BETA(180),SUB-RA226(180)
L1833725-05M4	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		SUB-RA228(180),SUB-ALPHA/BETA(180),SUB-RA226(180)
L1833725-05M5	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		SUB-RA228(180),SUB-ALPHA/BETA(180),SUB-RA226(180)
L1833725-05M6	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		SUB-RA228(180),SUB-ALPHA/BETA(180),SUB-RA226(180)
L1833725-05M7	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		SUB-RA228(180),SUB-ALPHA/BETA(180),SUB-RA226(180)
L1833725-05N	Amber 1000ml NaSulfite/HCL preserved	A	<2	<2	4.0	Y	Absent		SUB-525.2(14)
L1833725-05N1	Amber 1000ml NaSulfite/HCL preserved	A	<2	<2	4.0	Y	Absent		SUB-525.2(14)
L1833725-05P	Plastic 250ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		FE-RI(180),MN-RI(180)

*Values in parentheses indicate holding time in days

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833725
Report Date: 11/01/18

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1833725-05Q	Plastic 250ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		CD-2008T(180),CA-UI(180),NI-2008T(180),BE-2008T(180),K-UI(180),ZN-2008T(180),CU-2008T(180),FE-UI(180),HARDU(180),MG-UI(180),AG-2008T(180),AS-2008T(180),HG-U(28),SE-2008T(180),AL-UI(180),BA-2008T(180),MN-UI(180),NA-UI(180),CR-2008T(180),PB-2008T(180),SB-2008T(180),TL-2008T(180)
L1833725-05Q1	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		CD-2008T(180),CA-UI(180),NI-2008T(180),BE-2008T(180),K-UI(180),ZN-2008T(180),CU-2008T(180),FE-UI(180),HARDU(180),MG-UI(180),AG-2008T(180),AS-2008T(180),HG-U(28),SE-2008T(180),AL-UI(180),BA-2008T(180),MN-UI(180),NA-UI(180),CR-2008T(180),PB-2008T(180),SB-2008T(180),TL-2008T(180)
L1833725-05Q2	Plastic 950ml HNO3 preserved	A	<2	<2	4.0	Y	Absent		CD-2008T(180),CA-UI(180),NI-2008T(180),BE-2008T(180),K-UI(180),ZN-2008T(180),CU-2008T(180),FE-UI(180),HARDU(180),MG-UI(180),AG-2008T(180),AS-2008T(180),HG-U(28),SE-2008T(180),AL-UI(180),BA-2008T(180),MN-UI(180),NA-UI(180),CR-2008T(180),PB-2008T(180),SB-2008T(180),TL-2008T(180)
L1833725-05R	Plastic 250ml unpreserved/No Headspace	A	NA		4.0	Y	Absent		ALK-T-2320(14)
L1833725-05S	Plastic 950ml unpreserved	A	7	7	4.0	Y	Absent		F-4500(28),SO4-300(28),CL-300(28),ORP(1),NO2-353(2),COND-2510(1),NO3-353(2),PH-4500(.01),TDS-2540(7)
L1833725-05T	Amber 1000ml unpreserved	A	7	7	4.0	Y	Absent		COLOR-A-2120(2),ODOR-2150(1)
L1833725-05U	Plastic 250ml H2SO4 preserved	A	<2	<2	4.0	Y	Absent		TPHOS-4500(28),NH3-350(28)
L1833725-05V	Bacteria Cup unpreserved	A	NA		4.0	Y	Absent		PERC-332(28)
L1833725-05W	Plastic 250ml NaOH preserved	A	>12	>12	4.0	Y	Absent		TCN-4500(14)

*Values in parentheses indicate holding time in days

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833725
Project Number:	60567459	**Report Date:**	11/01/18

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Report Format: DU Report with 'J' Qualifiers

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833725
Project Number:	60567459	**Report Date:**	11/01/18

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

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

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

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

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

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833725
Project Number: 60567459 **Report Date:** 11/01/18

REFERENCES

3 Methods for the Determination of Metals in Environmental Samples, Supplement I. EPA/600/R-94/111. May 1994.

12 Annual Book of ASTM Standards. (American Society for Testing and Materials) ASTM International.

16 Methods for the Determination of Organic Compounds in Drinking Water - Supplement II. EPA/600/R-92/129, August 1992.

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

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

71 Determination of Perchlorate in Drinking Water by Ion Chromatography with Suppressed Conductivity and Electrospray Ionization Mass Spectrometry. EPA Method 332.0, EPA/600/R-05/049. Revision 1.0, March 2005.

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

LIMITATION OF LIABILITIES

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

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

Certification Information

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

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.

EPA 6860: SCM: Perchlorate

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

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

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

Westborough Facility:

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

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

Mansfield Facility:

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

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

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

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 08/27/18

ALPHA Job #: L1833725

ALPHA TECHNICAL
8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Client Information

Client: AECOM
Address: 250 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-2000
Email: erika.amir-lin@aecom.com
doug.denatale@aecom.com

Project Information

Project Name: Lynch New Source
Project Location: Ipswich, MA
Project #: 60567459
Project Manager: Doug DeNatale
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

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

Additional Project Information:
TOTAL Metals: Al, Ca, Cu, Fe, Mn, Mg, K, Na, Ag, Zn, As, Sb, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Tl.

