APPENDIX A

WPCF NPDES PERMIT NO. MA0101702, SEPTEMBER 2014

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

CERTIFIED MAIL - RETURN RECEIPT REQUESTED
SEP 12 2014

Lee Azinheira, Director
Manfield Department of Public Works
6 Park Row
Mansfield, MA 02048

Re: NPDES Permit No. MA0101702
for MFN Regional Water Pollution Control Facility

Dear Azinheira:

Enclosed is the final National Pollutant Discharge Elimination System (NPDES) permit issued to the MFN Regional Water Pollution Control Facility ("WPCF"), in Norton, Massachusetts, pursuant to the Clean Water Act, as amended, and the Massachusetts Clean Water Act, 21 M.G.L. §§ 43-45, as amended. The Town of Mansfield transports sewage for treatment to the MFN Regional WPCF and the Town is included as a co-permittee on the NPDES permit. The provisions applicable to co-permittees are set forth in Parts 1.B. and 1.C. of the draft permit. The permit will become effective on the date specified in the permit unless you file a timely petition for review with EPA's Environmental Appeals Board (EAB) pursuant to 40 C.F.R. § 124.19. *See* 40 C.F.R. § 124.15 (issuance and effective date of permit).

Also enclosed is a copy of the Massachusetts State Water Quality Certification for the final permit, the EPA's response to the comments received on the draft permit, Part II Standard Conditions, and information relative to appeals and stays of NPDES permits. Should you desire to contest any provision of the permit, your petition must be submitted to the Environmental Appeals Board as outlined below and in the enclosure. If you also wish to appeal the state permit, you must file a similar request for review with the Director of the Office of Watershed Management in accordance with the provisions of the Massachusetts Administrative Procedures Act, the Division's Rules for the Conduct of Adjudicatory Proceedings and the Timely Action Schedule and Fee Provisions (see enclosure).

The current regulations governing NPDES permit appeals are found at 40 C.F.R. § 124.19 and took effect on March 26, 2013. A copy of the regulations and more specific information about appeals are enclosed for your convenience. If you do wish to appeal this permit to the Environmental Appeals Board, please refer to these new regulations and to materials on the website of the Environmental Appeals Board (http://www.epa.gov/eab) for information concerning procedural and substantive requirements applicable to NPDES permit appeals. Please note in particular the new provisions related to filing and service requirements set forth at 40 C.F.R. § 124.19(a) and (i), and to the content and form of briefs set forth at § 124.19(a) and (d).

We appreciate your cooperation throughout the development of this permit. Should you have any questions concerning the permit, feel free to contact Susan Murphy at 617-918-1534.

Sincerely,

David M. Webster, Chief
Water Permits Branch
Office of Ecosystem Protection

Enclosures: Final Permit, MA State Water Quality Certification, Response to Comments, Part II General Conditions, Appealing NPDES Permits

cc: MassDEP, Division of Watershed Management

MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

DEVAL L. PATRICK
Governor

MAEVE VALLELY BARTLETT
Secretary

DAVID W. CASH
Commissioner

September 4, 2014

David Webster, Water Permit Branch Chief
USEPA – New England
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109-3912

Re: Water Quality Certification
NPDES Permit MA0101702
MFN Regional Wastewater District Water Pollution Abatement Facility

Dear Mr. Webster:

Your office has requested that Massachusetts Department of Environmental Protection ("MassDEP") issue a water quality certification pursuant to Section 401(a) of the Federal Clean Water Act (the "Act") and 40 CFR 124.53 for the above referenced NPDES permit.

MassDEP has reviewed the proposed permit and has determined that the conditions of the permit will achieve compliance with sections 208(e), 301, 302, 303, 306, and 307 of the Federal Act, and with the provisions of the Massachusetts Clean Waters Act, M.G.L. c. 21, ss. 26-53, and regulations promulgated thereunder. The permit conditions are sufficient to comply with the antidegradation provisions of the Massachusetts Surface Water Quality Standards [314 CMR 4.04] and the policy [October 21, 2009] implementing those provisions.

MassDEP hereby certifies the referenced permit. This certification supersedes the May 30, 2014 Water Quality Certification issued for the Mansfield Water Pollution Abatement Facility with this same permit number and renders that Water Quality Certificate null and void. This certification also superseded the August 8, 2014 Water Quality Certification issued for MFN Regional Wastewater District.

Sincerely,

David Ferris, Director
Massachusetts Wastewater Management Program
Bureau of Resource Protection

cc: Susan Murphy, US EPA (via e-mail)
Claire Golden, MassDEP (via e-mail)

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TDD# 1-866-539-7622 or 1-617-574-6868
MassDEP Website: www.mass.gov/dep

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AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §§1251 et seq.; the "CWA"), and the Massachusetts Clean Waters Act, as amended, (M.G.L. Chap. 21, §§ 26-53),

MFN Regional Wastewater District

is authorized to discharge from the facility located at

MFN Regional Water Pollution Control Facility
Intersection of Hill Street and Crane Street, Norton, MA

to receiving water named **Three Mile River**

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

The Towns of Mansfield, Norton and Foxboro are co-permittees for PART 1.B. UNAUTHORIZED DISCHARGES and PART 1.C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM, which include conditions regarding the operation and maintenance of the collection systems owned and operated by the Towns. The responsible Town authorities are:

Town of Mansfield DPW - Sewer Division 6 Park Row Mansfield, MA 02048	Town of Norton Water & Sewer Department 166 John Scott Boulevard Norton, MA 02766	Town of Foxboro Water & Sewer Department 40 South Street Foxboro, MA 02035

This permit will become effective on the first day of the calendar month immediately following sixty days after signature.

This permit and the authorization to discharge expire at midnight, five (5) years from the last day of the month preceding the effective date.

This permit supersedes the permit issued to the Town of Mansfield on April 9, 2004

This permit consists of **Part I** (19 pages including effluent limitations and monitoring requirements); **Attachments A** (USEPA Region 1 Freshwater Chronic Toxicity Test Procedure and Protocol, March 2013), **B** (USEPA Region 1 Freshwater Acute Toxicity Test Procedure and Protocol, February 2011) **C** (Reassessment of Technically Based Industrial Discharge Limits) and **D** (NPDES Permit Requirement For Industrial Pretreatment Annual Report), and **Part II** (25 pages including NPDES Part II Standard Conditions).

Signed this 11th day of Sept. 11, 2014

Ken Moraff, Director
Office of Ecosystem Protection
Environmental Protection Agency
Boston, MA

David Ferris, Director
Massachusetts Wastewater Management Program
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

PART I

A.1. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number **001** to the Three Mile River. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC			EFFLUENT LIMITS			MONITORING REQUIREMENTS [3]	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE**
FLOW[2]	*********	*********	3.14 MGD	*********	Report MGD	CONTINUOUS	RECORDER
FLOW[2]	*********	*********	Report MGD	*********	*********	CONTINUOUS	RECORDER
BOD_5 [4] (May 1-October 31)	262 lb/day	262 lb/day	10 mg/l	10 mg/l	Report mg/l	3/WEEK	24-HOUR COMPOSITE[5]
BOD_5 [4] (November 1-April 30)	786 lb/day	1,178 lb/day	30 mg/l	45 mg/l	Report mg/l	3/WEEK	24-HOUR COMPOSITE[5]
TSS [4] (May 1-October 31)	262 lb/day	262 lb/day	10 mg/l	10 mg/l	Report mg/l	3/WEEK	24-HOUR COMPOSITE[5]
TSS [4] (November 1-April 30)	786 lb/day	1,178 lb/day	30 mg/l	45 mg/l	Report mg/l	3/WEEK	24-HOUR COMPOSITE[5]
pH RANGE[1]	6.5 - 8.3 S.U. (SEE PERMIT PARAGRAPH I.A.1.b.)					1/DAY	GRAB
TOTAL RESIDUAL CHLORINE[1,7]	*********	**********	24 ug/l	*********	42 ug/l	2/DAY	GRAB
FECAL COLIFORM [1,6] (April 1–October 31) (First year only, see note 6)	*********	**********	200 cfu/100 ml	*********	400 cfu/100 ml	2/WEEK	GRAB
ESCHERICHIA COLI [1,6] (April 1–October 31) (Report only for first year, see note 6)	*********	**********	126 cfu/100 ml	*********	409 cfu/100 ml	2/WEEK	GRAB
TOTAL COPPER	*********	*********	24 ug/l	*********	29 ug/l	1/MONTH	24-HOUR COMPOSITE[5]
DISSOLVED OXYGEN (April 1-October 31)	NOT LESS THAN 6.0 mg/l					1/DAY	GRAB

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A.1. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number **001** to the Three Mile River. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC			EFFLUENT LIMITS			MONITORING REQUIREMENTS [3]	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE**
AMMONIA-NITROGEN (April 1 - April 30)	262 lbs/day	*********	10 mg/l	*********	Report mg/l	2/WEEK	24-HOUR COMPOSITE[5]
AMMONIA-NITROGEN (May 1 - May 31)	131 lbs/day	*********	5 mg/l	*********	Report mg/l	2/WEEK	24-HOUR COMPOSITE[5]
AMMONIA-NITROGEN (June 1 – October 31)	26 lbs/day	*********	1 mg/l	*********	Report mg/l	2/WEEK	24-HOUR COMPOSITE[5]
AMMONIA-NITROGEN (November 1 - March 31)	Report lbs/day	*********	30 mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE[5]
TOTAL NITROGEN[8] (May 1 – October 31)	131 lbs/day	*********	Report mg/l	*********	Report mg/l	2/WEEK	24-HOUR COMPOSITE[5]
TOTAL NITRATE NITROGEN	Report lbs/day		Report mg/l				
TOTAL NITRITE NITROGEN	Report lbs/day		Report mg/l				
TOTAL KJELDAHL NITROGEN	Report lbs/day		Report mg/l				
TOTAL NITROGEN[8,9] (November 1 – April 30)	Report lbs/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE[5]
TOTAL NITRATE NITROGEN	Report lbs/day		Report mg/l				
TOTAL NITRITE NITROGEN	Report lbs/day		Report mg/l				
TOTAL KJELDAHL NITROGEN	Report lbs/day		Report mg/l				
TOTAL PHOSPHORUS[8] (April 1 – October 31)	4.45 lbs/day	**********	0.17 mg/l	*********	Report mg/l	2/WEEK	24-HOUR COMPOSITE[5]
TOTAL PHOSPHORUS (November 1 – March 31)	26 lbs/day	*********	1.0 mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE[5]

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A.1. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge from treated effluent from outfall serial number **001** to the Three Mile River. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC	EFFLUENT LIMITS					MONITORING REQUIREMENTS [3]	
PARAMETER	AVERAGE MONTHLY	AVERAGE WEEKLY	AVERAGE MONTHLY	AVERAGE WEEKLY	MAXIMUM DAILY	MEASUREMENT FREQUENCY	SAMPLE TYPE
WHOLE EFFLUENT TOXICITY [10, 11, 12, 13]	Acute $LC_{50} \geq 100\%$ Chronic C-NOEC $\geq 45\%$					4/YEAR	24-HOUR COMPOSITE[5]
Hardness[14]	*******	*******	*******	*******	Report mg/l	4/YEAR	24-HR COMP[5]
Ammonia Nitrogen as N[14]	*******	*******	*******	*******	Report mg/l	4/YEAR	24-HR COMP[5]
Total Recoverable Aluminum[14]	*******	*******	*******	*******	Report mg/l	4/YEAR	24-HR COMP[5]
Total Recoverable Cadmium[14]	*******	*******	*******	*******	Report mg/l	4/YEAR	24-HR COMP[5]
Total Recoverable Copper[14]	*******	*******	*******	*******	Report mg/l	4/YEAR	24-HR COMP[5]
Total Recoverable Nickel[14]	*******	*******	*******	*******	Report mg/l	4/YEAR	24-HR COMP[5]
Total Recoverable Lead[14]	*******	*******	*******	*******	Report mg/l	4/YEAR	24-HR COMP[5]
Total Recoverable Zinc[14]	*******	*******	*******	*******	Report mg/l	4/YEAR	24-HR COMP[5]

Sampling Location: Composite sampling just after filtration; flow measured at Parshall flume after filtration; grab samples taken after chlorine contact chamber

Footnotes:

1. Required for State Certification.

2. Report annual average, monthly average, and the maximum daily flow. The limit is an annual average, which shall be reported as a rolling average. The value will be calculated as the arithmetic mean of the monthly average flow for the reporting month and the monthly average flows of the previous eleven months.

3. Effluent sampling shall be of the discharge and shall be collected at the point specified on page 4. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

   A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the week each month. Occasional deviations from the routine sampling program are allowed, but the reason for the deviation shall be documented in correspondence appended to the applicable discharge monitoring report.

   All samples shall be tested using the analytical methods found in 40 CFR § 136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR § 136.

4. Sampling required for influent and effluent.

5. 24-hour composite samples will consist of at least twenty four (24) grab samples taken during one consecutive 24 hour period, either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow.

6. Fecal coliform and *Escherichia coli* bacteria limits and monitoring requirements are in effect during the period April 1 through October 31 only, to reflect the seasonal disinfection period. The average monthly limits for fecal coliform and *E.coli* are expressed as geometric means. Samples for fecal coliform bacteria and *E. coli* shall be taken concurrently. E. coli monitoring shall be conducted concurrently with a total residual chlorine sample.

   The fecal coliform limits and monitoring requirements are in effect until one year from the permit effective date. The fecal coliform limits and monitoring requirements will end one year from the permit effective date.

   The *E. coli* effluent limitations go into effect one year from the permit effective date. The monitoring and report requirements for *E. coli* go into effect on the effective date of this permit. The monitoring frequency for *E. coli* is 1/month until one year from the permit effective date and 2/week thereafter.

7. Total residual chlorine monitoring is required whenever chlorine is added to the treatment process (i.e. TRC sampling is not required if chlorine is not added for disinfection or

other purpose). The limitations are in effect year-round.

The minimum level (ML) for total residual chlorine is defined as 20 ug/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G. One of these methods must be used to determine total residual chlorine. For effluent limitations less than 20 ug/l, compliance/non-compliance will be determined based on the ML. Sample results of 20 ug/l or less shall be reported as zero on the discharge monitoring report.

Within one year of the permit effective date, the chlorination and dechlorination systems shall include an alarm system for indicating system interruptions or malfunctions. Any interruption or malfunction of the chlorine dosing system that may have resulted in levels of chlorine that were inadequate for achieving effective disinfection, or interruptions or malfunctions of the dechlorination system that may have resulted in excessive levels of chlorine in the final effluent shall be reported with the monthly DMRs. The report shall include the date and time of the interruption or malfunction, the nature of the problem, and the estimated amount of time that the reduced levels of chlorine or dechlorination chemicals occurred.

8. The permittee shall comply with the 0.17 mg/l total phosphorus limit, the 131 lb/day total nitrogen limit and the optimization requirement of footnote 9 in accordance with the schedule contained in Section F below. Upon the effective date of the permit, and until the date specified in Section F below for compliance with the total nitrogen final limit of 131 lb/day, monitoring for total nitrogen during the May 1 to October 31 period shall be conducted once per week.

9. The permittee shall operate the treatment facility to reduce the discharge of total nitrogen during the months of November to April to the maximum extent possible. All available treatment equipment in place at the facility shall be operated unless equal or better performance can be achieved in a reduced operational mode. The addition of a carbon source that may be necessary in order to meet the total nitrogen limit during the months of May through October is not required during the months of November through April.

10. The permittee shall conduct chronic and acute toxicity tests *four* times per year. The permittee shall test the daphnid, Ceriodaphnia dubia, and the fathead minnow, Pimephales promelas. Toxicity test samples shall be collected during the second week of the months of February, May, August and November. The test results shall be submitted by the last day of the month following the completion of the test. The results are due March 31, June 30, September 30 and December 31, respectively. The tests must be performed in accordance with test procedures and protocols specified in **Attachments A and B** of this permit.

Test Dates Second Week in	**Submit Results By:**	**Test Species**	**Acute Limit LC_{50}**	**Chronic Limit C-NOEC**
February May August November	March 31 June 30 September 30 December 31	Ceriodaphnia dubia (daphnid) Pimephales promelas (fathead minnow)	≥ 100%	≥ 45%

After submitting **one year** and a **minimum** of four consecutive sets of WET test results, all of which demonstrate compliance with the WET permit limits, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from the EPA that the WET testing requirement has been changed.

11. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms. Therefore, a 100% limit means that a sample of 100% effluent (no dilution) shall cause no more than a 50% mortality rate.

12. C-NOEC (chronic-no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction, based on a statistically significant difference from dilution control, at a specific time of observation as determined from hypothesis testing. As described in the EPA WET Method Manual EPA 821-R-02-013, Section 10.2.6.2, all test results are to be reviewed and reported in accordance with EPA guidance on the evaluation of the concentration-response relationship. The "**45%** or greater" limit is defined as a sample which is composed of **45%** (or greater) effluent, the remainder being dilution water.

13. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall either follow procedures outlined in **Attachment A (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER** in order to obtain an individual approval for use of an alternate dilution water, or the permittee shall follow the Self-Implementing Alternative Dilution Water Guidance, which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. This guidance is found in Attachment G of *NPDES Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, which may be found on the EPA Region I web site at http://www.epa.gov/Region1/enforcementandassistance/dmr.html. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in **Attachment A**. Any modification or revocation to this guidance will be transmitted to

the permittees. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in **Attachment A**.

14. For each whole effluent toxicity test the permittee shall report on the appropriate discharge monitoring report, (DMR), the concentrations of the hardness, ammonia nitrogen as nitrogen, total recoverable aluminum, cadmium, copper, lead, nickel, and zinc found in the 100 percent effluent sample. All these aforementioned chemical parameters shall be determined to at least the minimum quantification level shown in **Attachment A**. Also the permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report.

Part I.A.1. (Continued)

a. The discharge shall not cause a violation of the water quality standards of the receiving waters.

b. The pH of the effluent shall not be less than 6.5 or greater than 8.3 at any time.

c. The discharge shall not cause objectionable discoloration of the receiving waters.

d. The effluent shall not contain a visible oil sheen, foam, or floating solids at any time.

e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of both total suspended solids and biochemical oxygen demand. The percent removal shall be based on monthly average values.

f. The permittee shall minimize the use of chlorine while maintaining adequate bacterial control.

g. The results of sampling for any parameter done in accordance with EPA approved methods above its required frequency must also be reported.

h. If the average annual flow in any calendar year exceeds 80 percent of the facility's design flow, the permittee shall submit a report to MassDEP by March 31 of the following calendar year describing its plans for further flow increases and describing how it will maintain compliance with the flow limit and all other effluent limitations and conditions.

2. All POTWs must provide adequate notice to the Director of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and

b. Any substantial change in the volume or character of pollutants being introduced

into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For purposes of this paragraph, adequate notice shall include information on:

(1) The quantity and quality of effluent introduced into the POTW; and

(2) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

3. Prohibitions Concerning Interference and Pass Through:

a. Pollutants introduced into POTW's by a non-domestic source (user) shall not pass through the POTW or interfere with the operation or performance of the works.

4. Toxics Control

a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.

b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.

5. Numerical Effluent Limitations for Toxicants

EPA or MassDEP may use the results of the toxicity tests and chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including but not limited to those pollutants listed in Appendix D of 40 CFR Part 122.

B. UNAUTHORIZED DISCHARGES

This permit authorizes discharges only from the outfall(s) listed in Part I.A.1. and only in accordance with the terms and conditions of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs), are not authorized by this permit and shall be reported to EPA and MassDEP in accordance with Section D.1.e.(1) of the General Requirements of this permit (Twenty-four hour reporting).

Notification of SSOs to MassDEP shall be made on its SSO Reporting Form (which includes MassDEP Regional Office telephone numbers). The reporting form and instruction for its completion may be found on-line at
http://www.mass.gov/eea/agencies/massdep/service/approvals/sanitary-sewer-overflow-bypass-

backup-notification.html.

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions. The permittee and each co-permittee is required to complete the following activities for the collection system which it owns:

1. Maintenance Staff

   The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit. Provisions to meet this requirement shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

2. Preventive Maintenance Program

   The permittee shall maintain an ongoing preventive maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges. Plans and programs to meet this requirement shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

3. Infiltration/Inflow

   The permittee shall control infiltration and inflow (I/I) into the sewer system as necessary to prevent high flow related unauthorized discharges from their collection systems and high flow related violations of the wastewater treatment plant's effluent limitations. Plans and programs to control I/I shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

4. Collection System Mapping

   Within 30 months of the effective date of this permit, the permittee shall prepare a map of the sewer collection system it owns (see page 1 of this permit for the effective date). The map shall be on a street map of the community, with sufficient detail and at a scale to allow easy interpretation. The collection system information shown on the map shall be based on current conditions and shall be kept up to date and available for review by federal, state, or local agencies. Such map(s) shall include, but not be limited to the following:

   a. All sanitary sewer lines and related manholes;
   b. All combined sewer lines, related manholes, and catch basins;
   c. All combined sewer regulators and any known or suspected connections between the sanitary sewer and storm drain systems (e.g. combination manholes);

d. All outfalls, including the treatment plant outfall(s), CSOs, and any known or suspected SSOs, including stormwater outfalls that are connected to combination manholes;
e. All pump stations and force mains;
f. The wastewater treatment facility(ies);
g. All surface waters (labeled);
h. Other major appurtenances such as inverted siphons and air release valves;
i. A numbering system which uniquely identifies manholes, catch basins, overflow points, regulators and outfalls;
j. The scale and a north arrow; and
k. The pipe diameter, date of installation, type of material, distance between manholes, and the direction of flow.

5. Collection System Operation and Maintenance Plan

The permittee shall develop and implement a Collection System Operation and Maintenance Plan.

a. Within six (6) months of the effective date of the permit, the permittee shall submit to EPA and MassDEP

(1) A description of the collection system management goals, staffing, information management, and legal authorities;
(2) A description of the collection system and the overall condition of the collection system including a list of all pump stations and a description of recent studies and construction activities; and
(3) A schedule for the development and implementation of the full Collection System O & M Plan including the elements in paragraphs b.1. through b.8. below.

b. The full Collection System O & M Plan shall be completed, implemented and submitted to EPA and MassDEP within twenty-four (24) months from the effective date of this permit. The Plan shall include:

(1) The required submittal from paragraph 5.a. above, updated to reflect current information;
(2) A preventive maintenance and monitoring program for the collection system;
(3) Description of sufficient staffing necessary to properly operate and maintain the sanitary sewer collection system and how the operation and maintenance program is staffed;
(4) Description of funding, the source(s) of funding and provisions for funding sufficient for implementing the plan;
(5) Identification of known and suspected overflows and back-ups, including manholes. A description of the cause of the identified overflows and

back-ups, corrective actions taken, and a plan for addressing the overflows and back-ups consistent with the requirements of this permit;

(6) A description of the permittee's programs for preventing I/I related effluent violations and all unauthorized discharges of wastewater, including overflows and by-passes and the ongoing program to identify and remove sources of I/I. The program shall include an inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts;

(7) An educational public outreach program for all aspects of I/I control, particularly private inflow; and

(8) An Overflow Emergency Response Plan to protect public health from overflows and unanticipated bypasses or upsets that exceed any effluent limitation in the permit.

6. Annual Reporting Requirement

The permittee shall submit a summary report of activities related to the implementation of its Collection System O & M Plan during the previous calendar year. The report shall be submitted to EPA and MassDEP annually by March 31. The summary report shall, at a minimum, include:

a. A description of the staffing levels maintained during the year;
b. A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year;
c. Expenditures for any collection system maintenance activities and corrective actions taken during the previous year;
d. A map with areas identified for investigation/action in the coming year;
e. If treatment plant flow has reached 80% of its design flow (2.5 MGD) based on the annual average flow during the reporting year, or there have been capacity related overflows, submit a calculation of the maximum daily, weekly, and monthly infiltration and the maximum daily, weekly, and monthly inflow for the reporting year; and
f. A summary of unauthorized discharges during the past year and their causes and a report of any corrective actions taken as a result of the unauthorized discharges reported pursuant to the Unauthorized Discharges section of this permit.

7. Alternate Power Source

In order to maintain compliance with the terms and conditions of this permit, the permittee shall provide an alternative power source(s) sufficient to operate the portion of the publicly owned treatment works[1] it owns and operates.

[1] As defined at 40 CFR §122.2, which references the definition at 40 CFR §403.3

D. SLUDGE CONDITIONS

1. The permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices, including EPA regulations promulgated at 40 CFR Part 503, which prescribe "Standards for the Use or Disposal of Sewage Sludge" pursuant to Section 405(d) of the CWA, 33 U.S.C. § 1345(d).

2. If both state and federal requirements apply to the permittee's sludge use and/or disposal practices, the permittee shall comply with the more stringent of the applicable requirements.

3. The requirements and technical standards of 40 CFR Part 503 apply to the following sludge use or disposal practices.

   a. Land application - the use of sewage sludge to condition or fertilize the soil

   b. Surface disposal - the placement of sewage sludge in a sludge only landfill

   c. Sewage sludge incineration in a sludge only incinerator

4. The requirements of 40 CFR Part 503 do not apply to facilities which dispose of sludge in a municipal solid waste landfill. 40 CFR § 503.4. These requirements also do not apply to facilities which do not use or dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g. lagoons, reed beds), or are otherwise excluded under 40 CFR § 503.6.

5. The 40 CFR. Part 503 requirements including the following elements:

   - General requirements
   - Pollutant limitations
   - Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
   - Management practices
   - Record keeping
   - Monitoring
   - Reporting

   Which of the 40 C.F.R. Part 503 requirements apply to the permittee will depend upon the use or disposal practice followed and upon the quality of material produced by a facility. The EPA Region 1 Guidance document, "EPA Region 1 - NPDES Permit Sludge Compliance Guidance" (November 4, 1999), may be used by the permittee to assist it in determining the applicable requirements.[2]

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[2] This guidance document is available upon request from EPA Region 1 and may also be found at: http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf

6. The sludge shall be monitored for pollutant concentrations (all Part 503 methods) and pathogen reduction and vector attraction reduction (land application and surface disposal) at the following frequency. This frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year

less than 290	1/ year
290 to less than 1,500	1 /quarter
1,500 to less than 15,000	6 /year
15,000 +	1 /month

Sampling of the sewage sludge shall use the procedures detailed in 40 CFR 503.8.

7. Under 40 CFR § 503.9(r), the permittee is a "person who prepares sewage sludge" because it "is … the person who generates sewage sludge during the treatment of domestic sewage in a treatment works …." If the permittee contracts with *another* "person who prepares sewage sludge" under 40 CFR § 503.9(r) – i.e., with "a person who derives a material from sewage sludge" – for use or disposal of the sludge, then compliance with Part 503 requirements is the responsibility of the contractor engaged for that purpose. If the permittee does not engage a "person who prepares sewage sludge," as defined in 40 CFR § 503.9(r), for use or disposal, then the permittee remains responsible to ensure that the applicable requirements in Part 503 are met. 40 CFR § 503.7. If the ultimate use or disposal method is land application, the permittee is responsible for providing the person receiving the sludge with notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

8. The permittee shall submit an annual report containing the information specified in the 40 CFR Part 503 requirements (§ 503.18 (land application), § 503.28 (surface disposal), or § 503.48 (incineration)) by **February 19** (*see also* "EPA Region 1 - NPDES Permit Sludge Compliance Guidance"). Reports shall be submitted to the address contained in the reporting section of the permit. If the permittee engages a contractor or contractors for sludge preparation and ultimate use or disposal, the annual report need contain only the following information:

   a. Name and address of contractor(s) responsible for sludge preparation, use or disposal
   b. Quantity of sludge (in dry metric tons) from the POTW that is transferred to the sludge contractor(s), and the method(s) by which the contractor will prepare and use or dispose of the sewage sludge.

E. INDUSTRIAL USERS AND PRETREATMENT PROGRAM

1. The permittee shall develop and enforce specific effluent limits (local limits) for Industrial User(s), and all other users, as appropriate, which together with appropriate changes in the POTW Treatment Plant's Facilities or operation, are necessary to ensure continued compliance with the POTW's NPDES permit or sludge use or disposal practices. Specific local limits shall not be developed and enforced without individual notice to persons or

groups who have requested such notice and an opportunity to respond. Within (120 days of the effective date of this permit), the permittee shall prepare and submit a written technical evaluation to the EPA analyzing the need to revise local limits. As part of this evaluation, the permittee shall assess how the POTW performs with respect to influent and effluent of pollutants, water quality concerns, sludge quality, sludge processing concerns/inhibition, biomonitoring results, activated sludge inhibition, worker health and safety and collection system concerns. In preparing this evaluation, the permittee shall complete and submit the attached form (Attachment C) with the technical evaluation to assist in determining whether existing local limits need to be revised. Justifications and conclusions should be based on actual plant data if available and should be included in the report. Should the evaluation reveal the need to revise local limits, the permittee shall complete the revisions within 120 days of notification by EPA and submit the revisions to EPA for approval. The Permittee shall carry out the local limits revisions in accordance with EPA's Local Limit Development Guidance (July 2004).

2. The permittee shall implement the Industrial Pretreatment Program in accordance with the legal authorities, policies, procedures, and financial provisions described in the permittee's approved Pretreatment Program, and the General Pretreatment Regulations, 40 CFR 403. At a minimum, the permittee must perform the following duties to properly implement the Industrial Pretreatment Program (IPP):

   a. Carry out inspection, surveillance, and monitoring procedures which will determine independent of information supplied by the industrial user, whether the industrial user is in compliance with the Pretreatment Standards. At a minimum, all significant industrial users shall be sampled and inspected at the frequency established in the approved IPP but in no case less than once per year and maintain adequate records.

   b. Issue or renew all necessary industrial user control mechanisms within 90 days of their expiration date or within 180 days after the industry has been determined to be a significant industrial user.

   c. Obtain appropriate remedies for noncompliance by any industrial user with any pretreatment standard and/or requirement.

   d. Maintain an adequate revenue structure for continued implementation of the Pretreatment Program.

3. The permittee shall provide the EPA and MassDEP with an annual report describing the permittee's pretreatment program activities for the twelve (12) month period ending 60 days prior to the due date in accordance with 403.12(i). The annual report shall be consistent with the format described in Attachment D of this permit and shall be submitted no later than **October 1** of each year.

4. The permittee must obtain approval from EPA prior to making any significant changes to the industrial pretreatment program in accordance with 40 CFR 403.18(c).

5. The permittee must assure that applicable National Categorical Pretreatment Standards are met by all categorical industrial users of the POTW. These standards are published in the Federal Regulations at 40 CFR 405 et. seq.

6. The permittee must modify its pretreatment program, if necessary, to conform to all changes in the Federal Regulations that pertain to the implementation and enforcement of the industrial pretreatment program. The permittee must provide EPA, in writing, within 180 days of this permit's effective date proposed changes, if applicable, to the permittee's pretreatment program deemed necessary to assure conformity with current Federal Regulations. At a minimum, the permittee must address in its written submission the following areas: (1) Enforcement response plan; (2) revised sewer use ordinances; and (3) slug control evaluations. The permittee will implement these proposed changes pending EPA Region I's approval under 40 CFR 403.18. This submission is separate and distinct from any local limits analysis submission described in Part I.E.1.

F. COMPLIANCE SCHEDULE

In order to comply with the new permit limits for total nitrogen and total phosphorus, the permittee shall take the following actions:

1. Within one year of the effective date of the permit, the Permittee shall submit to EPA and MassDEP a status report relative to the planning and design of the facilities necessary to achieve the total nitrogen and total phosphorus permit limits.

2. Within two years of the effective date of the permit, the Permittee shall complete design of the facility improvements required to achieve the total nitrogen and total phosphorus permit limits.

3. Within three years of the effective date of the permit, the Permittee shall initiate construction of the facility improvements required to achieve the total nitrogen and total phosphorus permit limits.

4. Within four years of the effective date of the permit, the Permittee shall submit to EPA and MassDEP a status report relative to construction of the facility improvements required to achieve the total nitrogen and total phosphorus permit limits.

5. The permit limits of 131 lb/dayl total nitrogen and 0.17 mg/l total phosphorus shall go into effect sixty (60) months from the effective date of the permit. Until such date the existing permit limit of 0.20 mg/l total phosphorus shall remain in effect.

6. The permittee shall notify EPA and MassDEP of its compliance or noncompliance with the requirements of this part in writing no later than 14 days after each interim or final date of compliance.

G. MONITORING AND REPORTING

1. **For a period of one year from the effective date of the permit**, the permittee may either submit monitoring data and other reports to EPA in hard copy form or report electronically using NetDMR, a web-based tool that allows permittees to electronically submit discharge monitoring reports (DMRs) and other required reports via a secure internet connection. **Beginning no later than one year after the effective date of the permit**, the permittee shall begin reporting using NetDMR, unless the facility is able to demonstrate a reasonable basis that precludes the use of NetDMR for submitting DMRs and reports. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

   a. Submittal of Reports Using NetDMR

      NetDMR is accessed from: http://www.epa.gov/netdmr. **Within one year of the effective date of this permit**, the permittee shall begin submitting DMRs and reports required under this permit electronically to EPA using NetDMR, unless the facility is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request").

      DMRs shall be submitted electronically to EPA no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA, including the MassDEP Monthly Operations and Maintenance Report, as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees shall continue to send hard copies of reports other than DMRs (including Monthly Operation and Maintenance Reports) to MassDEP until further notice from MassDEP.

      As NetDMR requires that reports be submitted as an attachment to a DMR, any report required under this permit shall be considered to be timely if it is electronically submitted to EPA with the next DMR due following the permit-specified report due date.

   b. Submittal of NetDMR Opt-Out Requests

      Opt-out requests must be submitted in writing to EPA for written approval at least sixty (60) days prior to the date a facility would be required under this permit to begin using NetDMR. This demonstration shall be valid for twelve (12) months from the date of EPA approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to EPA unless the permittee submits a renewed opt-out request and such request be approved by EPA. All opt-out requests should be sent to the following addresses:

<u>Attn: NetDMR Coordinator</u>
U.S. Environmental Protection Agency, Water Technical Unit
5 Post Office Square, Suite 100 (OES04-4)
Boston, MA 02109-3912

And

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608

c. Submittal of Reports in Hard Copy Form

Monitoring results shall be summarized for each calendar month and reported on separate hard copy Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15th day of the month following the completed reporting period. All reports required under this permit, including MassDEP Monthly Operation and Maintenance Reports, shall be submitted as an attachment to the DMRs. Signed and dated originals of the DMRs, and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Water Technical Unit (OES04-SMR)
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Duplicate signed copies of all reports or notifications required above shall be submitted to the State at the following addresses:

MassDEP – Southeast Region
Bureau of Resource Protection
20 Riverside Drive
Lakeville, MA 02347

Copies of toxicity tests and nitrogen optimization reports only to:

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608

Any verbal reports, if required in **Parts I** and/or **II** of this permit, shall be made to both EPA-New England and to MassDEP.

H. STATE PERMIT CONDITIONS

1. This authorization to discharge includes two separate and independent permit authorizations. The two permit authorizations are (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP) pursuant to the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and 314 C.M.R. 3.00. All of the requirements contained in this authorization, as well as the standard conditions contained in 314 CMR 3.19, are hereby incorporated by reference into this state surface water discharge permit.

2. This authorization also incorporates the state water quality certification issued by MassDEP under § 401(a) of the Federal Clean Water Act, 40 C.F.R. 124.53, M.G.L. c. 21, § 27 and 314 CMR 3.07. All of the requirements (if any) contained in MassDEP's water quality certification for the permit are hereby incorporated by reference into this state surface water discharge permit as special conditions pursuant to 314 CMR 3.11.

3. Each agency shall have the independent right to enforce the terms and conditions of this permit. Any modification, suspension or revocation of this permit shall be effective only with respect to the agency taking such action, and shall not affect the validity or status of this permit as issued by the other agency, unless and until each agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this permit is declared invalid, illegal or otherwise issued in violation of state law such permit shall remain in full force and effect under federal law as a NPDES Permit issued by the U.S. Environmental Protection Agency. In the event this permit is declared invalid, illegal or otherwise issued in violation of federal law, this permit shall remain in full force and effect under state law as a permit issued by the Commonwealth of Massachusetts.

NPDES No. MA0101702

MFN Regional Water Pollution Control Facility
(formerly Mansfield Water Pollution Abatement Facility)
Response to Comments

On July 1, 2013, the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) public noticed a Draft Permit (MA0101702) for the Mansfield Water Pollution Abatement Facility.

EPA received comments from the Town of Mansfield, the Town of Norton, and the Nature Conservancy. The following are responses to all significant comments received and descriptions of any changes made to the public-noticed permit as a result of those comments, and a description of other changes made to the Final Permit.

On July 23, 2014, EPA received notice from Lee Azinheira, the Town of Mansfield Director of Public Works and Executive Director of the newly established MFN Regional Wastewater District, that as of July 1, 2014 responsibility for the Mansfield WPAF and the referenced NPDES permit were transferred to the MFN Regional Wastewater District. Pursuant to 40 CFR § 122.61 the permit has been transferred to the MFN Regional Wastewater District and the Final Permit has been modified accordingly. The Town of Mansfield is now a co-permittee on the Final Permit with respect to the collection system it owns and operates. The comments and responses below continue to use the designation "Mansfield WPAF" consistent with the text of the Draft Permit and comment letters; that terminology includes the successor MFN Regional Water Pollution Control Facility as appropriate.

A. The Town of Mansfield submitted comments by letter dated November 7, 2013.

Comment A.1. The allowable TN mass load to the Taunton River estuary is the basis of the TN limit. This being the case, no concentration limit should be required. Mass loads are the basis of the nitrogen limits developed by EPA, per the Fact Sheet, and mass limits would allow the Mansfield WPAF to operate in a less costly manner during low flow periods. Therefore, we ask that the TN concentration limit be deleted from the permit.

> **Response A.1.** EPA agrees that the water quality analysis is based on mass loads to the estuary that have been translated into concentration-based permit limits. In general the use of concentration-based permit limits provides a clear target for facility design and operation, ensures that the underlying assumptions of the water quality analysis are met, and provides a better measure of operational control of the facility. Mass load-based WLAs and TMDLs in Massachusetts have generally been implemented through concentration-based limits. See, e.g., *Total Maximum Daily Load (TMDL) for Nutrients in the Upper/Middle Charles River* at 92 (http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/ucharles.pdf). This practice is consistent with EPA's regulations, which provide that "All pollutants limited in permits shall have limitations, standards or prohibitions expressed in terms of mass . . ." and that "Pollutants limited in terms of mass additionally may

be limited in terms of other units of measurement, and the permit shall require the permittee to comply with both limitations." 40 CFR 122.45(f)(1) and (2).

Concentration based limits are not mandated under EPA's regulations, and mass-only limits have been implemented in certain state-delegated NPDES programs, particularly those involving watershed-wide loading analyses of nitrogen load reductions. For example, the Long Island Sound TMDL nitrogen load allocations (see NYSDEC and CTDEP, *A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound* (December 2001)) have been implemented in Connecticut through a mass load-based *General Permit for Nitrogen Discharges* from POTWs. This approach facilitates the trading of nitrogen load credits under Connecticut's Nitrogen Credit Exchange. See http://www.ct.gov/deep/cwp/view.asp?A=2719&Q=325572. Similarly in the Chesapeake Bay Watershed, EPA encouraged a permitting approach based on annual mass loads and promoted watershed permits and trading programs. See Chesapeake Bay Program, *NPDES Permitting Approach for Discharges of Nutrients in the Chesapeake Bay Watershed* (December 2004). Load based permit limits facilitate trading programs.

In this case, there have been no proposals from permitted entities for trading of load allocations, and Massachusetts does not have a clear framework for trading permitted loads. However, EPA agrees that mass-only limits are sufficient in this case to meet the water quality requirements described in the Fact Sheet, and will provide some flexibility to the facility to operate in a more cost-efficient manner even in the absence of trading. Therefore EPA has eliminated the concentration limit for Total Nitrogen from the Final Permit.

Comment A.2. Page 4 includes <u>average monthly</u> effluent concentration and mass limits for total nitrogen (TN) in the period from May 1 to October 1. At the November 29, 2012 meeting, EPA indicated that the new TN limit would be a <u>seasonal average</u>. Monthly average limits are more restrictive than seasonal averages, and there does not appear to be any justification provided requiring average monthly limits. In fact, the Fact Sheet provides the justification for the new TN limit, and it repeatedly refers to "average summer load" or "seasonal average" in the discussion of allowable loads to the Taunton River estuary. The first mention of "average monthly" is on Page 31 of the Fact Sheet, and no justification for average monthly limits for the smaller dischargers to the Taunton River estuary, rather than the seasonal average limit indicated for the larger dischargers, is presented. Therefore, we ask that the permit include a seasonal average TN limit instead of an average monthly limit.

Response A.2. EPA recognizes that monthly average limits are more restrictive than seasonal averages. However, while the analysis that forms the basis of the permit limits is based on seasonal average loads, EPA's permitting regulations specifically require that permit limits for POTWs be expressed as monthly average and weekly average "unless impracticable." Therefore it is not the case that EPA must provide "justification" for including average monthly limits for

smaller dischargers to the Taunton River estuary; rather, EPA must justify any decision to base permit limits on longer averaging periods.

The standard for determining whether longer term averaging period are permissible for nutrient limits is discussed in an EPA memorandum concerning nutrient limits to protect Chesapeake Bay, wherein EPA approved a proposal to include permit limits based on annual averages rather than monthly averages. The approval memorandum recognized that the Chesapeake Bay may not be unique, and that

> [t]he establishment of an annual limit with a similar finding of "impracticability" pursuant to 40 CFR 122.45(d) may be appropriate for the implementation of nutrient criteria in other watersheds when: attainment of the criteria is dependent on long-term average loadings rather than short-term maximum loadings; the circumstances match those outlined in this memo for Chesapeake Bay and its tidal tributaries; annual limits are technically supportable with robust data and modeling as they are in the Chesapeake Bay context; and appropriate safeguards to protect all other applicable water quality standards are employed.

Hanlon, J.A., *MEMORANDUM: Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System* (EPA, 2004) ("Hanlon Memo"). The circumstances identified in support of annual limits included: "the exposure period of concern for nutrients loadings to Chesapeake Bay and its tidal tributaries is very long; the area of concern is far-field (as opposed to the immediate vicinity of the discharge); and the average pollutant load rather than the maximum pollutant load is of concern." The EPA memorandum also noted the variability of nutrient treatment systems on an annual basis, stating

> the efficiency of treatment of nutrients by biological nutrient removal is highly sensitive to ambient temperature and is not effective at lower temperatures. Thus, the effluent loading of nutrients is not constant due to seasonal temperature fluctuations in northern climates. Even a simple steady-state model for permit development such as dividing the annual limit by 12 and establishing that value as the monthly limit is therefore, not appropriate. Such a limit does not account for seasonal fluctuations in effluent loading.

Hanlon Memo at 5. There are a number of similarities between the circumstances identified in Chesapeake Bay and those underlying the limits here, in that the area of concern is "far-field (as opposed to the immediate vicinity of the discharge)" and EPA's load analysis is based on an average pollutant load (here seasonal rather than annual) rather than the maximum pollutant load. On the other hand, EPA's basis for concluding that the exposure period of concern for pollutants is

very long is not as robust in this analysis as it was in Chesapeake Bay; as noted in the Memorandum there was very detailed modeling in Chesapeake Bay that demonstrated that there was no benefit to monthly average as opposed to annual average limits:

> The complex movement of water within Chesapeake Bay and its tidal tributaries, particularly the density-driven vertical estuarine stratification, is simulated with a Chesapeake Bay hydrodynamic model of more than 13,000 cells. The Water Quality Model is linked to the hydrodynamic model and uses complex nonlinear equations describing 26 variables of relevance to the simulation of dissolved oxygen, water clarity and chlorophyll a. Coupled with the Water Quality Model are simulations of settling organic material into and upon the sediments and its subsequent decay and flux of inorganic nutrients from the sediment, as well as a coupled simulation of underwater Bay grasses in the shallows.
>
> The Water Quality Model was used to examine the differences between a constant monthly load and a variable monthly load, but each at the same annual load levels. For nitrogen, the constant monthly discharge estimate is based on a scenario that assumes the level of point source loads based on a constant 5 mg/1 discharge applied against point source flow. The variable load scenario is based on the records of 54 sewage treatment plants (STPs) that discharge to Chesapeake Bay that have complete monthly records. The Total Nitrogen average concentration for each month was calculated and then converted to a concentration that would be at the same annual loads as the constant 5 mg/l case, but still preserve the observed monthly variations. Monthly changes in flow were also taken into account. The variation in monthly concentrations varied from a low of 3.76 mg/l in August to a high of 8.46 mg/l in January. The derived monthly variation equivalent on an annual basis to the constant 5 mg/l monthly loads was applied to all point source dischargers in the Chesapeake Bay watershed. Water quality results of the two scenarios were indistinguishable, no difference was seen in the achievement of Chesapeake Bay water quality criteria. A similar analysis was performed for phosphorus and the same conclusion was reached.

Hanlon Memo at 3 n.4 and 5. In addition, the seasonal variability of treatment plant performance cited in the Memorandum is mitigated in this case by the use of a seasonal limit, which is only in effect May through October. While there is still some variability in treatment performance within that time period, EPA has generally found facilities to be able to achieve 5mg/l on a seasonal basis.

Given these factors, EPA cannot conclude at this time that the use of monthly average limits is "impracticable" under 40 CFR 122.45(d). The monthly average limit is maintained in the Final Permit.

EPA notes that the November 29, 2012 meeting referenced in the comment was a pre-draft informational meeting. As EPA was at all times aware of the restrictions on longer term averaging periods, it appears that there was some miscommunication; EPA disagrees that any firm statements regarding "seasonal" as opposed to "average monthly" limits were made. It also should be noted that EPA clearly stated at that meeting that the prospective limits being discussed were preliminary and subject to change prior to the issuance of the Draft Permit.

Comment A.3. The draft permit contains average weekly concentration and mass limits for BOD5 and TSS in the period from November through April 30. The average weekly concentration limits for these two parameters are greater than the average monthly limits (45 mg/l vs. 30 mg/l), but the average monthly mass limit of 786 lbs/day is not increased proportionally for the average weekly limit. To be consistent with the concentration limits, the average weekly mass limit should be 1178 lbs/day. This appears to be a clerical error, and the intent is acknowledged in Table 2 of the Fact Sheet. Please correct this error.

Response A.3. EPA apologizes for the clerical error and has corrected the average weekly mass limit in the Final Permit.

Comment A.4. The draft permit contains revised disinfection limits. At the November 29, 2012 meeting EPA indicated that it was possible to include a transition period in the permit so that plant staff could phase in the new procedures necessary to test for E. coli, but there is no indication of this transition period in the draft permit.

Response A.4. EPA agrees that a transition period is appropriate to allow for an orderly implementation of the new procedures, and the Final Permit includes a one year transition period. During the transition period the fecal coliform limits will be in effect, and concurrent testing for fecal coliform and E. coli will be conducted. The new E. coli permit limits will go into effect one year from the permit effective date. The change has been made in footnote 6 of the Final Permit.

Comment A.5. Footnote No. 7 (page 6 of 20) requires an alarm system for indicating a service interruption or malfunction of the chlorination and dechlorination systems. It appears that this would require the Town to procure and install an automatic in-situ total residual chlorine (TRC) monitoring system, because there is no such system currently installed at the plant. The plant's current systems have been operated problem-free and with constant compliance with the plant's TRC limit, and therefore we ask that the requirement for in-situ system be deleted. If not deleted, the permit must include a schedule compliance period that will allow the Town to procure, install and startup the system.