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC: ☐ 8260 ☐ 624 ☒ 524.2	~~SVOC: ☐ ABN~~	~~METALS: ☐ MCP 12~~	METALS: ☐ RCRA ☐ RCP-15	T-Coli, F-Coli ☐ RCP16 ☐ PP13	EPH: ~~☐ Ranges & Targets~~ ☐ Ranges Only	TDS	VPH: ~~☐ Ranges & Targets~~ ☐ Ranges Only	~~☐ PCB~~	TPH: ~~☐ Quant Only~~ ☐ Fingerprint	NH3, Phos	Alkalinity	TCN	Color, odor	cond, pH, TDS, SO4, Tuab, Cl, NO3, ORP, F, NO2	Total Metals (see notes)	Dissolved Metals (Fe, Mn)	Sample Comments	TOTAL # BOTTLES
33725-01	Final TW-14	08/27/18	0900	DW	EAL	X			X															6
02	Final TW-14	08/27/18	0910	DW	EAL	X			X															6
03	Final TW-13	08/27/18	0920	DW	EAL	X			X															6
04	Final TW-15	08/27/18	0930	DW	EAL	X			X															6
05	Final Day All Wells	08/27/18	1000	DW	EAL	X	X	X		X	X	X	X	X	X	X	X	X	X					32

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

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

Container Type	V	V,A	B	B	V	V	P	P	P	P	A	P	P	P
Preservative	B,I	G,I	A	H	D	A	C	D	A	E	A	A	C	C

$56

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	08/27/18 1305	[signature] AAL	8/27/18 13:05
[signature] AAL	8/27/18 17:15		8/27/18 17:15

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

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

Subcontract Chain of Custody

Hazen Research
4601 Indiana Street
Golden, CO 80403

Alpha Job Number
L1833725

Client Information

Client: Alpha Analytical Labs
Address: Eight Walkup Drive
Westborough, MA 01581-1019

Phone: 508.439.5186
Email: kraymond@alphalab.com

Project Information

Project Location: MA
Project Manager: Karyn Raymond

Turnaround & Deliverables Information

Due Date:
Deliverables:

Regulatory Requirements/Report Limits

State/Federal Program:

Regulatory Criteria:

Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L1833725

Report to include Method Blank, LCS/LCSD:

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

Lab ID	Client ID	Collection Date/Time	Sample Matrix	Analysis	Batch QC
	FINAL DAY ALL WELLS	08-27-18 10:00	DW	Radium 226; Radium 228; Radon	

Relinquished By:	Date/Time:	Received By:	Date/Time:
	8/28/18		

Form No: AL_subcoc

Subcontract Chain of Custody

Hazen Research
4601 Indiana Street
Golden, CO 80403

Alpha Job Number
L1833725

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

Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L1833725

Report to include Method Blank, LCS/LCSD:

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

Lab ID	Client ID	Collection Date/Time	Sample Matrix	Analysis	Batch QC
	FINAL DAY ALL WELLS	08-27-18 10:00	DW	Radium 226; Radium 228; Radon	

	Relinquished By:	Date/Time:	Received By:	Date/Time:
Form No: AL_subcoc				

Subcontract Chain of Custody

Granite State Analytical Services LLC
22 Manchester Rd
Derry, NH 03038

Alpha Job Number
L1833725

Client Information

Client: Alpha Analytical Labs
Address: Eight Walkup Drive
Westborough, MA 01581-1019

Phone: 508.439.5186
Email: kraymond@alphalab.com

Project Information

Project Location: MA
Project Manager: Karyn Raymond

Turnaround & Deliverables Information

Due Date:
Deliverables:

Regulatory Requirements/Report Limits

State/Federal Program:

Regulatory Criteria:

Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L1833725

Report to include Method Blank, LCS/LCSD:

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

Lab ID	Client ID	Collection Date/Time	Sample Matrix	Analysis	Batch QC
	FINAL DAY ALL WELLS	08-27-18 10:00	DW	EPA 504.1; PCB/Chlor/Tox - EPA 505; Chlor. Acids - EPA 515.3; Pesticides - EPA 525.2; Carbamates - EPA 531.1; Synthetic Organics (SOCs)	

Relinquished By:	Date/Time:	Received By:	Date/Time:

Form No: AL_subcoc

GRANITE STATE ANALYTICAL SERVICES, LLC
22 Manchester Road, Unit 2, Derry, NH 03038
Phone (800) 699-9920 (603) 432-3044 Fax (603) 434-4837
http://www.granitestateanalytical.com/

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE PRINTED: 09/07/2018
CLIENT NAME: Alpha Analytical
CLIENT ADDRESS: 8 Walkup Dr.
Westborough, MA 01581
SAMPLE ID#: 1808-03800-001
SAMPLED BY: Alpha Analytical
SAMPLE ADDRESS: L1833725
Final Day All Wells
MA
MORE LOC INFO:

DATE AND TIME COLLECTED: 08/27/2018 10:00AM
DATE AND TIME RECEIVED: 08/28/2018 11:50AM
ANALYSIS PACKAGE: SOC GSA MA
RECEIPT TEMPERATURE: ON ICE 6.0° CELSIUS
CLIENT JOB #