Response A.5. The requirement in Footnote 7 of the Draft Permit for the incorporation of an alarm system into the chlorination and dechlorination systems is being included in all NPDES permits issued to POTWs in Massachusetts that

use chlorination for disinfection of their effluent, regardless of their compliance history and the age of the system(s). For clarification, EPA is not requiring that the Town install any type of continuous residual chlorine analyzer for the monitoring and recording of the chlorine concentration in the effluent, before and after disinfection. Rather, the intent of this requirement is to ensure that facilities with chlorination and/or dechlorination systems have an alarm system installed solely for the purpose of alerting WWTP personnel in the event of a malfunction and/or interruption of the chemical dosing systems (i.e., for detecting a failure of the chemical delivery system) which could potentially affect the amount of chlorination and/or dechlorination chemicals added to the effluent. This requirement shall remain in the final permit.

Nonetheless, EPA agrees that a transition period is appropriate to allow the Town to procure, install and startup the system, and the Final Permit includes a one year transition period. The monitoring system requirement will go into effect one year from the permit effective date and the Final Permit has been revised to indicate the one year deadline.

Comment A.6. Footnote No. 9 (page 7 of 20) requires that in the period from November through April, the plant should be operated to reduce nitrogen to the "maximum extent possible". Other than the clarification regarding supplemental carbon use, it is not clear what would constitute compliance (or non-compliance) with this permit requirement. As an example, what if the plant schedules maintenance on a tank outside the permit season from May – October, and therefore is not operating "all available treatment equipment."? Would that constitute a permit violation? Please provide further clarification regarding permit compliance/non-compliance and necessary maintenance regarding this footnote.

Response A.6. EPA agrees that maintenance tasks may require that certain equipment and tanks be taken off-line for periods of time and that in those cases the equipment undergoing maintenance would not be considered "available" for purposes of footnote 9 of the permit. This would apply to any period of necessary maintenance, and is limited to the period of time necessary for such maintenance to be performed.

Comment A.7. The draft permit (Page 17) includes a compliance schedule for complying with the TN and TP limits. The milestone duration for the construction phase (54-36=18 months) is inadequate given the complexity of the anticipated work and the sequencing required to keep the current plant in operation while constructing the improvements. A duration of 30-months is appropriate for the construction phase; please modify the compliance schedule accordingly.

Response to Comment A.7. EPA recognizes that the anticipated construction work is complex and that the entire construction schedule may extend longer than 18 months. However, EPA notes that the other schedule milestones are intentionally generous (two years for design and three years to initiate construction) and the Town could certainly initiate construction sooner in order to

have a longer time period. In addition, the permit does not require full completion of all facility upgrades, but only those improvements necessary to achieve the permit limits. Appropriate construction sequencing to prioritize the nutrient removal components can assist in meeting the milestones. In any case, it is EPA's general position that a five year time frame is sufficient for planning, engineering and construction, and EPA does not extend construction schedules beyond 5 years in the absence of unusual circumstances. *See* EPA, *Combined Sewer Overflows Guidance for Financial Capability Assessment and Schedule Development* (1997).

However in order to provide the Town with maximum flexibility EPA has eliminated the requirement of "substantial completion" within 54 months, while the requirement that permit limits go into effect five years from effective date remains in the Final Permit. EPA usually includes a "substantial completion" milestone prior to the scheduled effective date of the permit to allow for a period of time for startup and testing. As this permit is expected to become effective in the fall, however, eliminating this milestone will avoid the permittee being constrained to complete those upgrades midwinter when biological nutrient systems may not be effectively operated in any case, while still having the opportunity for a period of testing and operational experience prior to the permit limits coming into effect.

EPA further notes that a 30 month construction schedule could be achieved by moving up the milestones for design and/or initiation of construction. As the permittee could implement that change on its own consistent with the permit requirements, EPA has not made that change in the Final Permit so as to allow the town maximum flexibility consistent with the permit requirements. EPA encourages the Town to establish a design and construction schedule that meets its needs consistent with the permit requirements.

Comment A.8. Page 10 on Fact Sheet Attachment B indicates that with different assumptions in the presented attenuation analysis, the Mansfield WPAF TN limit would vary from 3 to 7 mg/l. From the perspective of necessary capital improvements and the cost and sustainability of plant operation (including chemical and energy consumption), this range is not "relatively small" as indicated in the text. This range represents a very significant variation in plant requirements and reinforces the importance of developing limits based on a rigorous, thorough analysis. Please consider and address the assumptions made.

Response A.8. EPA acknowledges that the range of 3 to 7 mg/l represents a significant difference in cost and plant operations, although the entire range continues to represent a similarly large scale reduction in nitrogen discharges from this facility from current concentrations of approximately 19 mg/l. EPA agrees that a rigorous and thorough analysis is important for this facility and others in the watershed and disagrees with the suggestion that the existence of a recognized range of uncertainty, all of which requires substantial reduction in

pollutant discharge, is any indication that the analysis is something other than rigorous and thorough. With respect to the attenuation analysis, EPA conducted a season of field work to establish an attenuation rate for nitrogen in this watershed rather than relying on regional or literature values, and applied an attenuation figure that was site specific and data-based, and not unreasonably imprecise in comparison to attenuation figures presented in literature sources.[1] Therefore, and in the absence of any specific criticisms of the attenuation analysis aside from a desire for greater precision, EPA continues to believe that the attenuation analysis represents the best available information for assessment of nitrogen loads.

Comment A.9. Fact Sheet Page 23 indicates that the USGS LOADEST analysis was done for the period 2004-2005. Since that time, the Brockton AWRF has undergone a nutrient-removal upgrade and is discharging considerably less nitrogen that at the time this 2004-2005 data was collected. Is the use of the 2004-2005 data appropriate? The analysis should be based on recent data given the significant work in the watershed. The analysis presented in the Fact Sheet used 1303 lb/d as the nitrogen load from the Brockton WWTF in 2004-05, but the Fact Sheet indicates that in 2012 the Brockton WWTF discharged only 572 lb/day. A comparison of the Sonde data provided from 2005 and 2010 could indicate that *chlor a* has been significantly reduced. So perhaps the problems have diminished, and a reduction in TN from Mansfield is no longer required. Please update the analysis based on recent data.

Response to Comment A.9. The USGS LOADEST and other elements of EPA's analysis were based on 2004-05 data because that is the time period for which a comprehensive dataset is available. The Mount Hope Bay Monitoring Program of 2004-06[2] included monthly or more frequent sampling at 22 sites across Mount Hope Bay and the Taunton River Estuary, as well as of the freshwater inputs from the Taunton, Three Mile, Assonet, Segregansett, Quequechan and Cole Rivers. An extensive array of parameters were monitored and reported, including Total Nitrogen, Ammonia-N, Nitrate and Nitrite, Dissolved Inorganic Nitrogen, Dissolved Organic Nitrogen and Total Organic Nitrogen, Chlorophyll-a, Dissolved Oxygen concentration and percent saturation, Total Suspended Solids, Salinity, Secchi Depth, Orthophosphate and Total Organic Carbon. More recent data is much more limited. There is continuing water quality information through 2011-12 from a single site in Mount Hope Bay that includes datasonde DO, Chlorophyll and Salinity data along with monthly sampling data, and the Narragansett Bay Commission has conducted monitoring of a site at the Berkley Bridge on the Taunton River (within the estuarine portion

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[1] For example, the regional regression model presented in Moore et al., *Estimation of Total Nitrogen and Phosphorus in New England Streams Using Statistically Referenced Regression Models*, USGS SIR-2004-5012, provided an in-stream loss variable of 0.78 d^{-1} with a standard error of 0.49; this results in a range of predicted sewer loads in the Matfield River downstream of Brockton from 90,000 to 794,000 kg/yr (mean 230,000). *See* dataviewer and data links at http://vt.water.usgs.gov/projects/sparrow/index.htm

[2] 2006 was not included in the load analysis due to the extreme wet weather in spring of that year that was inconsistent with the steady state analysis; see Fact Sheet at 23 n.7.

of the river), although that monitoring did not include TN until 2013 (prior to 2013 were analyzed for Total Dissolved Nitrogen species only).[3]

In this context the 2004-05 period is used as a baseline for analysis, and projections concerning the impact of load reductions are made based on the analysis of the comprehensive dataset. This is the process used to determine permit limits (i.e. identifying a threshold allowable nitrogen concentration and determining the load reductions necessary to achieve that concentration), so projection of the impacts of nitrogen load reductions to future conditions was an essential part of EPA's analysis. To the extent more recent data is available, it can be used for comparison to the baseline analysis, with appropriate caution to ensure that the data is comparable and that the inherent variability of conditions being measured is taken into account.

Thus, in the Fact Sheet EPA noted that there had been some reductions in nitrogen load, specifically in connection with the upgrade to the Brockton AWRF, but that the reduction was not expected to be sufficient to resolve the water quality issues and that 2010 datasonde data from Mount Hope Bay indeed showed continued high chlorophyll and low DO consistent with continuing nitrogen impacts. To more specifically quantify that analysis, the City of Brockton's upgrade to its treatment plant, completed in 2010, has resulted in a significant decrease in total nitrogen loads of about 700 lb/d as of 2010. The total reduction in WWTP loads to the Taunton River Estuary has been approximately 25%, although the reduction in total TN load (including nonpoint sources) is less (about 17%). EPA's load reduction analysis, in comparison, indicates that a 51% decrease in total loads is necessary in order for water quality standards to be met in the estuary. Therefore, the Brockton load reduction, while commendable, is not expected to be sufficient to address eutrophication impacts downstream, and the limited available data, although located in Mount Hope Bay (datasonde), indicates continuing water quality issues consistent with EPA's conclusions.

Other recent data, not discussed in the Fact Sheet, is also consistent with EPA's analysis. Datasonde data for 2011 has been published and indicates continued elevated chlorophyll-a concentrations, corresponding periods of supersaturated DO at the surface, persistent bottom DO concentrations below 5 mg/l and frequent excursions below 3 mg/l. *See* Figure 9. This is consistent with EPA's determination that nitrogen reductions to date are not sufficient to resolve water quality issues.

[3] This latter dataset was not discussed in the Fact Sheet for this permit but was brought to EPA's attention by the City of Taunton in its comments on the draft Taunton WWTP permit.

Figure 9a. Surface Chlorophyll and DO percent at MHB sonde, 2011

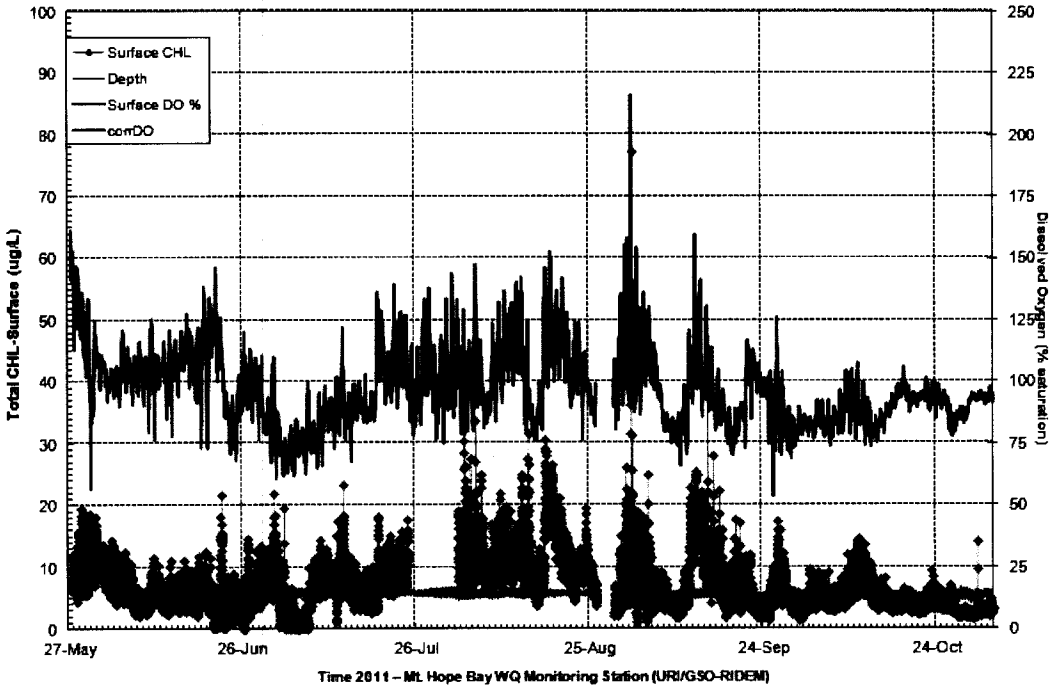


Chart by URI/GSO-RIDEM. Chart and data available at www.dem.ri.gov/bart

Figure 9b. DO concentration at surface and bottom, MHB sonde, 2011

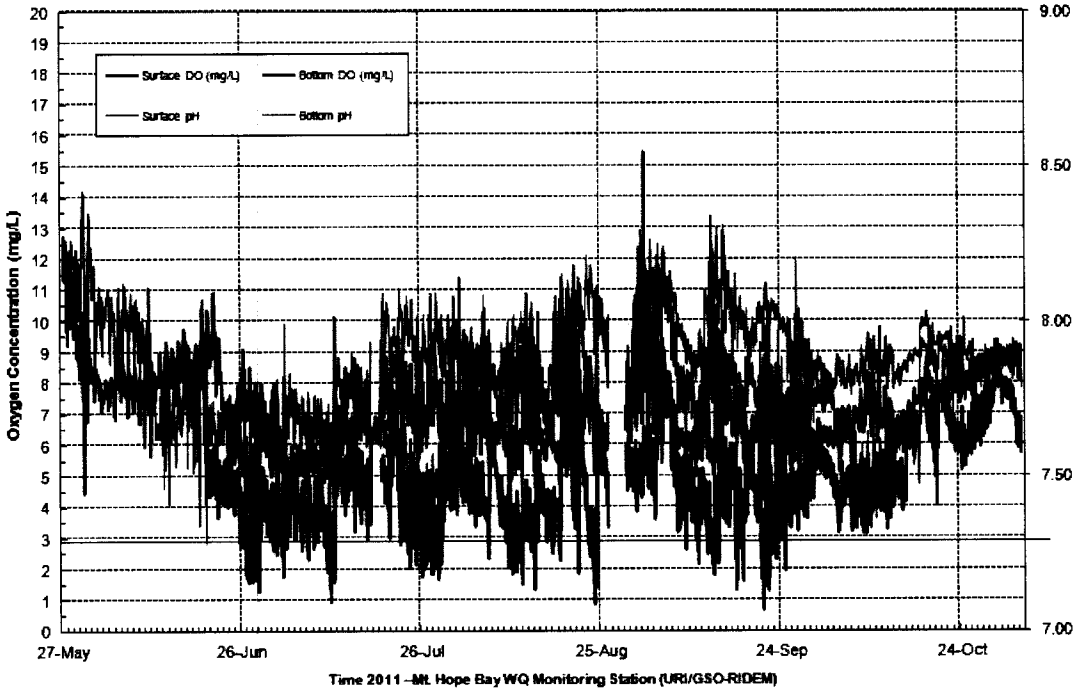


Chart by URI/GSO-RIDEM. Chart and data available at www.dem.ri.gov/bart

Other recent data is not directly comparable to EPA's analysis, but was examined to the extent possible for consistency with EPA's analysis. NBC monitoring of the Taunton

River began in 2006 and was limited to Total Dissolved Nitrogen (TDN) parameters until 2013. The results for TDN are not expected to be directly comparable to TN analyses, but to exhibit similar trends. A review of NBC monitoring from 2006 to 2013 indicates that those data appear consistent with a reduction in total Taunton River loads, although the variability of the data makes statistically significant results elusive. Figure 9c shows TDN concentrations over time along with a MS Excel-generated trendline; a slight decline is indicated but with extremely low statistical significance.

Figure 9c. NBC Taunton River monitoring, all TDN datapoints 2006-13

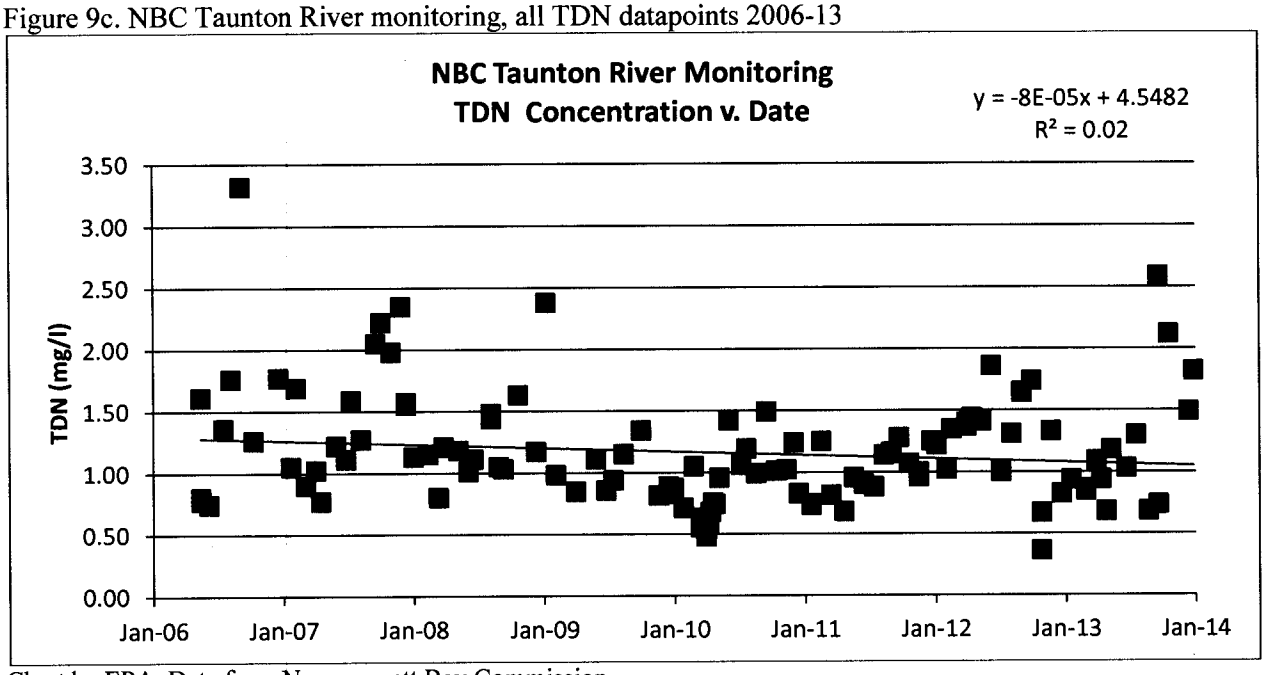


Chart by EPA. Data from Narragansett Bay Commission, http://snapshot.narrabay.com/app/MonitoringInitiatives/NutrientMonitoring

EPA then looked at a subset of the NBC data where WWTP nitrogen reductions would be expected to have the most impact in order to assess whether the load reduction is discernible in the data. WWTP reductions are likely to be most pronounced in low flow conditions and during warm weather when biological treatment processes are most effective. Therefore, a comparison of warm weather low flow[4] data between the periods 2006-09 and 2010-13 is presented in Figure 9d below. The median TDN concentration in the 2010-2013 period is 1.125 mg/l, 23% less than the 1.46 mg/l median in 2006-09. This is reasonably consistent with the scale of reduction predicted in EPA's analysis, as the reduction seen in low flow conditions should be greater than the reduction in total loads (calculated by EPA as 17%) but somewhat less than the reduction in point source loads alone from Brockton's upgrade (30%). The NBC monitoring does not include any eutrophication indicators in the Taunton River Estuary or Mount Hope Bay, so their data cannot be used for assessment of the response of this system to the load reduction.

[4] Here low flow is defined as less than 200 cfs at the USGS Bridgewater gage; this represents conditions where Brockton AWRF effluent is approximately 10% or more of Taunton River flow at Bridgewater.

Figure 9d. NBC Taunton River monitoring at low flows, 2006-13

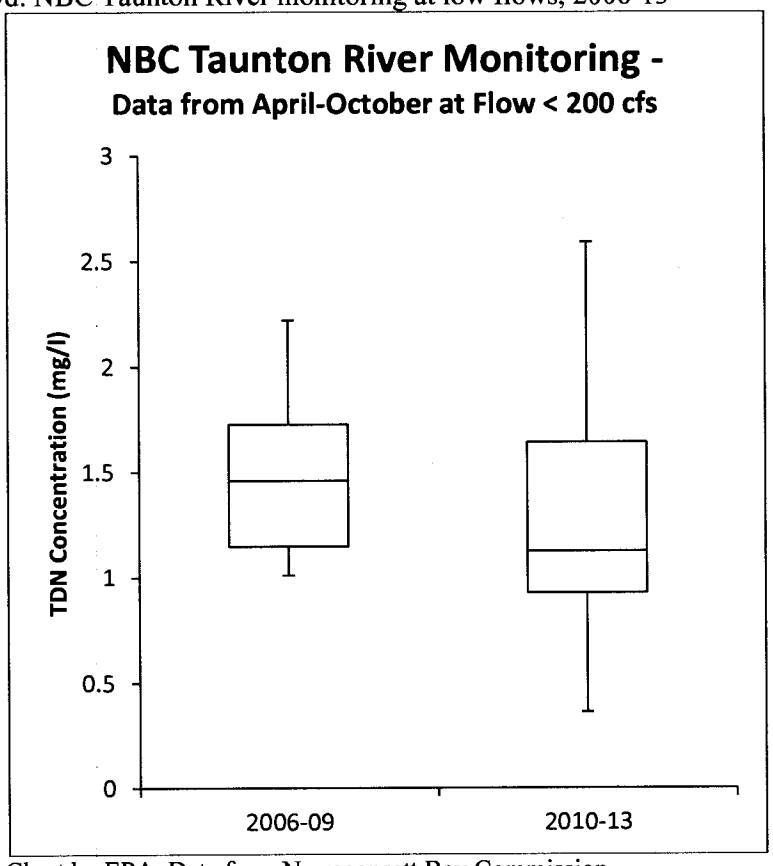


Chart by EPA. Data from Narragansett Bay Commission, http://snapshot.narrabay.com/app/MonitoringInitiatives/NutrientMonitoring

Second, unpublished monitoring data collected by the University of Rhode Island Graduate School of Oceanography (URI-GSO) at a single site in Mount Hope Bay includes measurements of Total Nitrogen that are significantly lower than those measured in the SMAST 2004-06 monitoring program used by EPA for the single year of overlapping data at nearby sites (2006 – SMAST average 0.58 mg/l; URI-GSO average 0.35 mg/l), with lower TN concentrations continuing in more recent URI-GSO data. See Figure 9e below. On their face these data do appear inconsistent with the data relied upon by EPA. The difference may be partly explained by the fact that the locations of the monitoring sites are not exactly the same, and they were collected under differing tidal conditions (the SMAST data at mid ebb tide, when concentrations are expected to be highest, versus URI data collected under a range of tidal conditions), although it is not clear that those differences would explain such a large difference in TN concentrations. The differing data does not, however, indicate a change in conditions between 2004-6 and the present; URI reported concentrations have been generally consistent over the 2006-2011 time period and were lower than the SMAST data in the overlapping year.

Figure 9e. Comparison of SMAST (2004-05) and URI-GSO (2006-11) data

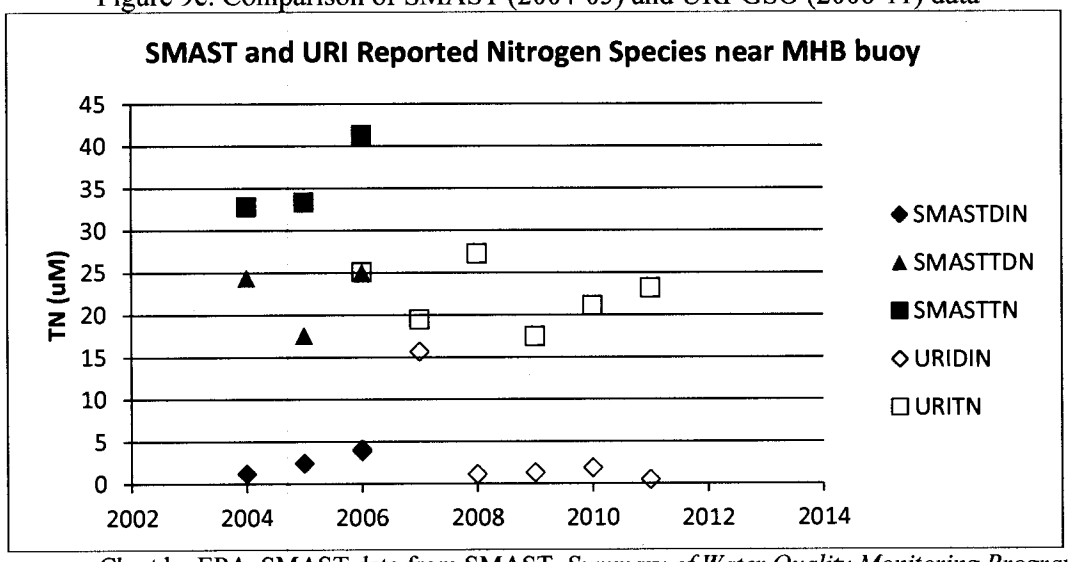


Chart by EPA. SMAST data from SMAST, *Summary of Water Quality Monitoring Program for the Mount Hope Bay Embayment System (2004 – 2006)* (2007) ; URI-GSO data tables from personal communication, Professor Candace Oviatt (see also Krumholz, *Spatial and Temporal Patterns in Nutrient Standing Stock and Mass-Balance in Response to Load Reductions in a Temperate Estuary* (2012); Decautis and Pryor, *Nutrient Conditions in Narragansett Bay & Numeric Nutrient Criteria Development Strategies for Rhode Island Estuarine Waters (Draft)* at 35 (2011)).