Test Description	Results	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date-Time Analyzed
1,2-Dibromo-3-chloropropane (DBCP)*	<0.02	ug/L	✓		0.02	0.2 ug/L	EPA 504.1	KV-NH	08/30/18 12:45AM
Date Extracted	-					No Limit	EPA 504.1	JG-NH	08/29/18 9:00AM
Ethylene Dibromide (EDB)*	<0.02	ug/L	✓		0.02	0.05 ug/L	EPA 504.1	KV-NH	08/30/18 12:45AM
Aroclor 1016 Screen*	<0.2	ug/L			0.2	No Limit	EPA 505	KV-NH	08/30/18 7:54AM
Aroclor 1221 Screen*	<0.2	ug/L			0.2	No Limit	EPA 505	KV-NH	08/30/18 7:54AM
Aroclor 1232 Screen*	<0.2	ug/L			0.2	No Limit	EPA 505	KV-NH	08/30/18 7:54AM
Aroclor 1242 Screen*	<0.2	ug/L			0.2	No Limit	EPA 505	KV-NH	08/30/18 7:54AM
Aroclor 1248 Screen*	<0.2	ug/L			0.2	No Limit	EPA 505	KV-NH	08/30/18 7:54AM
Aroclor 1254 Screen*	<0.2	ug/L			0.2	No Limit	EPA 505	KV-NH	08/30/18 7:54AM
Aroclor 1260 Screen*	<0.2	ug/L			0.2	No Limit	EPA 505	KV-NH	08/30/18 7:54AM
Chlordane*	<0.2	ug/L	✓		0.2	2 ug/L	EPA 505	KV-NH	08/30/18 7:54AM
Date Extracted	-					No Limit	EPA 505	JG-NH	08/29/18 9:00AM
Toxaphene*	<1.0	ug/L	✓		1.0	3 ug/L	EPA 505	KV-NH	08/30/18 7:54AM
2,4,5-TP (Silvex)*	<0.25	ug/L	✓		0.25	50 ug/L	EPA 515.3	KV-NH	08/31/18 4:56AM
2,4-D*	<1	ug/L	✓		1	70 ug/L	EPA 515.3	KV-NH	08/31/18 4:56AM
Dalapon*	<1	ug/L	✓		1	200 ug/L	EPA 515.3	KV-NH	08/31/18 4:56AM
Date Extracted	-					No Limit	EPA 515.3	KV-NH	08/30/18 8:30AM
Dicamba*	<0.18	ug/L			0.18	No Limit	EPA 515.3	KV-NH	08/31/18 4:56AM
Dinoseb*	<0.5	ug/L	✓		0.5	7 ug/L	EPA 515.3	KV-NH	08/31/18 4:56AM
Pentachlorophenol*	<0.1	ug/L	✓		0.1	1 ug/L	EPA 515.3	KV-NH	08/31/18 4:56AM
Picloram*	<1.3	ug/L	✓		1.3	500 ug/L	EPA 515.3	KV-NH	08/31/18 4:56AM
2,4-Dichlorophenylacetic acid	99	%	✓			70-130%	EPA 515.3 - SS	KV-NH	08/31/18 4:56AM
Alachlor*	<0.1	ug/L	✓		0.1	2 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Aldrin*	<0.1	ug/L			0.1	No Limit	EPA 525.2	DD-NH	09/04/18 7:07PM
Atrazine*	<0.1	ug/L	✓		0.1	3 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Benzo(a)pyrene*	<0.1	ug/L	✓		0.1	0.2 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Butachlor*	<0.1	ug/L			0.1	No Limit	EPA 525.2	DD-NH	09/04/18 7:07PM
Date Extracted	-					No Limit	EPA 525.2	KV-NH	08/31/18 11:45AM
Di(2-ethylhexyl)adipate*	<0.6	ug/L	✓		0.6	400 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Di(2-ethylhexyl)phthalate*	<3	ug/L	✓		3	6 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Dieldrin*	<0.04	ug/L			0.04	No Limit	EPA 525.2	DD-NH	09/04/18 7:07PM

GRANITE STATE ANALYTICAL SERVICES, LLC
22 Manchester Road, Unit 2, Derry, NH 03038
Phone (800) 699-9920 (603) 432-3044 Fax (603) 434-4837
http://www.granitestateanalytical.com/

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE PRINTED: 09/07/2018

CLIENT NAME: Alpha Analytical

CLIENT ADDRESS: 8 Walkup Dr.
Westborough, MA 01581

SAMPLE ID#: 1808-03800-001

SAMPLED BY: Alpha Analytical

DATE AND TIME COLLECTED: 08/27/2018 10:00AM

DATE AND TIME RECEIVED: 08/28/2018 11:50AM

SAMPLE ADDRESS: L1833725
Final Day All Wells
MA

ANALYSIS PACKAGE: SOC GSA MA

RECEIPT TEMPERATURE: ON ICE 6.0° CELSIUS

MORE LOC INFO:

CLIENT JOB #

Test Description	Results	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date-Time Analyzed
Endrin*	<0.1	ug/L	✓		0.1	2 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Heptachlor Epoxide*	<0.06	ug/L	✓		0.06	0.2 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Heptachlor*	<0.04	ug/L	✓		0.04	0.4 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Hexachlorobenzene*	<0.1	ug/L	✓		0.1	1 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Hexachlorocyclopentadiene*	<0.1	ug/L	✓		0.1	50 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Lindane*	<0.07	ug/L	✓		0.07	0.2 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Methoxychlor*	<0.1	ug/L	✓		0.1	40 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
Metolachlor*	0.24	ug/L			0.1	No Limit	EPA 525.2	DD-NH	09/04/18 7:07PM
Metribuzin*	<0.1	ug/L			0.1	No Limit	EPA 525.2	DD-NH	09/04/18 7:07PM
Propachlor*	<0.1	ug/L			0.1	No Limit	EPA 525.2	DD-NH	09/04/18 7:07PM
Simazine*	<0.1	ug/L	✓		0.1	4 ug/L	EPA 525.2	DD-NH	09/04/18 7:07PM
1,3-Dimethyl-2-nitrobenzene	100	%	✓			70-130%	EPA 525.2 - SS	DD-NH	09/04/18 7:07PM
Perylene-d12	97	%	✓			70-130%	EPA 525.2 - SS	DD-NH	09/04/18 7:07PM
Pyrene-d10	98	%	✓			70-130%	EPA 525.2 - SS	DD-NH	09/04/18 7:07PM
Triphenylphosphate	108	%	✓			70-130%	EPA 525.2 - SS	DD-NH	09/04/18 7:07PM
3-Hydroxycarbofuran*	<1	ug/L			1	No Limit	EPA 531.1	KV-NH	08/29/18 8:31PM
Aldicarb Sulfone*	<1	ug/L			1	No Limit	EPA 531.1	KV-NH	08/29/18 8:31PM
Aldicarb Sulfoxide*	<1	ug/L			1	No Limit	EPA 531.1	KV-NH	08/29/18 8:31PM
Aldicarb*	<1	ug/L			1	No Limit	EPA 531.1	KV-NH	08/29/18 8:31PM
Carbaryl*	<1	ug/L			1	No Limit	EPA 531.1	KV-NH	08/29/18 8:31PM
Carbofuran*	<0.9	ug/L	✓		0.9	40 ug/L	EPA 531.1	KV-NH	08/29/18 8:31PM
Date Extracted	-					No Limit	EPA 531.1	JG-NH	08/28/18 9:00AM
Methiocarb*	<1	ug/L			1	No Limit	EPA 531.1	KV-NH	08/29/18 8:31PM
Methomyl*	<1	ug/L			1	No Limit	EPA 531.1	KV-NH	08/29/18 8:31PM
Oxamyl (Vydate)*	<1	ug/L	✓		1	200 ug/L	EPA 531.1	KV-NH	08/29/18 8:31PM
Propoxur (Baygon)*	<1	ug/L			1	No Limit	EPA 531.1	KV-NH	08/29/18 8:31PM

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CERTIFICATE OF ANALYSIS FOR DRINKING WATER

Legend	
Passes	✓
Fails EPA Primary	⊗
Fails EPA Secondary	▼
Fails State Guideline	✕
Attention	⚠

DATE PRINTED: 09/07/2018

CLIENT NAME: Alpha Analytical

CLIENT ADDRESS: 8 Walkup Dr.
Westborough, MA 01581

SAMPLE ID#: 1808-03800-001

SAMPLED BY: Alpha Analytical

DATE AND TIME COLLECTED: 08/27/2018 10:00AM

DATE AND TIME RECEIVED: 08/28/2018 11:50AM

SAMPLE ADDRESS: L1833725
Final Day All Wells
MA

ANALYSIS PACKAGE: SOC GSA MA

RECEIPT TEMPERATURE: ON ICE 6.0° CELSIUS

MORE LOC INFO:

CLIENT JOB #

Test Description	Results	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date-Time Analyzed

The results presented in this report relate to the samples listed above in the condition in which they were received.
RL: "Reporting limit" means the lowest level of an analyte that can be accurately recovered from the matrix of interest.

Data Qualifier (DQ) Flags: None

*** MA Certified Analysis**

Donald A. D'Anjou, Ph. D.
Laboratory Director

This analysis meets Commonwealth of Massachusetts requirements except as noted.
State Certifications: | NH 1015 | MA M-NH003 | ME NH00003 | RI 101513 | VT VT-101507 |
This certificate shall not be reproduced, except in full, without the written approval of Granite State Analytical Services, LLC

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

Lab Control ID: 18M02604
Received: Aug 29, 2018
Reported: Oct 31, 2018
Purchase Order No.
L1833725

Customer ID: 01703Z
Account ID: Z00373

Karyn Raymond
Alpha Analytical
Eight Walkup Drive
Westborough, MA 01581-1019

AMENDED ANALYTICAL REPORT

Report may only be copied in its entirety.
Results reported herein relate only to discrete samples submitted by the client. Hazen Research, Inc. does not warrant that the results are representative of anything other than the samples that were received in the laboratory

By:_____
Jessica Axen
Analytical Laboratories Director

Hazen Research, Inc.
4601 Indiana Street
Golden, CO 80403 USA
Tel: (303) 279-4501
Fax: (303) 278-1528

Lab Control ID: 18M02604
Received: Aug 29, 2018
Reported: Oct 31, 2018
Purchase Order No.
L1833725