EPA has concerns about the comparability of these data. Not only are results inconsistent for the one overlapping year, but the low TN concentrations reported by URI-GSO in some time periods appear simply implausible. For example, TN concentrations were recorded as averaging 0.22 mg/l TN in June-September 2009, a period in which average chlorophyll concentrations measured at the datasonde were 13 ug/l. However analysis of Narragansett Bay data has indicated that particulate organic nitrogen (PON) concentrations, a subset of TN, are generally 20 to 50 times the chlorophyll concentration. Decautis and Pryor, 2011 at 25. The expected PON in 2009 therefore would be a minimum of 0.26 mg/l – higher than the reported TN concentration even without accounting for dissolved organic nitrogen or inorganic components. *Id.* The data appears more consistent with an exclusion of certain nitrogen species, and in fact the URI data closely matches the total dissolved nitrogen reported by SMAST in the overlapping year (as well as having similar DIN results).

EPA notes that if the TN concentrations report by URI-GSO were representative of the Bay, the persistence of elevated chlorophyll-a concentrations and dissolved oxygen violations as shown by other data would indicate that target TN concentrations should be set lower than the 0.45 mg/l identified by EPA in this permit proceeding. However given the data comparability concerns described above, and the consistent procedures used in the comprehensive dataset that underlies EPA's analysis, EPA is not revising its determination based on these data. EPA encourages further monitoring and particular attention to the intercomparability of datasets among different researchers.

Comment A.10. Fact Sheet Page 29 indicates that an assumed summer flow of 90% of design flow was used. The actual plant flow records are available from each plant in the Taunton River basin and we suggest that these should be used in the analysis. Note that the Mansfield WPAF's summer flow is closer to 80% of the annual average flow and this should be considered in the analysis.

> **Response A.10.** EPA disagrees with the suggestion. The 90% value was used as a projection of summer flow under future conditions where the facility is operating at design flow on an annual average basis. It was not used to characterize past or current flow patterns. While the facility historically may be closer to 80% of annual average during the summer, the town is engaged in a continuing process to address infiltration and inflow in its collection system. I/I reductions would be expected to reduce wet weather flows to the treatment plant and thus reduce the difference between summer and annual flows. If load allocations are based on historic figures, improvements to I/I would provide room for additional sanitary flow and related nutrient loads that are not accounted for in the analysis, and therefore would not be sufficiently protective under projected future conditions.

Comment A.11. Fact Sheet Page 30 indicates that the other facilities' nitrogen limits may differ from those presented in Table 10. How can a TN limit be set based on this table, which is a basin-wide allocation, if the values in the table may change?

> **Response to Comment A.11.** The specific reference in the Fact Sheet is to the fact that there are a number of alternative allocations of the allowable load to the Taunton River Estuary that would meet water quality requirements, and new information provided in connection with individual permit issuances could result in modifications of the allocation within the general framework of the total allowable load. This has already occurred between the Taunton and Mansfield draft permit issuances, as discussed in Response to Comment A.12. Nonetheless EPA emphasizes that as this allocation is being implemented through individual permits rather than through a separate Wasteload Allocation or TMDL, it is essential that individual permittees be provided with a meaningful opportunity to comment on their allocation and permit limits. While EPA does not expect major changes in the allocation as the individual permit issuances go forward, EPA is considering any additional information provided by individual facilities and other commenters, whether it is specific to the individual facility (e.g. site specific information on plant capacity, attenuation, or other factors) or on the allocation as a whole.

Comment A.12. Note that the Fact Sheet attached to the courtesy draft for Mansfield is not consistent with the Fact Sheet attached to the recently advertised Taunton WWTF draft permit in regards to establishing the basis for the TN limit. There are many text variations, and importantly the draft Taunton WWTF permit anticipates assigning the Mansfield WPAF at 5.5 mg/l TN limit. Why are the fact sheets inconsistent and why

didn't the Mansfield WPAD draft NPDES permit include a 5.5 mg/l TN as previously indicated in the Taunton draft NPDES permit?

> **Response A.12.** As stated in the draft Taunton WWTF permit Fact Sheet, the allocation presented therein was one of a number of possible allocations of load among the multiple facilities discharging in the Taunton River watershed. That Fact Sheet specifically stated that the actual permit limits for individual facilities other than the Taunton WWTF were not being decided in the Taunton WWTF proceeding and would be determined in connection with the individual permit reissuances for each facility.
>
> As the comment states, one possible allocation of loads among contributing facilities would result in a permit limit of 5.5. mg/l TN for the Mansfield WPAF, if the Somerset WWTF were assigned a permit limit of 3.0 mg/l. Upon further consideration of the appropriate allocation, EPA took note of the fact that 3 mg/l represents the limit of technology for nitrogen removal and can represent a significant challenge to achieve on a consistent basis. In contrast 5.0 mg/l has been recognized by EPA as representing a technology threshold achievable with a number of biological nutrient removal technologies, with a slightly higher 5.5 mg/l target representing opportunity for greater operational flexibility. In that context EPA determined that the required pollutant reduction would be more readily and consistently achieved by requiring Mansfield to achieve the 5 mg/l technology threshold, with Somerset's limit at a less stringent level than the current limit of technology.

Comment A.13. The calculations for the phosphorus limit do not appear to be correct. First, the formula as shown on page 33 of the Fact Sheet is in error – the last plus sign in the numerator should be a minus sign. Secondly, when corrected for this fact, the calculation results in a value of 0.17 mg/l, not 0.15 mg/l. If the Wheaton College flow is included, the value rises to 0.18 mg/l. All values in the permit that reflect this error should be corrected, including the mass based limits.

> **Response to Comment A.13.** EPA agrees that there is an error in the calculation of the phosphorus limit and that the result of that equation should be 0.17 mg/l rather than 0.15 mg/l. With respect to Wheaton College's flow, the current flow from Wheaton College is already part of the 7Q10 streamflow in the equation; while under design flow conditions the flow would be slightly higher the effect is small (a change of about 0.002 mg/l in the calculated effluent limit). The Final Permit therefore includes a corrected permit limit of 0.17 mg/l, which a corresponding mass limit of 4.45 lb/day.
>
> EPA notes that the calculation is dependent upon the concentration in the Three Mile River upstream of the discharge, but that there is no upstream monitoring data available. Therefore data from upstream tributaries were used, and adjusted to reflect the upstream wastewater load from Wheaton College. EPA believes these assumptions regarding upstream concentrations are reasonably conservative

and reflect reasonable projections of growth in upstream loads. However EPA will continue to reassess available data on upstream concentrations in the Three Mile River in future permit reissuances and will make necessary changes warranted by the data, including more stringent permit limits on Wheaton College if appropriate (assuming Wheaton College does not tie into the regional facility).

Comment A.14. Note that Table 3 is inconsistent with footnote 18 of the Fact Sheet that indicates that the allowable phosphorus load would increase to 4.1 pounds per day if Wheaton College connects to the system. But both values are in error based on Comment No. 13 above. Please address.

Response A.14. EPA is not clear where the figures are "inconsistent" as both Fact Sheet footnote 18 and Table 3 contain the 4.1 lb/day figure. As set forth in Response A.13. the permit limit for phosphorus is revised to 0.17 mg/l; this would result in a 4.6 lb/day load limit should Wheaton College connect to the system and terminate its discharge.

Comment A.15. Page 3 lists a flow limit of 3.14 mgd on a rolling annual average basis. At a November 29, 2012 meeting to discuss the pending draft permit, EPA indicated that when/if the 0.12 mgd permitted flow from Wheaton College is connected to the Mansfield system, a permit modification would be required (and would be permissible) to increase the allowable flow to 3.26 mgd. At that time, the mass limits associated with this permitted flow rate should also be increased proportionally. The fact sheet (page 6, second paragraph) acknowledges that the flow increase would be allowable, and Table 3 indicates that the allowable mass loads would also be increased proportionally. Please confirm.

Response A.15. Yes, at such time that Wheaton College is connected to the Mansfield system and terminates its discharge, a permit modification will be required and would be permissible to increase the allowable flow to 3.26 mgd, and the mass limits would also be increased proportionally as set forth in Revised Fact Sheet Table 3 above. EPA would consider this a "material and substantial alteration or addition to the permitted facility or activity" under 40 CFR 122.62(a)(1) that would justify a modification.

EPA notes that should such a tie-in fail to occur within the five year term of this permit but take place after this permit expires, a new permit reissuance will be required to implement the addition of the Wheaton College flow to the permit flow and mass limits.

Comment A.16. Page 3 of the Fact Sheet indicates that the Three Mile River has been identified (on the 303d list) as impaired due to pathogens, but <u>not nutrients</u>. That being the case, why are the Mansfield WPAF phosphorus limits being made more stringent? Page 32 of the Fact Sheet says "EPA is not aware of any assessments of eutrophication indicators or conditions downstream of the Mansfield WPAF since implementation of the permit limit . . . . EPA has calculated a new limit for this Draft Permit designed to meet

water quality standards in the Three Mile River." However, this appears to conflict with the 2012 303d list that includes no indication that the Three Mile River is impaired due to nutrients. We also note that the Fact Sheet states on Page 18 that in the Taunton River "molar N/P ratios are consistent with nitrogen limitation". Please address.

Response A.16. The setting of permit limits in NPDES permits is not dependent on 303(d) listing determinations. This is necessary as the standard for imposition of a water quality-based permit limit under 40 CFR 122.44(d) (a permit limit is necessary if a discharge of pollutant "causes, has reasonable potential to cause, or contributes") is different from that under the 303(d) list which is dependent on documented evidence of existing use impairments, generally based on limited sampling data. As different standards apply to permit and 303(d) list determinations, there is no "conflict" between the permit limit and the lack of a nutrient impairment listing. However EPA notes that the state's Water Quality Assessment Report for the Three Mile River identified the Aquatic Life Use in this segment with an "Alert Status" based in part on phosphorus concentrations. (*2001 Taunton River Water Quality Assessment Report* at 162-63; this is the most recent water quality assessment report and the basis for the 303(d) listing determinations in this watershed). This indicates the state's concern with the potential for phosphorus-related water quality impairments in this segment, consistent with EPA's "reasonable potential" finding.

Having found that "reasonable potential" exists, EPA is obligated to impose a permit limit that will "ensure that discharges do not cause or contribute to violations of water quality standards." 40 CFR 122.44(d) The more stringent phosphorus limit in the Draft Permit is based on a threshold phosphorus concentration of 100 ug/l in the receiving water, calculated under 7Q10 conditions pursuant to the Massachusetts Surface Water Quality Standards. This is an appropriate basis for determination of a water quality-based limit and replaces the less stringent limit than the 0.2 mg/l in the prior permit, which was based on "highest and best practical treatment" under 314 CMR 404(3) rather than a water quality-based calculation.

The reference to "nitrogen limitation" on page 18 is related to conditions in the estuarine portion of the Taunton River. The freshwater portions of the Taunton River (approximately upstream of Weir Village in Taunton) are not nitrogen-limited.

Comment A.17. Page 4 of the Fact Sheet refers to the anti-backsliding requirements of CWA 402(o) and 40 CFR §122.44(l). If a true TMDL of this estuary system is ever done in the future and the resulting waste load allocations are higher than what the results of analysis presented in the Fact Sheet, will it be possible to increase the Mansfield WPAF permit limits?

Response to Comment A.17. The permittee is correct that any change in permit limits to limits that are less stringent than those in this Final Permit would have to

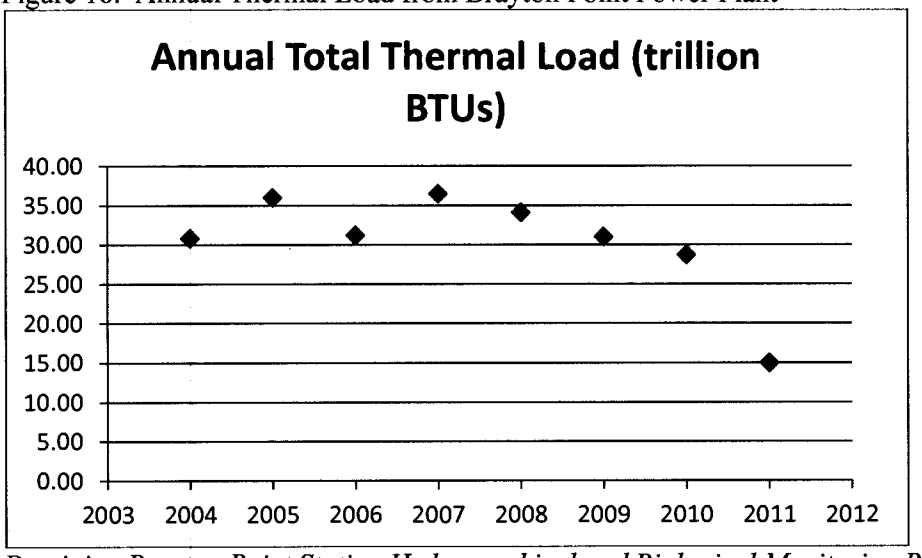
comply with the anti-backsliding requirements of CWA 402(o) and 40 CFR 122.44(l). The anti-backsliding requirements do not represent an absolute bar to less stringent permit limits, but have some exceptions. This includes an exception for new information under CWA § 402(o)(2)(B)(i) ("Information is available which was not available at time of permit issuance (other than revised regulations, guidance or test methods), and which would have justified a less stringent limitation at the time of permit issuance."). This exception is subject to the limitation that water quality-based effluent limitations may not be made less stringent based on "any revised waste load allocation or any alternative grounds for translating water quality standards into effluent limitations" except where the revised allocation "results in a decrease in the amount of pollutants discharged" and is "not a result of a discharge eliminating or substantially reducing its discharge of pollutants due to compliance with [the CWA] or for reasons otherwise unrelated to water quality."

EPA cannot in this Response address all possible circumstances of a hypothetical future development, so it cannot provide a firm answer as to how a TMDL would be implemented in the effected permits with respect to antibacksliding requirements. However, EPA notes that given the requirement that any revision "result in a decrease in the amount of pollutants," and the general reading of antidegradation requirements in Massachusetts to require facilities to achieve permit limits at least as stringent as their past performance (see Fact Sheet copper discussion), EPA expects that once the facility upgrade is completed and the facility is achieving the permit limit, no change to a less stringent limit would be approved.

Comment A.18. Page 15 of the Fact Sheet references the Brayton Point Power Plant and "temperature impairments", which may have influenced water quality in Massachusetts with incoming tides. Our understanding is that only recently has the plant stopped discharging high temperature water into the Bay – perhaps this is the difference in chlor a measured by the NBC sondes between 2005 and 2010. Has this reduced impact been considered?

Response A.18. Differences in Mount Hope Bay conditions between 2005 and 2010 would not be explained by changes in thermal loads from Brayton Point Power Plant, as the major recent reduction in thermal loads did not take place until 2011. Figure 18 below shows the annual thermal load from 2004 through 2011 as summarized by the facility; 2010 thermal loads are similar to those in preceding years.

Figure 18. Annual Thermal Load from Brayton Point Power Plant



Dominion Brayton Point Station Hydrographical and Biological Monitoring Program 2011 Annual Report at 1-12.

Thermal loads were reduced as of 2011, and EPA did consider the possibility of reduced eutrophication impacts due to changes in thermal loads. While in theory higher temperatures could have some impact on algal dynamics, there is no indication of a significant effect in Mount Hope Bay and impact on chlorophyll is not among the water quality factors considered significant in the Brayton Point permitting proceedings. Sonde data from 2011 shows continued eutrophication indicators including elevated chlorophyll concentrations, corresponding periods of supersaturated DO at the surface, persistent bottom DO concentrations below 5 mg/l and frequent excursions below 3 mg/l. See Figure 9a and b. The available data does not support the theory of a "reduced impact" as suggested in the comment.

Comment A.19. Page 30, Table 9 of the Fact Sheet indicates that the % load delivered to the estuary from the various treatment plants ranges from 83% to 96%. This implies a level of accuracy that doesn't exist based on the analysis approach and the assumptions used. How would the imprecision inherent in the analysis impact the eventual permit limits?

Response A.19. The Fact Sheet reference to the range of load delivery factors refers to the range of delivery factors applied to the different facilities based on the distance in river miles of attenuating stream. Thus the range is not intended as a measure of accuracy but as a reflection of the different level of attenuation of discharges that are different distances from the estuary. EPA does not believe the Fact Sheet "implies" a level of accuracy for the specific delivery factors that does not exist; the basis for the attenuation figures is set forth in great detail in Attachment B to the Fact Sheet, which addresses both the uncertainty and the impact of imprecision on the eventual permit limits. Indeed the permittee

commented on the range of permit limits in Comment A.8. See Response A.8. for further discussion of the impact of uncertainly on permit limits.

Comment A.20. Fact Sheet Page 40, Paragraph 2, refers to a "previous draft permit". We are not aware of any previous drafts for this permit cycle. Please clarify this reference.

Response A.20. EPA apologizes for the error in references on Page 40 which applied to the Taunton WWTP; the reference to a "previous draft permit" should have been deleted. The Fact Sheet is a final document and not subject to correction but EPA notes the error for the record.

Comment A.21. Fact Sheet Page 40, Paragraph 3, mistakenly refers to the Taunton WWTF. Please correct.

Response A.21. See Response A.20.

Comment A.22. Note that the Outfall 001 location shown in Figure 1 is incorrect; the discharge is from the southwest corner of the site.

Response A.22. A corrected Figure 1 is included as an attachment to this Response to Comments.

B. The Nature Conservancy submitted comments by letter dated August 27, 2013.

The Nature Conservancy is an international, nonprofit conservation organization. Our mission is to conserve the lands and waters on which all life depends. Our work is carried out in all 50 states and over 30 countries, and is supported by over 36,000 members in Massachusetts and Rhode Island and over one million members worldwide. The Conservancy works globally on freshwater and coastal science and management to help government agencies, water management agencies, industry, scientists, and other non-governmental organizations around the world to improve ecosystem health and implement sustainable solutions.

The Taunton River is the longest free flowing coastal river in New England, with tidal influence reaching nearly 20 miles inland from Narragansett Bay. This extent of tidal influence maintains large, high quality, and globally rare brackish and freshwater tidal marshes. The river supports populations of environmentally-sensitive species such as river otters and freshwater mussels; three globally rare species of plants and two globally rare fish, bridle shiner and Atlantic sturgeon, inhabit the watershed. The Taunton River provides important habitat for one of the largest spawning populations of river herring in New England and populations of other fish that play a critical role in supporting marine food webs. The River was designated Wild and Scenic in 2009, to protect six outstanding resource values: agriculture, ecology and biodiversity, estuary, fisheries, history and archaeology, and recreation.

Nutrient pollution from upstream wastewater is widely recognized as a major source of impairment for Narragansett Bay and other estuaries throughout the region. The Conservancy is committed to efforts to reduce reactive nitrogen levels in this region because of persistent problems related to excessive nitrogen including widespread algal blooms causing shellfish harvest closures, low dissolved oxygen levels, and loss of eelgrass.

From Nantucket Sound to Block Island Sound to Great South Bay, NY, The Nature Conservancy is investing in estuarine restoration focused on salt marsh, seagrass, oysters, bay scallops, hard clams, and diadromous fish habitat. However, monitoring and research have shown that to be truly effective at scale, restoration success requires improved water quality to support a diversity and abundance of native species and habitats. Limiting nitrogen from wastewater treatment facilities is a high priority for the Conservancy in our efforts to improve water quality and thus ecosystem health in the region's estuaries.

The Nature Conservancy supports the draft NPDES permit, and we agree with EPA that these limits are necessary to achieve water quality standards in the Three Mile River and downstream waterways, and that the limits are justified by the best available science. Requiring the Mansfield facility and other dischargers to meet these new limits will help to protect and improve water quality in the Taunton River watershed and associated estuary. We view this permit as a key piece of a comprehensive and watershed-wide approach to restoring the environmental conditions of the Taunton River estuary.

While the Conservancy strongly supports the 5.0 mg/l total nitrogen seasonal limit described in the draft permit as a step towards improving water quality, a stricter seasonal limit of 3.0 mg/l total nitrogen, reached over time, may be necessary to meet water quality standards. As the draft permit describes, recent monitoring by the University of Massachusetts School for Marine Science and Technology (SMAST) has shown elevated total nitrogen concentrations in the Taunton River Estuary and Mount Hope Bay. SMAST and Narragansett Bay Water Quality Network monitoring data have also shown other indicators of eutrophic condition, including low dissolved oxygen and elevated chlorophyll-a concentrations. Based on these data, EPA has concluded that excess nitrogen in the Taunton River Estuary and Mount Hope Bay has reached the level of a violation of state water quality standards for nutrients and aesthetics, and has subsequently determined a nitrogen limit is necessary to meet water quality requirements. The Mansfield facility currently constitutes 7% of the total watershed nitrogen load; a 51% reduction in nitrogen from the watershed, allocated among several sources, is needed. We agree that a numerical limit on total nitrogen should be included in the permit, and commend the use of recent local data to determine the limit. However, this limit is based on assumptions regarding future reductions in nonpoint source pollution and other point source reductions, in-stream nitrogen attenuation, and dilution within the estuary. To reach water quality conditions that will support historic eelgrass habitat and the general ecological health of Mount Hope Bay, the Conservancy recommends consideration of a 3.0 mg/l season nitrogen limit. The Nature Conservancy is also supportive of other source reductions and limits needed to reach the overall required load reduction, including reductions in nonpoint source pollution.

The Conservancy is supportive of measures to protect and restore the water balance in the Taunton River watershed, consistent with goals of the 2008/2011 Taunton River Watershed Study and the 2004 Massachusetts Water Policy. We encourage careful consideration of flow limits for wastewater treatment plants in the watershed, to restore water balance and promote groundwater recharge, as well as to maintain consistency with anti-degradation regulations to prevent increased discharge of pollutants to already impaired waters. Therefore, we support maintaining the current flow limit of 3.14 MGD for the Mansfield facility.

In coalition with associations representing municipalities and water suppliers, The Nature Conservancy has supported public policy and funding for municipal infrastructure related to water quality including leading the legislative advocacy efforts to create a $20 million loan fund for dam removal and repair and advocating for capital funding legislation to implement the recommendations of the Water Infrastructure Financing Commission. The Conservancy will continue to help ensure public funding and incentives are available to help communities protect clean water to benefit people and the environment.

Response B. EPA acknowledges the Nature Conservancy's support for the draft NPDES permit and agrees that nitrogen limits on this facility and others in the watershed are essential for restoring this estuarine ecosystem.