Customer ID: 01703Z
Account ID: Z00373

AMENDED ANALYTICAL REPORT

Karyn Raymond
Alpha Analytical

Lab Sample ID			18M02604-001					
Customer Sample ID			**Final Day All Wells** sampled on 08/27/18 @ 1000					
Parameter	**Units**	**Code**	Result	Precision* +/-	Detection Limit	Method	Analysis Date / Time	Analyst
Gross Alpha	**pCi/L**	**T**	0.4	2.1	0.1	SM 7110 B	10/29/18 @ 0757	SS
Gross Beta	**pCi/L**	**T**	<3.6	2.3	3.6	SM 7110 B	10/29/18 @ 0757	SS
Radium-226	**pCi/L**	**T**	<0.2	0.1	0.2	SM 7500-Ra B	10/1/18 @ 0806	SA
Radium-228	**pCi/L**	**T**	<0.2	0.7	0.2	EPA Ra-05	10/2/18 @ 1247	JR
Radon	**pCi/L**	**T**	314	26	16.1	SM 7500-Rn B	8/29/18 @ 1213	SA

Certification ID's: CO/EPA CO00008; CT PH-0152; KS E-10265; NJ CO008; NYSELAP (NELAC Certified) 11417; RI LAO00284; WI 998376610, TX T104704256-15-6

*Variability of the radioactive decay process (counting error) at the 95% confidence level, 1.96 sigma.

Codes: (T) = Total (D) = Dissolved (S) = Suspended (R) = Total Residual (AR) = As Received < = Less Than

Samples received with air bubbles. Radon results may be biased low.

Amended report to include additional analysis per client request.

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 10/29/2018

Batch QC Summary Form

Analyte: Gross Alpha

Control Standard/LFB: ID: C-11 pCi/mL: 57.4 (use 1 diluted)

Spike Solution: ID: C-11 pCi/mL: 57.4 (use 1 mL)

Spike Recovery Calculation: Sample: Tap*

Calculation: $\frac{(61.0)\ (1.000) - (0.0)\ (0.200)}{57.4} \times 100 =$ 106%

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
Control Std./LFB	+/- 30 %	x		
Spike Recovery	70 - 130 %	x		
Blank	< or = 3 x Uncertainty	x		
Duplicate 1	95% confidence interval overlap	x		
Duplicate 2 *	95% confidence interval overlap	x		

* Required for batch size greater than 10 samples.

Conclusions:

x Batch QC Passes**
____ Batch QC Fails
____ Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative:

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

18M03017	18M02604
18M02971	18M02954
18M02880	18M02955
18M03005	18M02986
18M03004	18M02987
18M02909	18M02988
18M02918	18M02922
18M02932	18M02958
18M02936	
18M02940	

Evaluator: Lynnea Rockwell

10/30/2018
Date

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 10/29/2018

Batch QC Summary Form

Analyte: Gross Beta

Control Standard/LFB: ID: C-11 pCi/mL: 44 (use 1 diluted)

Spike Solution: ID: C-11 pCi/mL: 44 (use 1 mL)

Spike Recovery Calculation: Sample: Tap*

Calculation: $\frac{(38.6)\ (1.000) - (0.0)\ (0.200)}{44} \times 100 =$ 88%

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
Control Std./LFB	+/- 20 %	x		
Spike Recovery	80 - 120 %	x		
Blank	< or = 3 x Uncertainty	x		
Duplicate 1	95% confidence interval overlap	x		
Duplicate 2 *	95% confidence interval overlap	x		

* Required for batch size greater than 10 samples.

Conclusions:

x Batch QC Passes**
____ Batch QC Fails
____ Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative:

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

18M03017	18M02940
18M02971	18M02604
18M02880	18M02954
18M03005	18M02955
18M03004	18M02958
18M02909	18M02986
18M02918	18M02987
18M02922	18M02988
18M02932	
18M02936	

Evaluator: Lynnea Rockwell

10/30/2018
Date

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 10/02/2018

Batch QC Summary Form

Analyte: Radium-226

Control Standard/LFB: ID: NBL 6A pCi/mL: 23 (use 2 diluted)

Spike Solution: ID: NBL 6A pCi/mL: 23 (use 2 mL)

Spike Recovery Calculation: Sample: 18M02604-001c

Calculation: $\frac{(42.5)\ (1.000) - (0.0)\ (1.000)}{46} \times 100 =$ 92%

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
Control Std./LFB	+/- 20 %	x		
Spike Recovery	80 - 120 %	x		
Blank	< or = 3 x Uncertainty	x		
Duplicate 1	95% confidence interval overlap	x		
Duplicate 2 *	95% confidence interval overlap	x		

* Required for batch size greater than 10 samples.

Conclusions:

x Batch QC Passes**
____ Batch QC Fails
____ Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative:

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

18M02604	
18M02646	
18M02568	
18M02605	
18M02619	
18M02622	
18M02635	
18M02648	
18M02627	

Evaluator: Lynnea Rockwell

10/05/2018
Date

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 10/02/2018

Batch QC Summary Form

Analyte: Radium-228

Control Standard/LFB: ID: NBL 7A pCi/mL: 13 (use 10 diluted)

Spike Solution: ID: NBL 7A pCi/mL: 13 (use 10 mL)

Spike Recovery Calculation: Sample: 18M02604-001f

Calculation: $\frac{(128.3)\ (1.000) - (0.2)\ (1.000)}{130} \times 100 =$ 99%

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
Control Std./LFB	+/- 20 %	x		
Spike Recovery	80 - 120 %	x		
Blank	< or = 3 x Uncertainty	x		
Duplicate 1	95% confidence interval overlap	x		
Duplicate 2 *	95% confidence interval overlap			x

* Required for batch size greater than 10 samples.