With respect to the recommendation that EPA consider a 3.0 mg/l nitrogen limit, EPA notes that it did consider a range of permit limits for this facility and that 3 mg/l is within the range of uncertainty of EPA's analysis (as are higher limits, e.g. 7 mg/l). It is EPA's technical judgment that the best available information supports a 5 mg/l permit limit for this facility and that the unavoidable presence of some uncertainty in the analysis does not necessitate the imposition of a limit of technology permit limit on this facility. The projected future nonpoint source and other point source reductions are achievable through ongoing permit reissuance (WWTPs and MS4 permits), atmospheric nitrogen reductions (see Chesapeake Bay TMDL Appendix L), and trends in agricultural land uses in the watersheds, although EPA agrees that continuing monitoring and analysis will be needed to assess both load reductions and the response of the estuary to the reduction in nitrogen loads. If additional monitoring and analysis indicate the need for further reductions in nitrogen loads, including if nonpoint source reductions are not achieved, lower limits may be needed in future permit reissuances.

EPA acknowledges the Conservancy's support for maintaining the current flow limit of 3.14 MGD for the Mansfield facility. EPA notes that it does not understand this comment as an objection to EPA's approach to the tie-in of Wheaton College (adding the permitted Wheaton College flow to Mansfield for a total permitted flow of 3.26 MGD), which will not result in an increase in total permitted flow to the watershed and will provide improved treatment for Wheaton College flow. To the extent that the Conservancy is objecting to the treatment of Wheaton College, EPA disagrees with the comment. EPA notes that the Town of

Mansfield has not requested a flow increase and is planning to accommodate its future wastewater disposal needs through groundwater discharge, an approach EPA has supported.

C. The Town of Norton submitted comments by letter dated August 28, 2013.

Comment C.1. The Town of Norton, as a Co-Permittee under Parts 1.B and part 1.C. of the draft NPDES permit for the Town of Mansfield Water Pollution Abatement Facility wants to reaffirm and support the comments made in the August 27, 2013 letter from the Town of Mansfield to your office concerning the Draft Permit.

Response to Comment C.1. EPA acknowledges the Town of Norton's support for the comments from the Town of Mansfield. See Responses A.1 through A.22 for specific responses to those comments.

Comment C.2. In addition, we want to let you know that Norton's discussion with representatives of Wheaton College are progressing toward the College connecting to the Mansfield Sewer System as discussed in Paragraphs 13 through 15 of the Mansfield comment letter. With regard to Paragraph 15, in the Mansfield letter, we want to verify that the mass loads will be increased proportionally based on the Wheaton permitted discharge and not the lesser flow proportional (3.26/3.14) increment.

Response C.2. EPA does not understand the distinction being made by the Town of Norton between "proportionally based on the Wheaton permitted discharge" and "the lesser flow proportional (3.26/3.14) increment." In EPA's view there are two basic approaches to the calculation of mass limits: (i) an additive approach that adds Wheaton College's mass limits to those of the Mansfield WPAF, and (ii) a proportional approach whereby the Wheaton College permitted flow is added to that of the Mansfield WPAF, with the mass limits increased proportional to the flow increase. EPA's approach is a proportional one; the revised mass limits are calculated using the same concentration limit but with a flow of 3.26 mgd instead of 3.14 mgd. This is the same as scaling the mass loads up by a factor of 3.26/3.14. The resulting permit limits are set forth in the Fact Sheet Table 3. Response A.15 confirms EPA's intent to modify the permit to reflect these changes upon tie-in and termination of Wheaton College's flow to the Mansfield WPAF.

Comment C.3. The only other issue that we wish to call your attention to at this time is the correct address for the Norton Water and Sewer Department, which is now located at 166 John Scott Boulevard in Norton.

Response to Comment C.3. The address for the Norton Water and Sewer Department has been updated in the Final Permit and EPA's files.

Other Changes to the Final Permit

EPA has become aware that the requirement to submit reports as electronic attachments to DMRs using NetDMR has created confusion as to report due dates, as report due dates generally differ from the DMR due date (the 15th of each month) and NetDMR does not allow submission of a report without a concurrently submitted DMR. Therefore, to assist in electronic reporting, EPA has added language to the Final Permit (Section I.G.1.a) stating that such reports shall be considered timely so long as they are electronically submitted with the next DMR due following the report due date specified in the permit.

NPDES PART II STANDARD CONDITIONS
(January, 2007)

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NPDES PART II STANDARD CONDITIONS
(January, 2007)

PART II. A. GENERAL REQUIREMENTS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

a. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.

b. The CWA provides that any person who violates Section 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any of such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Section 402 (a)(3) or 402 (b)(8) of the CWA is subject to a civil penalty not to exceed $25,000 per day for each violation. Any person who negligently violates such requirements is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both. Any person who knowingly violates such requirements is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both.

c. Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318, or 405 of the CWA, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the CWA. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

Note: See 40 CFR §122.41(a)(2) for complete "Duty to Comply" regulations.

2. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or notifications of planned changes or anticipated noncompliance does not stay any permit condition.

3. Duty to Provide Information

The permittee shall furnish to the Regional Administrator, within a reasonable time, any information which the Regional Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Regional Administrator, upon request, copies of records required to be kept by this permit.

4. Reopener Clause

The Regional Administrator reserves the right to make appropriate revisions to this permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA in order to bring all discharges into compliance with the CWA.

For any permit issued to a treatment works treating domestic sewage (including "sludge-only facilities"), the Regional Administrator or Director shall include a reopener clause to incorporate any applicable standard for sewage sludge use or disposal promulgated under Section 405 (d) of the CWA. The Regional Administrator or Director may promptly modify or revoke and reissue any permit containing the reopener clause required by this paragraph if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or contains a pollutant or practice not limited in the permit.

Federal regulations pertaining to permit modification, revocation and reissuance, and termination are found at 40 CFR §122.62, 122.63, 122.64, and 124.5.

5. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from responsibilities, liabilities or penalties to which the permittee is or may be subject under Section 311 of the CWA, or Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

6. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges.

7. Confidentiality of Information

a. In accordance with 40 CFR Part 2, any information submitted to EPA pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information).

b. Claims of confidentiality for the following information will be denied:

(1) The name and address of any permit applicant or permittee;
(2) Permit applications, permits, and effluent data as defined in 40 CFR §2.302(a)(2).

c. Information required by NPDES application forms provided by the Regional Administrator under 40 CFR §122.21 may not be claimed confidential. This includes information submitted on the forms themselves and any attachments used to supply information required by the forms.

8. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Regional Administrator. (The Regional Administrator shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

9. State Authorities

Nothing in Part 122, 123, or 124 precludes more stringent State regulation of any activity covered by these regulations, whether or not under an approved State program.

10. Other Laws

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, or local laws and regulations.

PART II. B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Need to Halt or Reduce Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4. Bypass

a. Definitions

(1) *Bypass* means the intentional diversion of waste streams from any portion of a treatment facility.

(2) *Severe property damage* means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can be reasonably expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Paragraphs B.4.c. and 4.d. of this section.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph D.1.e. of this part (Twenty-four hour reporting).

d. Prohibition of bypass

Bypass is prohibited, and the Regional Administrator may take enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and
(3) i) The permittee submitted notices as required under Paragraph 4.c. of this section.
ii) The Regional Administrator may approve an anticipated bypass, after considering its adverse effects, if the Regional Administrator determines that it will meet the three conditions listed above in paragraph 4.d. of this section.

5. <u>Upset</u>

a. Definition. *Upset* means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph B.5.c. of this section are met. No determination made during

administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;
(2) The permitted facility was at the time being properly operated;
(3) The permittee submitted notice of the upset as required in paragraphs D.1.a. and 1.e. (Twenty-four hour notice); and
(4) The permittee complied with any remedial measures required under B.3. above.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

PART II. C. MONITORING REQUIREMENTS

1. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Except for records for monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application except for the information concerning storm water discharges which must be retained for a total of 6 years. This retention period may be extended by request of the Regional Administrator at any time.

c. Records of monitoring information shall include:

(1) The date, exact place, and time of sampling or measurements;
(2) The individual(s) who performed the sampling or measurements;
(3) The date(s) analyses were performed;
(4) The individual(s) who performed the analyses;
(5) The analytical techniques or methods used; and
(6) The results of such analyses.

d. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.

e. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by

imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

2. Inspection and Entry

The permittee shall allow the Regional Administrator or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA, any substances or parameters at any location.

PART II. D. REPORTING REQUIREMENTS

1. Reporting Requirements

a. Planned Changes. The permittee shall give notice to the Regional Administrator as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:

(1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR§122.29(b); or
(2) The alteration or addition could significantly change the nature or increase the quantities of the pollutants discharged. This notification applies to pollutants which are subject neither to the effluent limitations in the permit, nor to the notification requirements at 40 CFR§122.42(a)(1).
(3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition or change may justify the application of permit conditions different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

b. Anticipated noncompliance. The permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

c. Transfers. This permit is not transferable to any person except after notice to the Regional Administrator. The Regional Administrator may require modification or revocation and reissuance of the permit to change the name of the permittee and

incorporate such other requirements as may be necessary under the CWA. (See 40 CFR Part 122.61; in some cases, modification or revocation and reissuance is mandatory.)

d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(1) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.

(2) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of the monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.

(3) Calculations for all limitations which require averaging or measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

e. Twenty-four hour reporting.

(1) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances.

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(2) The following shall be included as information which must be reported within 24 hours under this paragraph.

(a) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR §122.41(g).)
(b) Any upset which exceeds any effluent limitation in the permit.
(c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Regional Administrator in the permit to be reported within 24 hours. (See 40 CFR §122.44(g).)

(3) The Regional Administrator may waive the written report on a case-by-case basis for reports under Paragraph D.1.e. if the oral report has been received within 24 hours.

f. Compliance Schedules. Reports of compliance or noncompliance with, any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

g. Other noncompliance. The permittee shall report all instances of noncompliance not reported under Paragraphs D.1.d., D.1.e., and D.1.f. of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in Paragraph D.1.e. of this section.

h. Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Administrator, it shall promptly submit such facts or information.

2. Signatory Requirement

a. All applications, reports, or information submitted to the Regional Administrator shall be signed and certified. (See 40 CFR §122.22)

b. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 2 years per violation, or by both.

3. Availability of Reports.

Except for data determined to be confidential under Paragraph A.8. above, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statements on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA.

PART II. E. DEFINITIONS AND ABBREVIATIONS

1. Definitions for Individual NPDES Permits including Storm Water Requirements

Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

Applicable standards and limitations means all, State, interstate, and Federal standards and limitations to which a "discharge", a "sewage sludge use or disposal practice", or a related activity is subject to, including "effluent limitations", water quality standards, standards of performance, toxic effluent standards or prohibitions, "best management practices", pretreatment standards, and "standards for sewage sludge use and disposal" under Sections 301, 302, 303, 304, 306, 307, 308, 403, and 405 of the CWA.

Application means the EPA standard national forms for applying for a permit, including any additions, revisions, or modifications to the forms; or forms approved by EPA for use in "approved States", including any approved modifications or revisions.

Average means the arithmetic mean of values taken at the frequency required for each parameter over the specified period. For total and/or fecal coliforms and Escherichia coli, the average shall be the geometric mean.

Average monthly discharge limitation means the highest allowable average of "daily discharges" over a calendar month calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

Average weekly discharge limitation means the highest allowable average of "daily discharges" measured during the calendar week divided by the number of "daily discharges" measured during the week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Best Professional Judgment (BPJ) means a case-by-case determination of Best Practicable Treatment (BPT), Best Available Treatment (BAT), or other appropriate technology-based standard based on an evaluation of the available technology to achieve a particular pollutant reduction and other factors set forth in 40 CFR §125.3 (d).

Coal Pile Runoff means the rainfall runoff from or through any coal storage pile.

Composite Sample means a sample consisting of a minimum of eight grab samples of equal volume collected at equal intervals during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period.

Construction Activities - The following definitions apply to construction activities:

(a) Commencement of Construction is the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

(b) Dedicated portable asphalt plant is a portable asphalt plant located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to. The term dedicated portable asphalt plant does not include facilities that are subject to the asphalt emulsion effluent limitation guideline at 40 CFR Part 443.

(c) Dedicated portable concrete plant is a portable concrete plant located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

(d) Final Stabilization means that all soil disturbing activities at the site have been complete, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

(e) Runoff coefficient means the fraction of total rainfall that will appear at the conveyance as runoff.

Contiguous zone means the entire zone established by the United States under Article 24 of the Convention on the Territorial Sea and the Contiguous Zone.

Continuous discharge means a "discharge" which occurs without interruption throughout the operating hours of the facility except for infrequent shutdowns for maintenance, process changes, or similar activities.

CWA means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117; 33 USC §§1251 et seq.

Daily Discharge means the discharge of a pollutant measured during the calendar day or any other 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Director normally means the person authorized to sign NPDES permits by EPA or the State or an authorized representative. Conversely, it also could mean the Regional Administrator or the State Director as the context requires.

Discharge Monitoring Report Form (DMR) means the EPA standard national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by "approved States" as well as by EPA. EPA will supply DMRs to any approved State upon request. The EPA national forms may be modified to substitute the State Agency name, address, logo, and other similar information, as appropriate, in place of EPA's.

Discharge of a pollutant means:

(a) Any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source", or

(b) Any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation (See "Point Source" definition).

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead

to a treatment works; and discharges through pipes, sewers, or other conveyances leading into privately owned treatment works.

This term does not include an addition of pollutants by any "indirect discharger."

Effluent limitation means any restriction imposed by the Regional Administrator on quantities, discharge rates, and concentrations of "pollutants" which are "discharged" from "point sources" into "waters of the United States", the waters of the "contiguous zone", or the ocean.

Effluent limitation guidelines means a regulation published by the Administrator under Section 304(b) of CWA to adopt or revise "effluent limitations".

EPA means the United States "Environmental Protection Agency".

Flow-weighted composite sample means a composite sample consisting of a mixture of aliquots where the volume of each aliquot is proportional to the flow rate of the discharge.

Grab Sample – An individual sample collected in a period of less than 15 minutes.

Hazardous Substance means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the CWA.

Indirect Discharger means a non-domestic discharger introducing pollutants to a publicly owned treatment works.

Interference means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

(a) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

(b) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulatious): Section 405 of the Clean Water Act (CWA), the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resources Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the SDWA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection Research and Sanctuaries Act.

Landfill means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

Large and Medium municipal separate storm sewer system means all municipal separate storm sewers that are either: (i) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and 40 CFR Part 122); or (ii) located in the counties with unincorporated urbanized

populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships, or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or (iii) owned or operated by a municipality other than those described in Paragraph (i) or (ii) and that are designated by the Regional Administrator as part of the large or medium municipal separate storm sewer system.

Maximum daily discharge limitation means the highest allowable "daily discharge" concentration that occurs only during a normal day (24-hour duration).

Maximum daily discharge limitation (as defined for the Steam Electric Power Plants only) when applied to Total Residual Chlorine (TRC) or Total Residual Oxidant (TRO) is defined as "maximum concentration" or "Instantaneous Maximum Concentration" during the two hours of a chlorination cycle (or fraction thereof) prescribed in the Steam Electric Guidelines, 40 CFR Part 423. These three synonymous terms all mean "a value that shall not be exceeded" during the two-hour chlorination cycle. This interpretation differs from the specified NPDES Permit requirement, 40 CFR § 122.2, where the two terms of "Maximum Daily Discharge" and "Average Daily Discharge" concentrations are specifically limited to the daily (24-hour duration) values.

Municipality means a city, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribe organization, or a designated and approved management agency under Section 208 of the CWA.

National Pollutant Discharge Elimination System means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318, and 405 of the CWA. The term includes an "approved program".

New Discharger means any building, structure, facility, or installation:

(a) From which there is or may be a "discharge of pollutants";

(b) That did not commence the "discharge of pollutants" at a particular "site" prior to August 13, 1979;

(c) Which is not a "new source"; and

(d) Which has never received a finally effective NPDES permit for discharges at that "site".

This definition includes an "indirect discharger" which commences discharging into "waters of the United States" after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a "site" for which it does not have a permit; and any offshore rig or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a "site" under EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the Regional Administrator in the issuance of a final permit to be in an area of biological concern. In determining whether an area is an area of biological concern, the Regional Administrator shall consider the factors specified in 40 CFR §§125.122 (a) (1) through (10).

An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a "new discharger" only for the duration of its discharge in an area of biological concern.

New source means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants", the construction of which commenced:

(a) After promulgation of standards of performance under Section 306 of CWA which are applicable to such source, or

(b) After proposal of standards of performance in accordance with Section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with Section 306 within 120 days of their proposal.

NPDES means "National Pollutant Discharge Elimination System".

Owner or operator means the owner or operator of any "facility or activity" subject to regulation under the NPDES programs.

Pass through means a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

Permit means an authorization, license, or equivalent control document issued by EPA or an "approved" State.

Person means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point Source means any discernible, confined, and discrete conveyance, including but not limited to any pipe ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff (see 40 CFR §122.2).

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. §§2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

(a) Sewage from vessels; or

(b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well is used either to facilitate production or for disposal purposes is approved by the authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Primary industry category means any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D. D.C. 1979)); also listed in Appendix A of 40 CFR Part 122.

Privately owned treatment works means any device or system which is (a) used to treat wastes from any facility whose operation is not the operator of the treatment works or (b) not a "POTW".

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Publicly Owned Treatment Works (POTW) means any facility or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a "State" or "municipality".

This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Regional Administrator means the Regional Administrator, EPA, Region I, Boston, Massachusetts.

Secondary Industry Category means any industry which is not a "primary industry category".

Section 313 water priority chemical means a chemical or chemical category which:

(1) is listed at 40 CFR §372.65 pursuant to Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986);

(2) is present at or above threshold levels at a facility subject to EPCRA Section 313 reporting requirements; and

(3) satisfies at least one of the following criteria:

(i) are listed in Appendix D of 40 CFR Part 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols), or Table V (certain toxic pollutants and hazardous substances);
(ii) are listed as a hazardous substance pursuant to Section 311(b)(2)(A) of the CWA at 40 CFR §116.4; or
(iii) are pollutants for which EPA has published acute or chronic water quality criteria.

Septage means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained.

Sewage Sludge means any solid, semisolid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, Type III Marine Sanitation Device pumpings (33 CFR Part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

Sewage sludge use or disposal practice means the collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge.

Significant materials includes, but is not limited to: raw materials, fuels, materials such as solvents, detergents, and plastic pellets, raw materials used in food processing or production, hazardous substance designated under section 101(14) of CERCLA, any chemical the facility is required to report pursuant to EPCRA Section 313, fertilizers, pesticides, and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills includes, but is not limited to, releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the CWA (see 40 CFR §110.10 and §117.21) or Section 102 of CERCLA (see 40 CFR § 302.4).

Sludge-only facility means any "treatment works treating domestic sewage" whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to Section 405(d) of the CWA, and is required to obtain a permit under 40 CFR §122.1(b)(3).

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands.

Storm Water means storm water runoff, snow melt runoff, and surface runoff and drainage.

Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. (See 40 CFR §122.26 (b)(14) for specifics of this definition.

Time-weighted composite means a composite sample consisting of a mixture of equal volume aliquots collected at a constant time interval.

Toxic pollutants means any pollutant listed as toxic under Section 307 (a)(1) or, in the case of "sludge use or disposal practices" any pollutant identified in regulations implementing Section 405(d) of the CWA.

Treatment works treating domestic sewage means a POTW or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices.

For purposes of this definition, "domestic sewage" includes waste and wastewater from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under Section 405(f) of the CWA, the Regional Administrator may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR Part 503 as a "treatment works treating domestic sewage", where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR Part 503.

Waste Pile means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

Waters of the United States means:

(a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of tide;

(b) All interstate waters, including interstate "wetlands";

(c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands", sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

(1) Which are or could be used by interstate or foreign travelers for recreational or other purpose;

(2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(3) Which are used or could be used for industrial purposes by industries in interstate commerce;

(d) All impoundments of waters otherwise defined as waters of the United States under this definition;

(e) Tributaries of waters identified in Paragraphs (a) through (d) of this definition;

(f) The territorial sea; and

(g) "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in Paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds as defined in 40 CFR §423.11(m) which also meet the criteria of this definition) are not waters of the United States.

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole Effluent Toxicity (WET) means the aggregate toxic effect of an effluent measured directly by a toxicity test. (See Abbreviations Section, following, for additional information.)

2. Definitions for NPDES Permit Sludge Use and Disposal Requirements.

Active sewage sludge unit is a sewage sludge unit that has not closed.

Aerobic Digestion is the biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air.

Agricultural Land is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

Agronomic rate is the whole sludge application rate (dry weight basis) designed:

(1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and

(2) To minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

Air pollution control device is one or more processes used to treat the exit gas from a sewage sludge incinerator stack.

Anaerobic digestion is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.

Annual pollutant loading rate is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.

Annual whole sludge application rate is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period.

Apply sewage sludge or sewage sludge applied to the land means land application of sewage sludge.

Aquifer is a geologic formation, group of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs.

Auxiliary fuel is fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of the sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel.

Base flood is a flood that has a one percent chance of occurring in any given year (i.e. a flood with a magnitude equaled once in 100 years).

Bulk sewage sludge is sewage sludge that is not sold or given away in a bag or other container for application to the land.

Contaminate an aquifer means to introduce a substance that causes the maximum contaminant level for nitrate in 40 CFR §141.11 to be exceeded in ground water or that causes the existing concentration of nitrate in the ground water to increase when the existing concentration of nitrate in the ground water exceeds the maximum contaminant level for nitrate in 40 CFR §141.11.

Class I sludge management facility is any publicly owned treatment works (POTW), as defined in 40 CFR §501.2, required to have an approved pretreatment program under 40 CFR §403.8 (a) (including any POTW located in a state that has elected to assume local program responsibilities pursuant to 40 CFR §403.10 (e) and any treatment works treating domestic sewage, as defined in 40 CFR § 122.2,

classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved state programs, the Regional Administrator in conjunction with the State Director, because of the potential for sewage sludge use or disposal practice to affect public health and the environment adversely.

Control efficiency is the mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator.

Cover is soil or other material used to cover sewage sludge placed on an active sewage sludge unit.

Cover crop is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

Cumulative pollutant loading rate is the maximum amount of inorganic pollutant that can be applied to an area of land.

Density of microorganisms is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

Dispersion factor is the ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack.

Displacement is the relative movement of any two sides of a fault measured in any direction.

Domestic septage is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

Domestic sewage is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

Dry weight basis means calculated on the basis of having been dried at 105 degrees Celsius (°C) until reaching a constant mass (i.e. essentially 100 percent solids content).

Fault is a fracture or zone of fractures in any materials along which strata on one side are displaced with respect to the strata on the other side.

Feed crops are crops produced primarily for consumption by animals.

Fiber crops are crops such as flax and cotton.

Final cover is the last layer of soil or other material placed on a sewage sludge unit at closure.

Fluidized bed incinerator is an enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas.

Food crops are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

Forest is a tract of land thick with trees and underbrush.

Ground water is water below the land surface in the saturated zone.

Holocene time is the most recent epoch of the Quaternary period, extending from the end of the Pleistocene epoch to the present.

Hourly average is the arithmetic mean of all the measurements taken during an hour. At least two measurements must be taken during the hour.

Incineration is the combustion of organic matter and inorganic matter in sewage sludge by high temperatures in an enclosed device.

Industrial wastewater is wastewater generated in a commercial or industrial process.

Land application is the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil.

Land with a high potential for public exposure is land that the public uses frequently. This includes, but is not limited to, a public contact site and reclamation site located in a populated area (e.g., a construction site located in a city).

Land with low potential for public exposure is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

Leachate collection system is a system or device installed immediately above a liner that is designed, constructed, maintained, and operated to collect and remove leachate from a sewage sludge unit.

Liner is soil or synthetic material that has a hydraulic conductivity of 1×10^{-7} centimeters per second or less.

Lower explosive limit for methane gas is the lowest percentage of methane gas in air, by volume, that propagates a flame at 25 degrees Celsius and atmospheric pressure.

Monthly average (Incineration) is the arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month.

Monthly average (Land Application) is the arithmetic mean of all measurements taken during the month.

Municipality means a city, town, borough, county, parish, district, association, or other public body (including an intermunicipal agency of two or more of the foregoing entities) created by or under State law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management agency under section 208 of the CWA, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201 (e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use or disposal of sewage sludge.