Conclusions:

x Batch QC Passes**
____ Batch QC Fails
____ Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative:

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

18M02604
18M02605
18M02489
18M02855

Evaluator: Lynnea Rockwell

10/05/2018
Date

HAZEN RESEARCH, INC.
RADIOCHEMISTRY LABORATORY Date: 08/29/2018

Batch QC Evaluation Form

Analyte: Radon

Control Standard/LFB: ID: NBL 6A pCi/L: 2000

Batch QC Evaluation:

Parameter	Criteria	Pass	Fail	N/A
Control Std./LFB	+/- 20 %	x		
Control Std./LFB	+/- 20 %	x		
Control Std./LFB	+/- 20 %			x
Blank	< or = 3 x Uncertainty	x		
Duplicate 1	95% confidence interval overlap		x	
Duplicate 2 *	95% confidence interval overlap	x		

* Required for batch size greater than 10 samples.

Conclusions:

_____ Batch QC Passes**
_____ Batch QC Fails
x Batch QC Passes, with exceptions**:

Reruns Required: _____

Narrative: Samples 18M02601-001 and 18M02603-001 were outside of the 95% confidence interval overlap between the two sample containers. Data quality was not adversely affected and the higher of the two results is being reported.

**All QC data provided in this section of the report met the acceptance criteria specified in the analytical methods and procedures. State Maximum Contamination Levels (MCLs) are not evaluted in this report.

Batch Listing by Lab Control Number:

18M02601
18M02602
18M02603
18M02604

Evaluator: Lynnea Rockwell

08/30/2018
Date

18M02604

Subcontract Chain of Custody

ALPHA ANALYTICAL

Hazen Research
4601 Indiana Street
Golden, CO 80403

Alpha Job Number
L1833725

Client Information

Client: Alpha Analytical Labs
Address: Eight Walkup Drive
Westborough, MA 01581-1019

Phone: 508.439.5186
Email: kraymond@alphalab.com

Project Information

Project Location: MA
Project Manager: Karyn Raymond

Turnaround & Deliverables Information

Due Date:
Deliverables:

Regulatory Requirements/Report Limits

State/Federal Program:
Regulatory Criteria:

Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L1833725

Report to include Method Blank, LCS/LCSD:

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

Lab ID	Client ID	Collection Date/Time	Sample Matrix	Analysis	Batch QC
	FINAL DAY ALL WELLS	08-27-18 10:00	DW	Radium 226; Radium 228; Radon	

Relinquished By:	Date/Time:	Received By:	Date/Time:
	8/28/18		8/29/18 1130

Form No: AL_subcoc

ANALYTICAL REPORT

Lab Number:	L1833723
Client:	AECOM 250 Apollo Dr. Chelmsford, MA 01824
ATTN:	Doug DeNatale
Phone:	(978) 905-2180
Project Name:	LYNCH NEW SOURCE
Project Number:	60567459
Report Date:	09/18/18

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1833723-01	TW-14	DW	IPSWICH, MA	08/27/18 07:45	08/27/18
L1833723-02	TW-16	DW	IPSWICH, MA	08/27/18 07:50	08/27/18
L1833723-03	TW-13	DW	IPSWICH, MA	08/27/18 07:55	08/27/18
L1833723-04	TW-15	DW	IPSWICH, MA	08/27/18 08:00	08/27/18
L1833723-05	FIELD BLANK	DW	IPSWICH, MA	08/27/18 08:05	08/27/18

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833723
Report Date: 09/18/18

Case Narrative

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

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

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

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

Please contact Client Services at 800-624-9220 with any questions.

Project Name: LYNCH NEW SOURCE **Lab Number:** L1833723
Project Number: 60567459 **Report Date:** 09/18/18

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Perfluorinated Alkyl Acids

L1833723-01: The surrogate recoveries were outside the acceptance criteria for n-deuterioethylperfluoro-1-octanesulfonamidoacetic acid (d5-netfosaa) (69%); however, re-analysis achieved similar results: n-deuterioethylperfluoro-1-octanesulfonamidoacetic acid (d5-netfosaa) (66%). The surrogate associated with the target analytes reported is within acceptance criteria, thus the results of both runs are reported.

L1833723-02: The surrogate recoveries were outside the acceptance criteria high for n-deuterioethylperfluoro-1-octanesulfonamidoacetic acid (d5-netfosaa) (144%); however, the surrogates associated with the target analytes reported were within acceptance criteria, thus the results are reported.

L1833723-03: The surrogate recoveries were outside the acceptance criteria for n-deuterioethylperfluoro-1-octanesulfonamidoacetic acid (d5-netfosaa) (60%); however, re-analysis achieved similar results: n-deuterioethylperfluoro-1-octanesulfonamidoacetic acid (d5-netfosaa) (58%). The surrogate associated with the target analytes reported is within acceptance criteria, thus the results of both runs are reported.

L1833723-04: The surrogate recoveries were outside the acceptance criteria for perfluoro-n-[1,2-13c2]decanoic acid (13c-pfda) (61%) and n-deuterioethylperfluoro-1-octanesulfonamidoacetic acid (d5-netfosaa) (55%); however, re-analysis achieved similar results: perfluoro-n-[1,2-13c2]decanoic acid (13c-pfda) (60%) and n-deuterioethylperfluoro-1-octanesulfonamidoacetic acid (d5-netfosaa) (53%). The surrogate associated with the target analytes reported is within acceptance criteria, thus the results of both runs are reported.