Other container is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

Pasture is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

Pathogenic organisms are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

Permitting authority is either EPA or a State with an EPA-approved sludge management program.

Person is an individual, association, partnership, corporation, municipality, State or Federal Agency, or an agent or employee thereof.

Person who prepares sewage sludge is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

pH means the logarithm of the reciprocal of the hydrogen ion concentration; a measure of the acidity or alkalinity of a liquid or solid material.

Place sewage sludge or sewage sludge placed means disposal of sewage sludge on a surface disposal site.

Pollutant (as defined in sludge disposal requirements) is an organic substance, an inorganic substance, a combination or organic and inorganic substances, or pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could on the basis on information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction) or physical deformations in either organisms or offspring of the organisms.

Pollutant limit (for sludge disposal requirements) is a numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of pollutant that can be applied to a unit of land (e.g., kilograms per hectare); or the volume of the material that can be applied to the land (e.g., gallons per acre).

Public contact site is a land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

Qualified ground water scientist is an individual with a baccalaureate or post-graduate degree in the natural sciences or engineering who has sufficient training and experience in ground water hydrology and related fields, as may be demonstrated by State registration, professional certification, or completion of accredited university programs, to make sound professional judgments regarding ground water monitoring, pollutant fate and transport, and corrective action.

Range land is open land with indigenous vegetation.

Reclamation site is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.

Risk specific concentration is the allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of a site where the sewage sludge incinerator is located.

Runoff is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off the land surface.

Seismic impact zone is an area that has 10 percent or greater probability that the horizontal ground level acceleration to the rock in the area exceeds 0.10 gravity once in 250 years.

Sewage sludge is a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to:, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in treatment works.

Sewage sludge feed rate is either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located.

Sewage sludge incinerator is an enclosed device in which only sewage sludge and auxiliary fuel are fired.

Sewage sludge unit is land on which only sewage sludge is placed for final disposal. This does not include land on which sewage sludge is either stored or treated. Land does not include waters of the United States, as defined in 40 CFR §122.2.

Sewage sludge unit boundary is the outermost perimeter of an active sewage sludge unit.

Specific oxygen uptake rate (SOUR) is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in sewage sludge.

Stack height is the difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 meters. When the difference is greater than 65 meters, stack height is the creditable stack height determined in accordance with 40 CFR §51.100 (ii).

State is one of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Commonwealth of the Northern Mariana Islands, and an Indian tribe eligible for treatment as a State pursuant to regulations promulgated under the authority of section 518(e) of the CWA.

Store or storage of sewage sludge is the placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment.

Surface disposal site is an area of land that contains one or more active sewage sludge units.

Total hydrocarbons means the organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane.

Total solids are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

Treat or treatment of sewage sludge is the preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge.

Treatment works is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

Unstable area is land subject to natural or human-induced forces that may damage the structural components of an active sewage sludge unit. This includes, but is not limited to, land on which the soils are subject to mass movement.

Unstabilized solids are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

Vector attraction is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

Volatile solids is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.

Wet electrostatic precipitator is an air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

Wet scrubber is an air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

3. Commonly Used Abbreviations

BOD	Five-day biochemical oxygen demand unless otherwise specified
CBOD	Carbonaceous BOD
CFS	Cubic feet per second
COD	Chemical oxygen demand
Chlorine	
Cl_2	Total residual chlorine
TRC	Total residual chlorine which is a combination of free available chlorine (FAC, see below) and combined chlorine (chloramines, etc.)

TRO	Total residual chlorine in marine waters where halogen compounds are present
FAC	Free available chlorine (aqueous molecular chlorine, hypochlorous acid, and hypochlorite ion)
Coliform	
Coliform, Fecal	Total fecal coliform bacteria
Coliform, Total	Total coliform bacteria
Cont. (Continuous)	Continuous recording of the parameter being monitored, i.e. flow, temperature, pH, etc.
Cu. M/day or M^3/day	Cubic meters per day
DO	Dissolved oxygen
kg/day	Kilograms per day
lbs/day	Pounds per day
mg/l	Milligram(s) per liter
ml/l	Milliliters per liter
MGD	Million gallons per day
Nitrogen	
Total N	Total nitrogen
NH_3-N	Ammonia nitrogen as nitrogen
NO_3-N	Nitrate as nitrogen
NO_2-N	Nitrite as nitrogen
NO_3-NO_2	Combined nitrate and nitrite nitrogen as nitrogen
TKN	Total Kjeldahl nitrogen as nitrogen
Oil & Grease	Freon extractable material
PCB	Polychlorinated biphenyl
pH	A measure of the hydrogen ion concentration. A measure of the acidity or alkalinity of a liquid or material
Surfactant	Surface-active agent

Temp. °C	Temperature in degrees Centigrade
Temp. °F	Temperature in degrees Fahrenheit
TOC	Total organic carbon
Total P	Total phosphorus
TSS or NFR	Total suspended solids or total nonfilterable residue
Turb. or Turbidity	Turbidity measured by the Nephelometric Method (NTU)
ug/l	Microgram(s) per liter
WET	"Whole effluent toxicity" is the total effect of an effluent measured directly with a toxicity test.
C-NOEC	"Chronic (Long-term Exposure Test) – No Observed Effect Concentration". The highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specified time of observation.
A-NOEC	"Acute (Short-term Exposure Test) – No Observed Effect Concentration" (see C-NOEC definition).
LC_{50}	LC_{50} is the concentration of a sample that causes mortality of 50% of the test population at a specific time of observation. The LC_{50} = 100% is defined as a sample of undiluted effluent.
ZID	Zone of Initial Dilution means the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports.

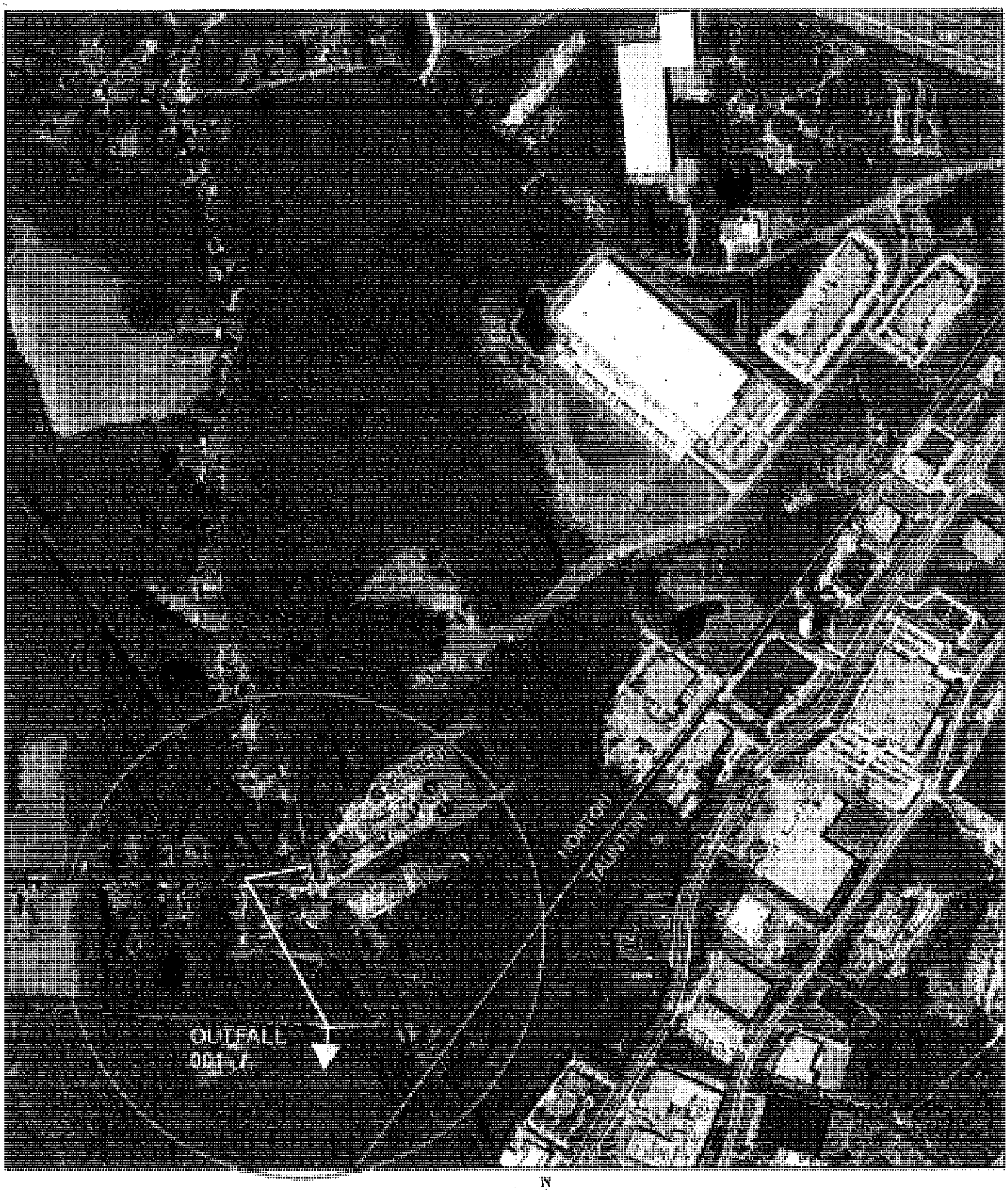

Figure 1 - Corrected. Location Map
Mansfield WPAF
NPDES No. MA0101702

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W E
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820 410 0 820 Feet

Mansfield WPAF

FRESHWATER CHRONIC TOXICITY TEST PROCEDURE AND PROTOCOL

USEPA Region 1

I. GENERAL REQUIREMENTS

The permittee shall be responsible for the conduct of acceptable chronic toxicity tests using three fresh samples collected during each test period. The following tests shall be performed as prescribed in Part 1 of the NPDES discharge permit in accordance with the appropriate test protocols described below. (Note: the permittee and testing laboratory should review the applicable permit to determine whether testing of one or both species is required).

- **Daphnid (Ceriodaphnia dubia) Survival and Reproduction Test.**
- **Fathead Minnow (Pimephales promelas) Larval Growth and Survival Test.**

Chronic toxicity data shall be reported as outlined in Section VIII.

II. METHODS

Methods to follow are those recommended by EPA in: Short Term Methods For Estimating The Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, Fourth Edition. October 2002. United States Environmental Protection Agency. Office of Water, Washington, D.C., EPA 821-R-02-013. The methods are available on-line at http://www.epa.gov/waterscience/WET/ . Exceptions and clarification are stated herein.

III. SAMPLE COLLECTION AND USE

A total of three fresh samples of effluent and receiving water are required for initiation and subsequent renewals of a freshwater, chronic, toxicity test. The receiving water control sample must be collected immediately upstream of the permitted discharge's zone of influence. Fresh samples are recommended for use on test days 1, 3, and 5. However, provided a total of three samples are used for testing over the test period, an alternate sampling schedule is acceptable. The acceptable holding times until initial use of a sample are 24 and 36 hours for on-site and off-site testing, respectively. A written waiver is required from the regulating authority for any hold time extension. All test samples collected may be used for 24, 48 and 72 hour renewals after initial use. All samples held for use beyond the day of sampling shall be refrigerated and maintained at a temperature range of 0-6° C.

All samples submitted for chemical and physical analyses will be analyzed according to Section VI of this protocol.

Sampling guidance dictates that, where appropriate, aliquots for the analysis required in this protocol shall be split from the samples, containerized and immediately preserved, or analyzed as per 40 CFR Part 136. EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection. Testing for the presence of total residual chlorine (TRC) must be analyzed immediately or as soon as possible, for all effluent samples, prior to WET testing. TRC analysis may be performed on-site or by the toxicity testing laboratory and the samples must be dechlorinated, as necessary, using sodium thiosulfate prior to sample use for toxicity testing.

If any of the renewal samples are of sufficient potency to cause lethality to 50 percent or more of the test organisms in any of the test treatments for either species or, if the test fails to meet its permit limits, then chemical analysis for total metals (originally required for the initial sample only in Section VI) will be required on the renewal sample(s) as well.

IV. DILUTION WATER

Samples of receiving water must be collected from a location in the receiving water body immediately upstream of the permitted discharge's zone of influence at a reasonably accessible location. Avoid collection near areas of obvious road or agricultural runoff, storm sewers or other point source discharges and areas where stagnant conditions exist. EPA strongly urges that screening for toxicity be performed prior to the set up of a full, definitive toxicity test any time there is a question about the test dilution water's ability to achieve test acceptability criteria (TAC) as indicated in Section V of this protocol. The test dilution water control response will be used in the statistical analysis of the toxicity test data. All other control(s) required to be run in the test will be reported as specified in the Discharge Monitoring Report (DMR) Instructions, Attachment F, page 2,Test Results & Permit Limits.

The test dilution water must be used to determine whether the test met the applicable TAC. When receiving water is used for test dilution, an additional control made up of standard laboratory water (0% effluent) is required. This control will be used to verify the health of the test organisms and evaluate to what extent, if any, the receiving water itself is responsible for any toxic response observed.

If dechlorination of a sample by the toxicity testing laboratory is necessary a "sodium thiosulfate" control, representing the concentration of sodium thiosulfate used to adequately dechlorinate the sample prior to toxicity testing, must be included in the test.

If the use of an alternate dilution water (ADW) is authorized, in addition to the ADW test control, the testing laboratory must, for the purpose of monitoring the receiving water, also run a receiving water control.

If the receiving water diluent is found to be, or suspected to be toxic or unreliable an ADW of known quality with hardness similar to that of the receiving water may be substituted. Substitution is species specific meaning that the decision to use ADW is made for each species and is based on the toxic response of that particular species. Substitution to an ADW is authorized in two cases. The first is the case where repeating a test due to toxicity in the site dilution water requires an **immediate decision** for ADW use be made by the permittee and toxicity testing laboratory. The second is in the case where two of the most recent documented incidents of unacceptable site dilution water toxicity requires ADW use in future WET testing.

For the second case, written notification from the permittee requesting ADW use **and** written authorization from the permit issuing agency(s) is required **prior to** switching to a long-term use of ADW for the duration of the permit.

Written requests for use of ADW must be mailed with supporting documentation to the following addresses:

Director
Office of Ecosystem Protection (CAA)
U.S. Environmental Protection Agency, Region 1
Five Post Office Square, Suite 100
Mail Code OEP06-5
Boston, MA 02109-3912

and

Manager
Water Technical Unit (SEW)
U.S. Environmental Protection Agency
Five Post Office Square, Suite 100
Mail Code OES04-4
Boston, MA 02109-3912

Note: USEPA Region 1 retains the right to modify any part of the alternate dilution water policy stated in this protocol at any time. Any changes to this policy will be documented in the annual DMR posting.

See the most current annual DMR instructions which can be found on the EPA Region 1 website at http://www.epa.gov/region1/enforcementandassistance/dmr.html for further important details on alternate dilution water substitution requests.

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

Method specific test conditions and TAC are to be followed and adhered to as specified in the method guidance document, EPA 821-R-02-013. If a test does not meet TAC the test must be repeated with fresh samples within 30 days of the initial test completion date.

V.1. Use of Reference Toxicity Testing

Reference toxicity test results and applicable control charts must be included in the toxicity testing report.

If reference toxicity test results fall outside the control limits established by the laboratory for a specific test endpoint, a reason or reasons for this excursion must be evaluated, correction made and reference toxicity tests rerun as necessary.

If a test endpoint value exceeds the control limits at a frequency of more than one out of twenty then causes for the reference toxicity test failure must be examined and if problems are identified corrective action taken. The reference toxicity test must be repeated during the same month in which the exceedance occurred.

If two consecutive reference toxicity tests fall outside control limits, the possible cause(s) for the exceedance must be examined, corrective actions taken and a repeat of the reference toxicity test must take place immediately. Actions taken to resolve the problem must be reported.

V.1.a. Use of Concurrent Reference Toxicity Testing

In the case where concurrent reference toxicity testing is required due to a low frequency of testing with a particular method, if the reference toxicity test results fall slightly outside of laboratory established control limits, but the primary test met the TAC, the results of the primary test will be considered acceptable. However, if the results of the concurrent test fall well outside the established **upper** control limits i.e. ≥3 standard deviations for IC25 values and ≥ two concentration intervals for NOECs, and even though the primary test meets TAC, the primary test will be considered unacceptable and must be repeated.

V.2. For the *C. dubia* test, the determination of TAC and formal statistical analyses must be performed using only the first three broods produced.

V.3. Test treatments must include 5 effluent concentrations and a dilution water control. An additional test treatment, at the permitted effluent concentration (% effluent), is required if it is not included in the dilution series.

VI. CHEMICAL ANALYSIS

As part of each toxicity test's daily renewal procedure, pH, specific conductance, dissolved oxygen (DO) and temperature must be measured at the beginning and end of each 24-hour period in each test treatment and the control(s).

The additional analysis that must be performed under this protocol is as specified and noted in the table below.

Parameter	Effluent	Receiving Water	ML (mg/l)
Hardness[1, 4]	x	x	0.5
Total Residual Chlorine (TRC)[2, 3, 4]	x		0.02
Alkalinity[4]	x	x	2.0
pH[4]	x	x	--
Specific Conductance[4]	x	x	--
Total Solids[6]	x		--
Total Dissolved Solids[6]	x		--
Ammonia[4]	x	x	0.1
Total Organic Carbon[6]	x	x	0.5
Total Metals[5]			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005
Al	x	x	0.02
Other as permit requires			

Notes:

1. Hardness may be determined by:

- APHA Standard Methods for the Examination of Water and Wastewater, 21st Edition
  -Method 2340B (hardness by calculation)
  -Method 2340C (titration)

2. Total Residual Chlorine may be performed using any of the following methods provided the required minimum limit (ML) is met.

- APHA Standard Methods for the Examination of Water and Wastewater, 21st Edition
  -Method 4500-CL E Low Level Amperometric Titration
  -Method 4500-CL G DPD Colorimetric Method
- USEPA 1983. Manual of Methods Analysis of Water and Wastes
  -Method 330.5

3. Required to be performed on the sample used for WET testing prior to its use for toxicity testing
4. Analysis is to be performed on samples and/or receiving water, as designated in the table above, from all three sampling events.
5. Analysis is to be performed on the initial sample(s) only unless the situation arises as stated in Section III, paragraph 4
6. Analysis to be performed on initial samples only

VII. TOXICITY TEST DATA ANALYSIS AND REVIEW

A. Test Review

1. Concentration / Response Relationship

A concentration/response relationship evaluation is required for test endpoint determinations from both Hypothesis Testing and Point Estimate techniques. The test report is to include documentation of this evaluation in support of the endpoint values reported. The dose-response review must be performed as required in Section 10.2.6 of EPA-821-R-02-013. Guidance for this review can be found at http://water.epa.gov/scitech/methods/cwa/ . In most cases, the review will result in one of the following three conclusions: (1) Results are reliable and reportable; (2) Results are anomalous and require explanation; or (3) Results are inconclusive and a retest with fresh samples is required.

2. Test Variability (Test Sensitivity)

This review step is separate from the determination of whether a test meets or does not meet TAC. Within test variability is to be examined for the purpose of evaluating test sensitivity. This evaluation is to be performed for the sub-lethal hypothesis testing endpoints reproduction and growth as required by the permit. The test report is to include documentation of this evaluation to support that the endpoint values reported resulted from a toxicity test of adequate sensitivity. This evaluation must be performed as required in Section 10.2.8 of EPA-821-R-02-013.

To determine the adequacy of test sensitivity, USEPA requires the calculation of test percent minimum significant difference (PMSD) values. In cases where NOEC determinations are made based on a non-parametric technique, calculation of a test PMSD value, for the sole purpose of assessing test sensitivity, shall be calculated using a comparable parametric statistical analysis technique. The calculated test PMSD is then compared to the upper and lower PMSD bounds shown for freshwater tests in Section 10.2.8.3, p. 52, Table 6 of EPA-821-R-02-013. The comparison will yield one of the following determinations.

- The test PMSD exceeds the PMSD upper bound test variability criterion in Table 6, the test results are considered highly variable and the test may not be sensitive enough to determine the presence of toxicity at the permit limit concentration (PLC). If the test results indicate that the discharge is not toxic at the PLC, then the test is considered insufficiently sensitive and must be repeated within 30 days of the initial test completion using fresh samples. If the test results indicate that the discharge is toxic at the PLC, the test is considered acceptable and does not have to be repeated.

- The test PMSD falls below the PMSD lower bound test variability criterion in Table 6, the test is determined to be very sensitive. In order to determine which treatment(s) are statistically significant and which are not, for the purpose of reporting a NOEC, the relative percent difference (RPD) between the control and each treatment must be calculated and compared to the lower PMSD boundary. See *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the NPDES Program*, EPA 833-R-00-003, June 2002, Section 6.4.2. The following link: Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the NPDES Program can be used to locate the USEPA website containing this document. If the RPD for a treatment falls below the PMSD lower bound, the difference is considered statistically insignificant. If the RPD for a treatment is greater that the PMSD lower bound, then the treatment is considered statistically significant.

- The test PMSD falls within the PMSD upper and lower bounds in Table 6, the sub-lethal test endpoint values shall be reported as is.

B. Statistical Analysis

1. General - Recommended Statistical Analysis Method

Refer to general data analysis flowchart, EPA 821-R-02-013, page 43

For discussion on Hypothesis Testing, refer to EPA 821-R-02-013, Section 9.6

For discussion on Point Estimation Techniques, refer to EPA 821-R-02-013, Section 9.7

2. *Pimephales promelas*

Refer to survival hypothesis testing analysis flowchart, EPA 821-R-02-013, page 79

Refer to survival point estimate techniques flowchart, EPA 821-R-02-013, page 80

Refer to growth data statistical analysis flowchart, EPA 821-R-02-013, page 92

3. *Ceriodaphnia dubia*

Refer to survival data testing flowchart, EPA 821-R-02-013, page 168

Refer to reproduction data testing flowchart, EPA 821-R-02-013, page 173

VIII. TOXICITY TEST REPORTING

A report of results must include the following:

- Test summary sheets (2007 DMR Attachment F) which includes:
  - Facility name
  - NPDES permit number
  - Outfall number
  - Sample type
  - Sampling method
  - Effluent TRC concentration
  - Dilution water used
  - Receiving water name and sampling location
  - Test type and species
  - Test start date
  - Effluent concentrations tested (%) and permit limit concentration
  - Applicable reference toxicity test date and whether acceptable or not
  - Age, age range and source of test organisms used for testing
  - Results of TAC review for all applicable controls
  - Test sensitivity evaluation results (test PMSD for growth and reproduction)
  - Permit limit and toxicity test results
  - Summary of test sensitivity and concentration response evaluation

In addition to the summary sheets the report must include:

- A brief description of sample collection procedures
- Chain of custody documentation including names of individuals collecting samples, times and dates of sample collection, sample locations, requested analysis and lab receipt with time and date received, lab receipt personnel and condition of samples upon receipt at the lab(s)
- Reference toxicity test control charts
- All sample chemical/physical data generated, including minimum limits (MLs) and analytical methods used
- All toxicity test raw data including daily ambient test conditions, toxicity test chemistry, sample dechlorination details as necessary, bench sheets and statistical analysis
- A discussion of any deviations from test conditions
- Any further discussion of reported test results, statistical analysis and concentration-response relationship and test sensitivity review per species per endpoint

USEPA REGION 1 FRESHWATER ACUTE TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable acute toxicity tests in accordance with the appropriate test protocols described below:

- **Daphnid (Ceriodaphnia dubia) definitive 48 hour test.**
- **Fathead Minnow (Pimephales promelas) definitive 48 hour test.**

Acute toxicity test data shall be reported as outlined in Section VIII.

II. METHODS

The permittee shall use 40 CFR Part 136 methods. Methods and guidance may be found at:

http://water.epa.gov/scitech/methods/cwa/wet/disk2_index.cfm

The permittee shall also meet the sampling, analysis and reporting requirements included in this protocol. This protocol defines more specific requirements while still being consistent with the Part 136 methods. If, due to modifications of Part 136, there are conflicting requirements between the Part 136 method and this protocol, the permittee shall comply with the requirements of the Part 136 method.