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

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative Date: 09/18/18

ORGANICS

SEMIVOLATILES

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

SAMPLE RESULTS

Lab ID: L1833723-01
Client ID: TW-14
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw
Analytical Method: 122,537
Analytical Date: 09/14/18 05:49
Analyst: AJ

Date Collected: 08/27/18 07:45
Date Received: 08/27/18
Field Prep: Not Specified

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	1.14	J	ng/l	1.83	0.593	1
Perfluoroheptanoic Acid (PFHpA)	0.623	J	ng/l	1.83	0.216	1
Perfluorohexanesulfonic Acid (PFHxS)	0.663	J	ng/l	1.83	0.300	1
Perfluorooctanoic Acid (PFOA)	2.01		ng/l	1.83	0.238	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.83	0.234	1
Perfluorooctanesulfonic Acid (PFOS)	2.50		ng/l	1.83	0.205	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	84		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	73		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**69**	Q	70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

SAMPLE RESULTS

Lab ID: L1833723-01 R
Client ID: TW-14
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw
Analytical Method: 122,537
Analytical Date: 09/18/18 02:06
Analyst: AJ

Date Collected: 08/27/18 07:45
Date Received: 08/27/18
Field Prep: Not Specified

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	1.26	J	ng/l	1.83	0.593	1
Perfluoroheptanoic Acid (PFHpA)	0.582	J	ng/l	1.83	0.216	1
Perfluorohexanesulfonic Acid (PFHxS)	0.791	J	ng/l	1.83	0.300	1
Perfluorooctanoic Acid (PFOA)	2.01		ng/l	1.83	0.238	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.83	0.234	1
Perfluorooctanesulfonic Acid (PFOS)	2.86		ng/l	1.83	0.205	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	86		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	70		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**66**	Q	70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

SAMPLE RESULTS

Lab ID: L1833723-02 R
Client ID: TW-16
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw
Analytical Method: 122,537
Analytical Date: 09/14/18 12:30
Analyst: AJ

Date Collected: 08/27/18 07:50
Date Received: 08/27/18
Field Prep: Not Specified

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	1.54	J	ng/l	1.79	0.581	1
Perfluoroheptanoic Acid (PFHpA)	2.01		ng/l	1.79	0.211	1
Perfluorohexanesulfonic Acid (PFHxS)	2.33		ng/l	1.79	0.294	1
Perfluorooctanoic Acid (PFOA)	5.78		ng/l	1.79	0.233	1
Perfluorononanoic Acid (PFNA)	0.545	J	ng/l	1.79	0.229	1
Perfluorooctanesulfonic Acid (PFOS)	10.5		ng/l	1.79	0.201	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	90		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	70		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**144**	Q	70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

SAMPLE RESULTS

Lab ID: L1833723-03
Client ID: TW-13
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw
Analytical Method: 122,537
Analytical Date: 09/14/18 06:22
Analyst: AJ

Date Collected: 08/27/18 07:55
Date Received: 08/27/18
Field Prep: Not Specified

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	1.39	J	ng/l	1.82	0.589	1
Perfluoroheptanoic Acid (PFHpA)	1.13	J	ng/l	1.82	0.214	1
Perfluorohexanesulfonic Acid (PFHxS)	1.17	J	ng/l	1.82	0.298	1
Perfluorooctanoic Acid (PFOA)	3.49		ng/l	1.82	0.236	1
Perfluorononanoic Acid (PFNA)	0.247	J	ng/l	1.82	0.233	1
Perfluorooctanesulfonic Acid (PFOS)	4.55		ng/l	1.82	0.204	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	80		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	70		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**58**	Q	70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

SAMPLE RESULTS

Lab ID: L1833723-03 R
Client ID: TW-13
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw
Analytical Method: 122,537
Analytical Date: 09/18/18 02:39
Analyst: AJ

Date Collected: 08/27/18 07:55
Date Received: 08/27/18
Field Prep: Not Specified

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	1.46	J	ng/l	1.82	0.589	1
Perfluoroheptanoic Acid (PFHpA)	1.21	J	ng/l	1.82	0.214	1
Perfluorohexanesulfonic Acid (PFHxS)	1.30	J	ng/l	1.82	0.298	1
Perfluorooctanoic Acid (PFOA)	3.51		ng/l	1.82	0.236	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.82	0.233	1
Perfluorooctanesulfonic Acid (PFOS)	5.05		ng/l	1.82	0.204	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	81		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	70		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**60**	Q	70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

SAMPLE RESULTS

Lab ID: L1833723-04
Client ID: TW-15
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw
Analytical Method: 122,537
Analytical Date: 09/14/18 06:39
Analyst: AJ

Date Collected: 08/27/18 08:00
Date Received: 08/27/18
Field Prep: Not Specified

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	2.12		ng/l	1.83	0.593	1
Perfluoroheptanoic Acid (PFHpA)	1.72	J	ng/l	1.83	0.216	1
Perfluorohexanesulfonic Acid (PFHxS)	1.43	J	ng/l	1.83	0.300	1
Perfluorooctanoic Acid (PFOA)	5.87		ng/l	1.83	0.238	1
Perfluorononanoic Acid (PFNA)	0.355	J	ng/l	1.83	0.234	1
Perfluorooctanesulfonic Acid (PFOS)	5.84		ng/l	1.83	0.205	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	82		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	**61**	Q	70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**55**	Q	70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