III. SAMPLE COLLECTION

A discharge sample shall be collected. Aliquots shall be split from the sample, containerized and preserved (as per 40 CFR Part 136) for chemical and physical analyses required. The remaining sample shall be measured for total residual chlorine and dechlorinated (if detected) in the laboratory using sodium thiosulfate for subsequent toxicity testing. (Note that EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection.) Grab samples must be used for pH, temperature, and total residual chlorine (as per 40 CFR Part 122.21).

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1.0 mg/L chlorine. If dechlorination is necessary, a thiosulfate control (maximum amount of thiosulfate in lab control or receiving water) must also be run in the WET test.

All samples held overnight shall be refrigerated at 1- 6°C.

IV. DILUTION WATER

A grab sample of dilution water used for acute toxicity testing shall be collected from the receiving water at a point immediately upstream of the permitted discharge's zone of influence at a reasonably accessible location. Avoid collection near areas of obvious road or agricultural runoff, storm sewers or other point source discharges and areas where stagnant conditions exist. In the case where an alternate dilution water has been agreed upon an additional receiving water control (0% effluent) must also be tested.

If the receiving water diluent is found to be, or suspected to be toxic or unreliable, an alternate standard dilution water of known quality with a hardness, pH, conductivity, alkalinity, organic carbon, and total suspended solids similar to that of the receiving water may be substituted **AFTER RECEIVING WRITTEN APPROVAL FROM THE PERMIT ISSUING AGENCY(S).** Written requests for use of an alternate dilution water should be mailed with supporting documentation to the following address:

Director
Office of Ecosystem Protection (CAA)
U.S. Environmental Protection Agency-New England
5 Post Office Sq., Suite 100 (OEP06-5)
Boston, MA 02109-3912

and

Manager
Water Technical Unit (SEW)
U.S. Environmental Protection Agency
5 Post Office Sq., Suite 100 (OES04-4)
Boston, MA 02109-3912

Note: USEPA Region 1 retains the right to modify any part of the alternate dilution water policy stated in this protocol at any time. Any changes to this policy will be documented in the annual DMR posting.

See the most current annual DMR instructions which can be found on the EPA Region 1 website at http://www.epa.gov/region1/enforcement/water/dmr.html *for further important details on alternate dilution water substitution requests.*

It may prove beneficial to have the proposed dilution water source screened for suitability prior to toxicity testing. EPA strongly urges that screening be done prior to set up of a full definitive toxicity test any time there is question about the dilution water's ability to support acceptable performance as outlined in the 'test acceptability' section of the protocol.

V. TEST CONDITIONS

The following tables summarize the accepted daphnid and fathead minnow toxicity test conditions and test acceptability criteria:

EPA NEW ENGLAND EFFLUENT TOXICITY TEST CONDITIONS FOR THE DAPHNID, CERIODAPHNIA DUBIA 48 HOUR ACUTE TESTS[1]

1.	Test type	Static, non-renewal
2.	Temperature (°C)	20 ± 1°C or 25 ± 1°C
3.	Light quality	Ambient laboratory illumination
4.	Photoperiod	16 hour light, 8 hour dark
5.	Test chamber size	Minimum 30 ml
6.	Test solution volume	Minimum 15 ml
7.	Age of test organisms	1-24 hours (neonates)
8.	No. of daphnids per test chamber	5
9.	No. of replicate test chambers per treatment	4
10.	Total no. daphnids per test concentration	20
11.	Feeding regime	As per manual, lightly feed YCT and Selenastrum to newly released organisms while holding prior to initiating test
12.	Aeration	None
13.	Dilution water[2]	Receiving water, other surface water, synthetic water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q[R] or equivalent deionized water and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
14.	Dilution series	≥ 0.5, must bracket the permitted RWC
15.	Number of dilutions	5 plus receiving water and laboratory water control and thiosulfate control, as necessary. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution

		series.
16.	Effect measured	Mortality-no movement of body or appendages on gentle prodding
17.	Test acceptability	90% or greater survival of test organisms in dilution water control solution
18.	Sampling requirements	For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must first be used within 36 hours of collection.
19.	Sample volume required	Minimum 1 liter

Footnotes:

1. Adapted from EPA-821-R-02-012.
2. Standard prepared dilution water must have hardness requirements to generally reflect the characteristics of the receiving water.

EPA NEW ENGLAND TEST CONDITIONS FOR THE FATHEAD MINNOW (PIMEPHALES PROMELAS) 48 HOUR ACUTE TEST[1]

1.	Test Type	Static, non-renewal
2.	Temperature (°C)	20 ± 1 ° C or 25 ± 1°C
3.	Light quality	Ambient laboratory illumination
4.	Photoperiod	16 hr light, 8 hr dark
5.	Size of test vessels	250 mL minimum
6.	Volume of test solution	Minimum 200 mL/replicate
7.	Age of fish	1-14 days old and age within 24 hrs of each other
8.	No. of fish per chamber	10
9.	No. of replicate test vessels per treatment	4
10.	Total no. organisms per concentration	40
11.	Feeding regime	As per manual, lightly feed test age larvae using concentrated brine shrimp nauplii while holding prior to initiating test
12.	Aeration	None, unless dissolved oxygen (D.O.) concentration falls below 4.0 mg/L, at which time gentle single bubble aeration should be started at a rate of less than 100 bubbles/min. (Routine D.O. check is recommended.)
13.	dilution water[2]	Receiving water, other surface water, synthetic water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q[R] or equivalent deionized and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
14.	Dilution series	≥ 0.5, must bracket the permitted RWC

15.	Number of dilutions	5 plus receiving water and laboratory water control and thiosulfate control, as necessary. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
16.	Effect measured	Mortality-no movement on gentle prodding
17.	Test acceptability	90% or greater survival of test organisms in dilution water control solution
18.	Sampling requirements	For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples are used within 36 hours of collection.
19.	Sample volume required	Minimum 2 liters

Footnotes:

1. Adapted from EPA-821-R-02-012
2. Standard dilution water must have hardness requirements to generally reflect characteristics of the receiving water.

VI. CHEMICAL ANALYSIS

At the beginning of a static acute toxicity test, pH, conductivity, total residual chlorine, oxygen, hardness, alkalinity and temperature must be measured in the highest effluent concentration and the dilution water. Dissolved oxygen, pH and temperature are also measured at 24 and 48 hour intervals in all dilutions. The following chemical analyses shall be performed on the 100 percent effluent sample and the upstream water sample for each sampling event.

Parameter	Effluent	Receiving Water	ML (mg/l)
Hardness[1]	x	x	0.5
Total Residual Chlorine (TRC)[2, 3]	x		0.02
Alkalinity	x	x	2.0
pH	x	x	--
Specific Conductance	x	x	--
Total Solids	x		--
Total Dissolved Solids	x		--
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005
Al	x	x	0.02
Other as permit requires			

Notes:

1. Hardness may be determined by:
   - APHA Standard Methods for the Examination of Water and Wastewater, 21st Edition
     - Method 2340B (hardness by calculation)
     - Method 2340C (titration)
2. Total Residual Chlorine may be performed using any of the following methods provided the required minimum limit (ML) is met.
   - APHA Standard Methods for the Examination of Water and Wastewater, 21st Edition
     - Method 4500-CL E Low Level Amperometric Titration
     - Method 4500-CL G DPD Colorimetric Method
3. Required to be performed on the sample used for WET testing prior to its use for toxicity testing.

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration (Determined at 48 Hours)

Methods of Estimation:

- Probit Method
- Spearman-Karber
- Trimmed Spearman-Karber
- Graphical

See the flow chart in Figure 6 on p. 73 of EPA-821-R-02-012 for appropriate method to use on a given data set.

No Observed Acute Effect Level (NOAEL)

See the flow chart in Figure 13 on p. 87 of EPA-821-R-02-012.

VIII. TOXICITY TEST REPORTING

A report of the results will include the following:

- Description of sample collection procedures, site description
- Names of individuals collecting and transporting samples, times and dates of sample collection and analysis on chain-of-custody
- General description of tests: age of test organisms, origin, dates and results of standard toxicant tests; light and temperature regime; other information on test conditions if different than procedures recommended. Reference toxicant test data should be included.
- All chemical/physical data generated. (Include minimum detection levels and minimum quantification levels.)
- Raw data and bench sheets.
- Provide a description of dechlorination procedures (as applicable).
- Any other observations or test conditions affecting test outcome.

EPA - New England

Reassessment of Technically Based Industrial Discharge Limits

Under 40 CFR §122.21(j)(4), all Publicly Owned Treatment Works (POTWs) with approved Industrial Pretreatment Programs (IPPs) shall provide the following information to the Director: a written evaluation of the need to revise local industrial discharge limits under 40 CFR §403.5(c)(1).

Below is a form designed by the U.S. Environmental Protection Agency (EPA - New England) to assist POTWs with approved IPPs in evaluating whether their existing Technically Based Local Limits (TBLLs) need to be recalculated. The form allows the permittee and EPA to evaluate and compare pertinent information used in previous TBLLs calculations against present conditions at the POTW.

Please read direction below before filling out form.

ITEM I.

* In Column (1), list what your POTW's influent flow rate was when your existing TBLLs were calculated. In Column (2), list your POTW's present influent flow rate. Your current flow rate should be calculated using the POTW's average daily flow rate from the previous 12 months.

* In Column (1) list what your POTW's SIU flow rate was when your existing TBLLs were calculated. In Column (2), list your POTW's present SIU flow rate.

* In Column (1), list what dilution ratio and/or 7Q10 value was used in your old/expired NPDES permit. In Column (2), list what dilution ration and/or 7Q10 value is presently being used in your new/reissued NPDES permit.

  The 7Q10 value is the lowest seven day average flow rate, in the river, over a ten year period. The 7Q10 value and/or dilution ratio used by EPA in your new NPDES permit can be found in your NPDES permit "Fact Sheet."

* In Column (1), list the safety factor, if any, that was used when your existing TBLLs were calculated.

* In Column (1), note how your bio-solids were managed when your existing TBLLs were calculated. In Column (2), note how your POTW is presently disposing of its biosolids and how your POTW will be disposing of its biosolids in the future.

ITEM II.

* List what your existing TBLLs are - as they appear in your current Sewer Use Ordinance (SUO).

ITEM III.

* Identify how your existing TBLLs are allocated out to your industrial community. Some pollutants may be allocated differently than others, if so please explain.

ITEM IV.

* Since your existing TBLLs were calculated, identify the following in detail:

  (1) if your POTW has experienced any upsets, inhibition, interference or pass-through as a result of an industrial discharge.

  (2) if your POTW is presently violating any of its current NPDES permit limitations - include toxicity.

ITEM V.

* Using current sampling data, list in Column (1) the average and maximum amount of pollutants (in pounds per day) received in the POTW's influent. Current sampling data is defined as data obtained over the last 24 month period.

  All influent data collected and analyzed must be in accordance with 40 CFR §136. Sampling data collected should be analyzed using the lowest possible detection method(s), e.g. graphite furnace.

* Based on your existing TBLLs, as presented in Item II., list in Column (2), for each pollutant the Maximum Allowable Headwork Loading (MAHL) values derived from an applicable environmental criteria or standard, e.g. water quality, sludge, NPDES, inhibition, etc. For more information, please see EPA's Local Limit Guidance Document (July 2004).

Item VI.

* Using current sampling data, list in Column (1) the average and maximum amount of pollutants (in micrograms per liter) present your POTW's effluent. Current sampling data is defined as data obtained during the last 24 month period.

(Item VI. continued)

All effluent data collected and analyzed must be in accordance with 40 CFR §136. Sampling data collected should be analyzed using the lowest possible detection method(s), e.g. graphite furnace.

* List in Column (2A) what the Water Quality Standards (WQS) were (in micrograms per liter) when your TBLLs were calculated, please note what hardness value was used at that time. Hardness should be expressed in milligram per liter of Calcium Carbonate.

  List in Column (2B) the current WQSs or "Chronic Gold Book" values for each pollutant multiplied by the dilution ratio used in your new/reissued NPDES permit. For example, with a dilution ratio of 25:1 at a hardness of 25 mg/l - Calcium Carbonate (copper's chronic WQS equals 6.54 ug/l) the chronic NPDES permit limit for copper would equal 156.25 ug/l.

ITEM VII.

* In Column (1), list all pollutants (in micrograms per liter) limited in your new/reissued NPDES permit. In Column (2), list all pollutants limited in your old/expired NPDES permit.

ITEM VIII.

* Using current sampling data, list in Column (1) the average and maximum amount of pollutants in your POTW's biosolids. Current data is defined as data obtained during the last 24 month period. Results are to be expressed as total dry weight.

  All biosolids data collected and analyzed must be in accordance with 40 CFR §136.

  In Column (2A), list current State and/or Federal sludge standards that your facility's biosolids must comply with. Also note how your POTW currently manages the disposal of its biosolids. If your POTW is planing on managing its biosolids differently, list in Column (2B) what your new biosolids criteria will be and method of disposal.

In general, please be sure the units reported are correct and all pertinent information is included in your evaluation. If you have any questions, please contact your pretreatment representative at EPA - New England.

REASSESSMENT OF TECHNICALLY BASED LOCAL LIMITS (TBLLs)

POTW Name & Address : _____

NPDES PERMIT # : _____

Date EPA approved current TBLLs : _____

Date EPA approved current Sewer Use Ordinance : _____

ITEM I.

In Column (1) list the conditions that existed when your current TBLLs were calculated. In Column (2), list current conditions or expected conditions at your POTW.		
	Column (1) EXISTING TBLLs	Column (2) PRESENT CONDITIONS
POTW Flow (MGD)		
Dilution Ratio or 7Q10 (from NPDES Permit)		
SIU Flow (MGD)		
Safety Factor		N/A
Biosolids Disposal Method(s)		

ITEM II.

EXISTING TBLLs			
POLLUTANT	NUMERICAL LIMIT (mg/l) or (lb/day)	POLLUTANT	NUMERICAL LIMIT (mg/l) or (lb/day)

ITEM III.

Note how your existing TBLLs, listed in Item II., are allocated to your Significant Industrial Users (SIUs), i.e. uniform concentration, contributory flow, mass proportioning, other. Please specify by circling.

ITEM IV.

Has your POTW experienced any upsets, inhibition, interference or pass-through from industrial sources since your existing TBLLs were calculated?
If yes, explain.

_____

_____

Has your POTW violated any of its NPDES permit limits and/or toxicity test requirements?

If yes, explain.

_____

_____

ITEM V.

Using current POTW influent sampling data fill in Column (1). In Column (2), list your Maximum Allowable Headwork Loading (MAHL) values used to derive your TBLLs listed in Item II. In addition, please note the Environmental Criteria for which each MAHL value was established, i.e. water quality, sludge, NPDES etc.

Pollutant	Column (1) Influent Data Analyses Maximum (lb/day)	Average (lb/day)	Column (2) MAHL Values (lb/day)	Criteria
Arsenic				
Cadmium				
Chromium				
Copper				
Cyanide				
Lead				
Mercury				
Nickel				
Silver				
Zinc				
Other (List)				

ITEM VI.

Using current POTW effluent sampling data, fill in Column (1). In Column (2A) list what the Water Quality Standards (Gold Book Criteria) were at the time your existing TBLLs were developed. List in Column (2B) current Gold Book values multiplied by the dilution ratio used in your new/reissued NPDES permit.

Pollutant	Column (1) Effluent Data Analyses Maximum (ug/l)	Average (ug/l)	Columns (2A) (2B) Water Quality Criteria (Gold Book) From TBLLs Today (ug/l)	(ug/l)
Arsenic				
*Cadmium				
*Chromium				
*Copper				
Cyanide				
*Lead				
Mercury				
*Nickel				
Silver				
*Zinc				
Other (List)				

*Hardness Dependent (mg/l - $CaCO_3$)

ITEM VII.

In Column (1), identify all pollutants limited in your new/reissued NPDES permit. In Column (2), identify all pollutants that were limited in your old/expired NPDES permit.

Column (1) NEW PERMIT Pollutants	Limitations (ug/l)	Column (2) OLD PERMIT Pollutants	Limitations (ug/l)

ITEM VIII.

Using current POTW biosolids data, fill in Column (1). In Column (2A), list the biosolids criteria that was used at the time your existing TBLLs were calculated. If your POTW is planing on managing its biosolids differently, list in Column (2B) what your new biosolids criteria would be and method of disposal.

Pollutant	Column (1) Biosolids Data Analyses Average (mg/kg)	Columns (2A) (2B) Biosolids Criteria From TBLLs New (mg/kg) (mg/kg)	
Arsenic			
Cadmium			
Chromium			
Copper			
Cyanide			
Lead			
Mercury			
Nickel			
Silver			
Zinc			
Molybdenum			
Selenium			
Other (List)			

NPDES PERMIT REQUIREMENT
FOR
INDUSTRIAL PRETREATMENT ANNUAL REPORT

The information described below shall be included in the pretreatment program annual reports:

1. An updated list of all industrial users by category, as set forth in 40 C.F.R. 403.8(f)(2)(i), indicating compliance or noncompliance with the following:
   - baseline monitoring reporting requirements for newly promulgated industries
   - compliance status reporting requirements for newly promulgated industries
   - periodic (semi-annual) monitoring reporting requirements,
   - categorical standards, and
   - local limits;

2. A summary of compliance and enforcement activities during the preceding year, including the number of:
   - significant industrial users inspected by POTW (include inspection dates for each industrial user),
   - significant industrial users sampled by POTW (include sampling dates for each industrial user),
   - compliance schedules issued (include list of subject users),
   - written notices of violations issued (include list of subject users),
   - administrative orders issued (include list of subject users),
   - criminal or civil suits filed (include list of subject users) and,
   - penalties obtained (include list of subject users and penalty amounts);

3. A list of significantly violating industries required to be published in a local newspaper in accordance with 40 C.F.R. 403.8(f)(2)(vii);

4. A narrative description of program effectiveness including present and proposed changes to the program, such as funding, staffing, ordinances, regulations, rules and/or statutory authority;

5. A summary of all pollutant analytical results for influent, effluent, sludge and any toxicity or bioassay data from the wastewater treatment facility. The summary shall include a comparison of influent sampling results versus threshold inhibitory concentrations for the Wastewater Treatment System and effluent sampling results versus water quality standards. Such a comparison shall be based on the sampling program described in the paragraph below or any similar sampling program described in this Permit.

At a minimum, annual sampling and analysis of the influent and effluent of the Wastewater Treatment Plant shall be conducted for the following pollutants:

a.) Total Cadmium	f.) Total Nickel
b.) Total Chromium	g.) Total Silver
c.) Total Copper	h.) Total Zinc
d.) Total Lead	i.) Total Cyanide
e.) Total Mercury	j.) Total Arsenic

The sampling program shall consist of one 24-hour flow-proportioned composite and at least one grab sample that is representative of the flows received by the POTW. The composite shall consist of hourly flow-proportioned grab samples taken over a 24-hour period if the sample is collected manually or shall consist of a minimum of 48 samples collected at 30 minute intervals if an automated sampler is used. Cyanide shall be taken as a grab sample during the same period as the composite sample. Sampling and preservation shall be consistent with 40 CFR Part 136.

6. A detailed description of all interference and pass-through that occurred during the past year;

7. A thorough description of all investigations into interference and pass-through during the past year;

8. A description of monitoring, sewer inspections and evaluations which were done during the past year to detect interference and pass-through, specifying parameters and frequencies;

9. A description of actions being taken to reduce the incidence of significant violations by significant industrial users; and,

10. The date of the latest adoption of local limits and an indication as to whether or not the permittee is under a State or Federal compliance schedule that includes steps to be taken to revise local limits.

APPEALING NPDES PERMITS

If you wish to contest any of the provisions of this permit, you must petition the Environmental Appeals Board, (EAB), within thirty (30) days. The Environmental Appeals Board (EAB) of the U.S. Environmental Protection Agency is the final Agency decisionmaker on administrative appeals of NPDES permits. If you received notice of this permit via certified mail, the 30-day period begins on the day after the date of receipt. If you were served by regular mail, the 30-day period begins on the day after the date of receipt, and an additional three days are added to the period within which to appeal in order to compensate for mail delay.

In order to be eligible to file a petition for review, you must have filed comments on the draft permit or participated in any public hearing that may have been held pertaining to this permit. In addition, the issues raised in the appeal must have been raised during the public comment period so long as they were reasonably ascertainable. Any person who failed to file comments or failed to participate in any public hearing on the draft permit may file a petition for review of permit conditions, but only to the extent that such permit conditions reflect changes from the draft permit.

Procedures for appealing permits can be found at 40 C.F.R. § 124.19. Related provisions can be found at 40 C.F.R. § 124.16 (stays of permit conditions), 40 C.F.R. § 124.20 (computation of time), and 40 C.F.R. § 124.60 (issuance and effective date and stays of NPDES permits).

Please note: Section 124.19 has been revised, and the changes took effect on March 26, 2013. (See 17 Fed. Reg. 5281, 5285-5288 (Jan. 25, 2013)). All permit appeals filed after that date must conform to the revised regulation. Set forth on the following pages is the revised version of § 124.19. More information on the appeals process and the EAB can be found on the Internet at http://www.epa.gov/eab.

ENVIRONMENTAL APPEALS BOARD (EAB) CONTACT INFORMATION

The EAB's telephone number is (202) 233-0122. The EAB's fax number is (202) 233-0121. The EAB website is at http://www.epa.gov/eab.

The EAB's mailing address is

Clerk of the Board
U.S. Environmental Protection Agency
Environmental Appeals Board
1200 Pennsylvania Avenue, N.W.
(Mail Code 1103M)
Washington, D.C. 20460-0001

40 CFR Part 124, Section 124.19(a) - (p) is revised, effective March 26, 2013, as set forth on the following pages:

issues a subsequent "final permit decision" under section 124.19 *after* administrative review proceedings are exhausted. This revised text now appears in section 124.19(l)(2).

B. What is the Agency's authority for taking this action?

EPA is issuing this document under its general rulemaking authority, Reorganization Plan No. 3 of 1970 (5 U.S.C. app.).

Section 553 of the Administrative Procedure Act (APA), 5 U.S.C. § 553(b)(3)(A), provides that "rules of agency organization, procedure, or practice" are exempt from notice and comment requirements. The action the Agency is taking today involves revisions to the Environmental Appeals Board's procedural rules to clarify existing practices and procedures that are applicable in permit appeals filed with the Environmental Appeals Board. These revisions fall under the exemption provided in APA § 553(b)(3)(A). Accordingly, EPA is not taking comment on this action.

III. Statutory and Executive Order Reviews

This action involves revisions to the Environmental Appeals Board's procedural rules to clarify existing practices and procedures that are applicable in permit appeals filed with the Environmental Appeals Board. This type of action is exempt from review under Executive Orders 12866 (58 FR 51735, October 4, 1993) and 13563 (76 FR 3821, January 21, 2011). Because this action is not subject to notice and comment requirements under the Administrative Procedures Act or any other statute, it is not subject to the Regulatory Flexibility Act (5 U.S.C. 601 *et. seq.*) or sections 202 and 205 of the Unfunded Mandates Reform Act of 1999 (UMRA) (Pub. L. 104–4). In addition, this action does not significantly or uniquely affect small governments. This action does not create new binding legal requirements that substantially and directly affect Tribes under Executive Order 13175 (63 FR 67249, November 9, 2000). This action does not have significant Federalism implications under Executive Order 13132 (64 FR 43255, August 10, 1999). This rule also is not subject to Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," (62 FR 19885, April 23, 1997), because it is not economically significant. This action is not subject to Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" (66 FR 28355, May 22, 2001), because it is not a significant regulatory action under Executive Order 12866. This action does not involve technical standards; thus the requirements of § 12(d) of the National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272 note) do not apply. This action does not impose an information collection burden under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). The Congressional Review Act, 5 U.S.C 801 et seq., as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. Section 804 exempts from section 801 the following types of rules (1) rules of particular applicability; (2) rules relating to agency management or personnel; and (3) rules of agency organization, procedure, or practice that do not substantially affect the rights or obligations of non-agency parties. 5 U.S.C. 804(3). EPA is not required to submit a rule report regarding today's action under section 801 because this is a rule of agency organization, procedure, or practice that does not substantially affect the rights or obligations of non-agency parties.