SAMPLE RESULTS

Lab ID: L1833723-04 R
Client ID: TW-15
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw
Analytical Method: 122,537
Analytical Date: 09/18/18 02:55
Analyst: AJ

Date Collected: 08/27/18 08:00
Date Received: 08/27/18
Field Prep: Not Specified

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	2.25		ng/l	1.83	0.593	1
Perfluoroheptanoic Acid (PFHpA)	1.67	J	ng/l	1.83	0.216	1
Perfluorohexanesulfonic Acid (PFHxS)	1.55	J	ng/l	1.83	0.300	1
Perfluorooctanoic Acid (PFOA)	5.54		ng/l	1.83	0.238	1
Perfluorononanoic Acid (PFNA)	0.286	J	ng/l	1.83	0.234	1
Perfluorooctanesulfonic Acid (PFOS)	6.72		ng/l	1.83	0.205	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	80		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	**60**	Q	70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	**53**	Q	70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

SAMPLE RESULTS

Lab ID: L1833723-05
Client ID: FIELD BLANK
Sample Location: IPSWICH, MA

Sample Depth:
Matrix: Dw
Analytical Method: 122,537
Analytical Date: 09/14/18 04:26
Analyst: AJ

Date Collected: 08/27/18 08:05
Date Received: 08/27/18
Field Prep: Not Specified

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.88	0.609	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.88	0.222	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.88	0.308	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.88	0.244	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.88	0.241	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.88	0.210	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	80		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	75		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	75		70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

Method Blank Analysis
Batch Quality Control

Analytical Method: 122,537
Analytical Date: 09/14/18 03:37
Analyst: AJ

Extraction Method: EPA 537
Extraction Date: 09/05/18 09:50

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab for sample(s): 01-05 Batch: WG1153644-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	0.648
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	0.236
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	0.328
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	0.260
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	0.256
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	0.224

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	85		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	82		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	76		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: LYNCH NEW SOURCE
Project Number: 60567459
Lab Number: L1833723
Report Date: 09/18/18

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537 - Mansfield Lab Associated sample(s): 01-05 Batch: WG1153644-2 WG1153644-3								
Perfluorobutanesulfonic Acid (PFBS)	90		94		70-130	4		30
Perfluoroheptanoic Acid (PFHpA)	91		90		70-130	1		30
Perfluorohexanesulfonic Acid (PFHxS)	95		92		70-130	3		30
Perfluorooctanoic Acid (PFOA)	95		105		70-130	10		30
Perfluorononanoic Acid (PFNA)	98		102		70-130	4		30
Perfluorooctanesulfonic Acid (PFOS)	93		88		70-130	6		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	79		82		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	84		89		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	76		77		70-130

Project Name: LYNCH NEW SOURCE
Project Number: 60567459

Lab Number: L1833723
Report Date: 09/18/18

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1833723-01A	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-01B	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-01C	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-02A	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-02B	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-02C	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-03A	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-03B	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-03C	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-04A	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-04B	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-04C	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-05A	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)
L1833723-05B	3 Plastic Trizma/1 Plastic/1 H20+Trizma	A	NA		4.2	Y	Absent		A2-537-UCMR6(14)

*Values in parentheses indicate holding time in days

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833723
Project Number:	60567459	**Report Date:**	09/18/18

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Report Format: DU Report with 'J' Qualifiers

Project Name:	LYNCH NEW SOURCE	**Lab Number:**	L1833723
Project Number:	60567459	**Report Date:**	09/18/18

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

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

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

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

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

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers

REFERENCES

122 Determination of Selected Perfluorintated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). EPA Method 537, EPA/600/R-08/092. Version 1.1, September 2009.

LIMITATION OF LIABILITIES

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

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

Certification Information

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

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.

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

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

Westborough Facility:

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

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

Mansfield Facility:

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

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

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

MANSFIELD CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 8/27/18

ALPHA Job #: L833723

WESTBORO, MA
TEL: 508-898-9220
FAX: 508-898-9193

MANSFIELD, MA
TEL: 508-822-9300
FAX: 508-822-3288

Client Information

Client: AECOM
Address: 250 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-2000
Fax: 978-905-2100
Email: erika.amir-lin@aecom.com
doug.denatale@aecom.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Lynch New Source
Project Location: Ipswich, MA
Project #: 60567459
Project Manager: Doug DeNatale
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☒ EMAIL
☒ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program	Criteria

Other Project Specific Requirements/Comments/Detection Limits:

PLEASE NOTE
MS/MSD (at unit cost) will be omitted unless you check here: ☐

SAMPLE HANDLING
Filtration
☐ Done
☒ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: EPA Method 537 (PFAS)	Sample Specific Comments	TOTAL # BOTTLES
33723.01	TW-14	08/27/18	0745	DW	EAL	X		3
.02	TW-16	08/27/18	0750	DW	EAL	X		3
.03	TW-13	08/27/18	0755	DW	EAL	X		3
.04	TW-15	08/27/18	0800	DW	EAL	X		3
.05	Field Blank	08/27/18	0805	DW	EAL	X		2

(14)

Container Type	P
Preservative	O

Relinquished By:	Date/Time	Received By:	Date/Time
	08/27/18-1305	PAL	8/27/18 13:05
PAL	8/27/18 17:15		8/27/18 1715
	8/27 19:30		8/27/18 1930

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 101-09 (rev. 27-SEP-10)