List of Subjects

40 CFR Part 124

Administrative Practice and Procedures.

40 CFR Part 270

Environmental Protection, Hazardous Waste.

Dated: January 14, 2013.

Lisa P. Jackson,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency amends title 40 parts 124 and 270 of the Code of Federal Regulations as follows:

PART 124—PROCEDURES FOR DECISIONMAKING

■ 1. The authority citation for part 124 continues to read as follows:

Authority: Resource Conservation and Recovery Act, 42 U.S.C. 6901 *et seq.*; Safe Drinking Water Act, 42 U.S.C. 300f *et seq.*; Clean Water Act, 33 U.S.C. 1251 *et seq.*; Clean Air Act, 42 U.S.C. 7401 *et seq.*

■ 2. Section 124.10 is amended by removing paragraph (a)(1)(iv) and redesignating paragraphs (a)(1)(v) through (a)(1)(vi) as paragraphs (a)(1)(iv) through paragraphs (a)(1)(v), respectively.

■ 3. Paragraph (b)(1) of § 124.16 is revised to read as follows:

§ 124.16 Stays of contested permit conditions.

* * * * *

(b) *Stays based on cross effects.* (1) A stay may be granted based on the grounds that an appeal to the Administrator under § 124.19 of one permit may result in changes to another EPA-issued permit only when each of the permits involved has been appealed to the Administrator.

* * * * *

■ 4. Section 124.19 is revised to read as follows:

§ 124.19 Appeal of RCRA, UIC, NPDES and PSD Permits.

(a) *Petitioning for review of a permit decision.* (1) *Initiating an appeal.* Appeal from a RCRA, UIC, NPDES, or PSD final permit decision issued under § 124.15 of this part, or a decision to deny a permit for the active life of a RCRA hazardous waste management facility or unit under § 270.29 of this chapter, is commenced by filing a petition for review with the Clerk of the Environmental Appeals Board within the time prescribed in paragraph (a)(3) of this section.

(2) *Who may file?* Any person who filed comments on the draft permit or participated in a public hearing on the draft permit may file a petition for review as provided in this section. Additionally, any person who failed to file comments or failed to participate in the public hearing on the draft permit may petition for administrative review of any permit conditions set forth in the final permit decision, but only to the extent that those final permit conditions reflect changes from the proposed draft permit.

(3) *Filing deadline.* A petition for review must be filed with the Clerk of the Environmental Appeals Board within 30 days after the Regional Administrator serves notice of the issuance of a RCRA, UIC, NPDES, or PSD final permit decision under § 124.15 or a decision to deny a permit for the active life of a RCRA hazardous waste management facility or unit under § 270.29 of this chapter. A petition is filed when it is received by the Clerk of the Environmental Appeals Board at the address specified for the appropriate method of delivery as provided in paragraph (i)(2) of this section.

(4) *Petition contents.* (i) In addition to meeting the requirements in paragraph (d), a petition for review must identify the contested permit condition or other

specific challenge to the permit decision and clearly set forth, with legal and factual support, petitioner's contentions for why the permit decision should be reviewed. The petition must demonstrate that each challenge to the permit decision is based on:

(A) A finding of fact or conclusion of law that is clearly erroneous, or

(B) An exercise of discretion or an important policy consideration that the Environmental Appeals Board should, in its discretion, review.

(ii) Petitioners must demonstrate, by providing specific citation to the administrative record, including the document name and page number, that each issue being raised in the petition was raised during the public comment period (including any public hearing) to the extent required by § 124.13. For each issue raised that was not raised previously, the petition must explain why such issues were not required to be raised during the public comment period as provided in § 124.13. Additionally, if the petition raises an issue that the Regional Administrator addressed in the response to comments document issued pursuant to § 124.17, then petitioner must provide a citation to the relevant comment and response and explain why the Regional Administrator's response to the comment was clearly erroneous or otherwise warrants review.

(b) *Response(s) to a petition for review.* (1) In a PSD or other new source permit appeal, the Regional Administrator must file a response to the petition for review, a certified index of the administrative record, and the relevant portions of the administrative record within 21 days after the filing of the petition.

(2) In all other permit appeals under this section, the Regional Administrator must file a response to the petition, a certified index of the administrative record, and the relevant portions of the administrative record within 30 days after the filing of a petition.

(3) A permit applicant who did not file a petition but who wishes to participate in the appeal process must file a notice of appearance and a response to the petition. Such documents must be filed by the deadlines provided in paragraph (b)(1) or (2) of this section, as appropriate.

(4) The State or Tribal authority where the permitted facility or site is or is proposed to be located (if that authority is not the permit issuer) must also file a notice of appearance and a response if it wishes to participate in the appeal. Such response must be filed by the deadlines provided in paragraph (b)(1) or (2) of this section, as appropriate.

(c) *Replies.* (1) In PSD and other new source permit appeals, the Environmental Appeals Board will apply a presumption against the filing of a reply brief. By motion, petitioner may seek leave of the Environmental Appeals Board to file a reply to the response, which the Environmental Appeals Board, in its discretion, may grant. The motion must be filed simultaneously with the proposed reply within 10 days after service of the response. In its motion, petitioner must specify those arguments in the response to which petitioner seeks to reply and the reasons petitioner believes it is necessary to file a reply to those arguments. Petitioner may not raise new issues or arguments in the motion or in the reply.

(2) In all other permit appeals under this section, petitioner may file a reply within 15 days after service of the response. Petitioner may not raise new issues or arguments in the reply.

(d) *Content and form of briefs.* (1) *Content requirements.* All briefs filed under this section must contain, under appropriate headings:

(i) A table of contents, with page references;

(ii) A table of authorities with references to the pages of the brief where they are cited;

(iii) A table of attachments, if required under paragraph (d)(2) of this section; and

(iv) A statement of compliance with the word limitation.

(2) *Attachments.* Parts of the record to which the parties wish to direct the Environmental Appeals Board's attention may be appended to the brief submitted. If the brief includes attachments, a table must be included that provides the title of each appended document and assigns a label identifying where it may be found (e.g., Excerpts from the Response to Comments Document * * * Attachment 1).

(3) *Length.* Unless otherwise ordered by the Environmental Appeals Board, petitions and response briefs may not exceed 14,000 words, and all other briefs may not exceed 7,000 words. Filers may rely on the word-processing system used to determine the word count. In lieu of a word limitation, filers may comply with a 30-page limit for petitions and response briefs, or a 15-page limit for replies. Headings, footnotes, and quotations count toward the word limitation. The table of contents, table of authorities, table of attachments (if any), statement requesting oral argument (if any), statement of compliance with the word limitation, and any attachments do not count toward the word limitation. The Environmental Appeals Board may exclude any petition, response, or other brief that does not meet word limitations. Where a party can demonstrate a compelling and documented need to exceed such limitations, such party must seek advance leave of the Environmental Appeals Board to file a longer brief. Such requests are discouraged and will be granted only in unusual circumstances.

(e) *Participation by amicus curiae.* Any interested person may file an amicus brief in any appeal pending before the Environmental Appeals Board under this section. The deadline for filing such brief is 15 days after the filing of the response brief, except that amicus briefs in PSD or other new source permit appeals must be filed within 21 days after the filing of the petition. Amicus briefs must comply with all procedural requirements of this section.

(f) *Motions.* (1) *In general.* A request for an order or other relief must be made by written motion unless these rules prescribe another form.

(2) *Contents of a motion.* A motion must state with particularity the grounds for the motion, the relief sought, and the legal argument necessary to support the motion. In advance of filing a motion, parties must attempt to ascertain whether the other party(ies) concur(s) or object(s) to the motion and must indicate in the motion the attempt made and the response obtained.

(3) *Response to motion.* Any party may file a response to a motion. Responses must state with particularity the grounds for opposition and the legal argument necessary to support the motion. The response must be filed within 15 days after service of the motion unless the Environmental Appeals Board shortens or extends the time for response.

(4) *Reply.* Any reply to a response filed under paragraph (f)(3) of this section must be filed within 10 days after service of the response. A reply must not introduce any new issues or arguments and may respond only to matters presented in the response.

(5) *Disposition of a motion for a procedural order.* The Environmental Appeals Board may act on a motion for a procedural order at any time without awaiting a response.

(g) *Timing of motions for extension of time.* Parties must file motions for extensions of time sufficiently in advance of the due date to allow other

parties to have a reasonable opportunity to respond to the request for more time and to provide the Environmental Appeals Board with a reasonable opportunity to issue an order.

(h) *Oral argument.* The Environmental Appeals Board may hold oral argument on its own initiative or at its discretion in response to a request by one or more of the parties. To request oral argument, a party must include in its substantive brief a statement explaining why oral argument should be permitted. The Environmental Appeals Board will apply a presumption against oral argument in PSD or other new source permit appeals. The Environmental Appeals Board may, by order, establish additional procedures governing any oral argument before the Environmental Appeals Board.

(i) *Filing and service requirements.* Documents filed under this section, including the petition for review, must be filed with the Clerk of the Environmental Appeals Board. A document is filed when it is received by the Clerk of the Environmental Appeals Board at the address specified for the appropriate method of delivery as provided in paragraph (i)(2) of this section.

(1) *Caption and other filing requirements.* Every document filed with the Environmental Appeals Board must specifically identify in the caption the permit applicant, the permitted facility, and the permit number. All documents that are filed must be signed by the person filing the documents or the representative of the person filing the documents. Each filing must also indicate the signer's name, address, and telephone number, as well as an email address, and facsimile number, if any.

(2) *Method of filing.* Unless otherwise permitted under these rules, documents must be filed either electronically, by mail, or by hand delivery. In addition, a motion or a response to a motion may be submitted by facsimile if the submission contains no attachments. Upon filing a motion or response to a motion by facsimile, the sender must, within one business day, submit the original copy to the Clerk of the Environmental Appeals Board either electronically, by mail, or by hand-delivery.

(i) *Electronic filing.* Documents that are filed electronically must be submitted using the Environmental Appeals Board's electronic filing system, subject to any appropriate conditions and limitations imposed by order of the Environmental Appeals Board. All documents filed electronically must include the full name of the person filing below the signature line. Compliance with Environmental Appeals Board electronic filing requirements constitutes compliance with applicable signature requirements.

(ii) *Filing by U.S. Mail.* Documents that are sent by U.S. Postal Service (except by U.S. Express Mail) must be sent to the official mailing address of the Clerk of the Environmental Appeals Board at: U.S. Environmental Protection Agency, Environmental Appeals Board, 1200 Pennsylvania Avenue NW., Mail Code 1103M, Washington, DC 20460–0001. The original and two copies of each document must be filed. The person filing the documents must include a cover letter to the Clerk of the Environmental Appeals Board clearly identifying the documents that are being submitted, the name of the party on whose behalf the documents are being submitted, as well as the name of the person filing the documents, his or her address, telephone number and, if available, fax number and email address.

(iii) *Filing by hand delivery.* Documents delivered by hand or courier (including deliveries by U.S. Express Mail) must be delivered to the Clerk of the Environmental Appeals Board at: U.S. Environmental Protection Agency, Environmental Appeals Board, EPA East Building, 1201 Constitution Avenue NW., Room 3334, Washington, DC 20004. The original and two copies of each document must be filed. The person filing the documents must include a cover letter to the Clerk of the Environmental Appeals Board clearly identifying the documents being submitted, the name of the party on whose behalf the documents are being submitted, as well as the name of the person filing the documents, his or her address, telephone number and, if available, fax number and email address.

(3) *Service requirements.* Petitioner must serve the petition for review on the Regional Administrator and the permit applicant (if the applicant is not the petitioner). Once an appeal is docketed, every document filed with the Environmental Appeals Board must be served on all other parties. Service must be by first class mail, or by any reliable commercial delivery service. Upon agreement by the parties, service may be made by facsimile or electronic means.

(4) *Proof of service.* A certificate of service must be appended to each document filed stating the names of persons served, the date and manner of service, as well as the electronic, mailing, or hand delivery address, or facsimile number, as appropriate.

(j) *Withdrawal of permit or portions of permit by Regional Administrator.* The Regional Administrator, at any time prior to 30 days after the Regional Administrator files its response to the petition for review under paragraph (b) of this section, may, upon notification to the Environmental Appeals Board and any interested parties, withdraw the permit and prepare a new draft permit under § 124.6 addressing the portions so withdrawn. The new draft permit must proceed through the same process of public comment and opportunity for a public hearing as would apply to any other draft permit subject to this part. Any portions of the permit that are not withdrawn and that are not stayed under § 124.16(a) continue to apply. If the Environmental Appeals Board has held oral argument, the Regional Administrator may not unilaterally withdraw the permit, but instead must request that the Environmental Appeals Board grant a voluntary remand of the permit or any portion thereof.

(k) *Petitioner request for dismissal of petition.* Petitioner, by motion, may request to have the Environmental Appeals Board dismiss its appeal. The motion must briefly state the reason for its request.

(l) *Final disposition and judicial review.* (1) A petition to the Environmental Appeals Board under paragraph (a) of this section is, under 5 U.S.C. 704, a prerequisite to seeking judicial review of the final agency action.

(2) For purposes of judicial review under the appropriate Act, final agency action on a RCRA, UIC, NPDES, or PSD permit occurs when agency review procedures under this section are exhausted and the Regional Administrator subsequently issues a final permit decision under this paragraph. A final permit decision must be issued by the Regional Administrator:

(i) When the Environmental Appeals Board issues notice to the parties that the petition for review has been denied;

(ii) When the Environmental Appeals Board issues a decision on the merits of the appeal and the decision does not include a remand of the proceedings; or

(iii) Upon the completion of remand proceedings if the proceedings are remanded, unless the Environmental Appeals Board's remand order specifically provides that appeal of the remand decision will be required to exhaust administrative remedies.

(3) The Regional Administrator must promptly publish notice of any final agency action regarding a PSD permit in the Federal Register.

(m) *Motions for reconsideration or clarification.* Motions to reconsider or clarify any final disposition of the Environmental Appeals Board must be filed within 10 days after service of that order. Motions for reconsideration must set forth the matters claimed to have been erroneously decided and the nature of the alleged errors. Motions for clarification must set forth with specificity the portion of the decision for which clarification is being sought and the reason clarification is necessary. Motions for reconsideration or clarification under this provision must be directed to, and decided by, the Environmental Appeals Board. Motions for reconsideration or clarification directed to the Administrator, rather than the Environmental Appeals Board, will not be considered, unless such motion relates to a matter that the Environmental Appeals Board has referred to the Administrator pursuant to § 124.2 and for which the Administrator has issued the final order. A motion for reconsideration or clarification does not stay the effective date of the final order unless the Environmental Appeals Board specifically so orders.

(n) *Board authority.* In exercising its duties and responsibilities under this part, the Environmental Appeals Board may do all acts and take all measures necessary for the efficient, fair, and impartial adjudication of issues arising in an appeal under this part including, but not limited to, imposing procedural sanctions against a party who, without adequate justification, fails or refuses to comply with this part or an order of the Environmental Appeals Board. Such sanctions may include drawing adverse inferences against a party, striking a party's pleadings or other submissions from the record, and denying any or all relief sought by the party in the proceeding. Additionally, for good cause, the Board may relax or suspend the filing requirements prescribed by these rules or Board order.

(o) *General NPDES permits.* (1) Persons affected by an NPDES general permit may not file a petition under this section or otherwise challenge the conditions of a general permit in further Agency proceedings. Instead, they may do either of the following:

(i) Challenge the general permit by filing an action in court; or

(ii) Apply for an individual NPDES permit under § 122.21 as authorized in § 122.28 of this chapter and may then petition the Environmental Appeals Board to review the individual permit as provided by this section.

(2) As provided in § 122.28(b)(3) of this chapter, any interested person may also petition the Director to require an individual NPDES permit for any discharger eligible for authorization to discharge under an NPDES general permit.

(p) The Environmental Appeals Board also may decide on its own initiative to review any condition of any RCRA, UIC, NPDES, or PSD permit decision issued under this part for which review is available under paragraph (a) of this section. The Environmental Appeals Board must act under this paragraph within 30 days of the service date of notice of the Regional Administrator's action.

■ 5. Paragraph (b)(1) of § 124.60 is amended by removing the reference to "§ 124.19(f)" in the first sentence and adding in its place "§ 124.19(k)(2)".

PART 270—EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

■ 6. The authority citation for part 270 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912, 6924, 6925, 6927, 6939, and 6974.

■ 7. Paragraph (f)(3) of § 270.42 is revised to read as follows:

§ 270.42 Permit modification at the request of permittee.

* * * * *

(f) * * *

(3) An automatic authorization that goes into effect under paragraph (b)(6)(iii) or (v) of this section may be appealed under the permit appeal procedures of 40 CFR 124.19; however, the permittee may continue to conduct the activities pursuant to the automatic authorization unless and until a final determination is made by the Environmental Appeals Board to grant review and remand the permit decision.

* * * * *

■ 8. Paragraph (a) of 270.155 is revised to read as follows:

§ 270.155 May the decision to approve or deny my RAP application be administratively appealed?

(a) Any commenter on the draft RAP or notice of intent to deny, or any participant in any public hearing(s) on the draft RAP, may appeal the Director's decision to approve or deny your RAP application to EPA's Environmental Appeals Board under § 124.19 of this chapter. Any person who did not file comments, or did not participate in any public hearing(s) on the draft RAP, may petition for administrative review only to the extent of the changes from the draft to the final RAP decision. Appeals of RAPs may be made to the same extent as for final permit decisions under § 124.15 of this chapter (or a decision under § 270.29 to deny a permit for the active life of a RCRA hazardous waste management facility or unit).

* * * * *

[FR Doc. 2013–01318 Filed 1–24–13; 8:45 am]
BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 239 and 258

[EPA–R01–RCRA–2012–0944; FRL–9771–7]

Adequacy of Massachusetts Municipal Solid Waste Landfill Permit Program

AGENCY: Environmental Protection Agency (EPA).

ACTION: Direct final rule.

SUMMARY: This action approves a modification to Massachusetts's approved municipal solid waste landfill (MSWLF) program. The approved modification allows the State to issue Research, Development, and Demonstration (RD&D) Permits to owners and operators of MSWLF in accordance with its State law. On March 22, 2004, EPA issued final regulations allowing research, development, and demonstration (RD&D) permits to be issued to certain municipal solid waste landfills by approved states. On December 7, 2012 Massachusetts submitted an application to EPA Region 1 seeking Federal approval of its RD&D requirements. After thorough review EPA Region 1 is determining that Massachusetts's RD&D permit requirements are adequate through this direct final action.

DATES: This determination of RD&D program adequacy for Massachusetts will become effective April 25, 2013 without further notice unless EPA receives adverse comments on or before March 26, 2013. If adverse comments are received, EPA will review the comments and publish another Federal Register document responding to the comments and either affirming or revising the initial decision.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–R01–RCRA–2012–0944, by one of the following methods:

- *www.regulations.gov:* Follow the on-line instructions for submitting comments.
- *Email: hsieh.juiyu@epa.gov.*
- *Fax:* (617) 918–0646, to the attention of Juiyu Hsieh.
- *Mail:* Juiyu Hsieh, RCRA Waste Management and UST Section, Office of

Information for Filing an Adjudicatory Hearing Request
with the Commonwealth of Massachusetts
Department of Environmental Protection

Within thirty days of the receipt of this letter the adjudicatory hearing request should be sent to:

Docket Clerk
Office of Administrative Appeals
Department of Environmental Protection
One Winter Street, Second Floor
Boston, MA 02108

In addition, a valid check payable to the Commonwealth of Massachusetts in the amount of $100 must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

The hearing request to the Commonwealth will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver.

The filing fee is not required if the appellant is a city, town (or municipal agency), county, district of the Commonwealth of Massachusetts, or a municipal housing authority. The Department may waive the adjudicatory hearing filing fee for a permittee who shows that paying the fee will create an undue financial hardship. A permittee seeking a waiver must file, along with the hearing request, an affidavit setting forth the facts believed to support the claim of undue financial hardship.

APPENDIX B

CDM SMITH RESPONSE TO COMMENTS MEMORANDUM, MAY 2015; MASSDEP COMMENT LETTER, FEBRUARY 2015; & *HYDROGEOLOGICAL EVALUATION REPORT: PINE STREET SITE, NORTON, MASSACHUSETTS,* MAY 2014

Memorandum

To: *David Burns, MassDEP SERO and Stephen Hallem, MassDEP Boston*

From: *Robert P. Schreiber*

Date: *May 29, 2015*

Subject: *Supplemental Groundwater Modeling Analysis in Support of Infiltration Basin Design at the Pine Street Site in Norton, Massachusetts for the MFN Regional Wastewater District*

This memorandum is a supplement to the May 2014 *Pine Street Site Hydrogeological Evaluation Report* (2014 report). The purpose of this memo is to summarize the supplemental groundwater modeling analysis conducted in April 2015 to examine the feasibility-level results regarding effluent loading at a rate of 1.0 million gallons per day (mgd) at the Pine Street site in Norton, Massachusetts. The 1.0 mgd capacity was identified in the wastewater needs in the 2008 *Regional Effluent Disposal Alternative Study* (2008 report) conducted on behalf of the Town of Mansfield, Massachusetts and the newly formed MFN Regional Wastewater District (July 1, 2014), completed as part of Mansfield's comprehensive wastewater management planning (CWMP) process. In the 2014 report, a total infiltration basin area of 2.4 acres, or 104,544 square feet (ft^2) was identified at the site to accommodate the 1.0 mgd recharge at a long-term application rate of 9.6 gallons per day per square foot (gpd/ft^2).

The supplemental groundwater modeling was requested by the Massachusetts Department of Environmental Protection (MassDEP) staff during a meeting on March 24, 2015 to discuss their comments on the 2014 report. At that meeting it was agreed that the proposed design infiltration basin area and effluent recharge application rates could be utilized if two conditions were met. First, supplemental modeling at the MassDEP requested application rate of 5.0 gpd/ft^2 and 200,000 ft^2 of basin area should be conducted to show satisfactory results. Second, once the Phase I basins (see **Figure 1**) are constructed at the design parameters proposed in the 2014 report, a full scale loading test should be conducted to verify the application rate and basin area. If the results indicate that a lower application rate of 5.0 gpd/ft^2 should be utilized, the MFN Regional Wastewater District would construct the additional infiltration basin area (Phase II) to meet that rate. Thus, this memorandum is intended to meet the first condition.

The following information is provided in this memorandum:

- **Background** – provides a narrative of the most recent studies and chain-of-events that led to the April 2015 supplemental groundwater modeling-based analysis of 1.0 mgd effluent recharge at an application rate of 5.0 gpd/ft^2.

- **Groundwater Flow Modeling** – describes the supplemental predictive groundwater flow modeling conducted in response to written comments provided by the MassDEP on February 24, 2015 and verbal comments provided at the meeting on March 24, 2015.
- **Predictive Modeling Results** – summarizes the results of the predictive groundwater flow simulations, demonstrating satisfactory results regarding potentially limiting factors such as separation distance, impact on near-by vernal pools and homes, and travel time to the public supply well.

Background

On May 29, 2014 CDM Smith submitted the 2014 report to the MassDEP. The report analyzed the potential use of the Pine Street site as an effluent recharge site as part of the regional wastewater solution for Mansfield, Foxborough, and Norton. The work has been conducted in accordance with the scope of work approved by MassDEP on February 25, 2014. The report also addressed comments MassDEP provided on August 31, 2010 after reviewing the 2008 report, submitted in September 2008 as a precursor to the 2014 report.

In support of the 2014 report, an infiltration basin pilot loading test was conducted on-site between October 18 and November 4, 2013. The pilot test was conducted to evaluate the long term application rate at the proposed site. The results of the pilot test coupled with groundwater modeling indicated that the site could sustain a design loading rate of 1.0 mgd using a long term application rate of 9.6 gpd/ft^2 (based on EPA and MassDEP guidance documents) over an application area of 104,544 ft^2. The results of the effluent loading analyses were provided in the 2014 report.

In a letter dated February 24, 2015, MassDEP approved the 2014 report and authorized the applicant (MFN Regional Wastewater District) to apply for a BRP WP 79, Individual Groundwater Discharge Permit subject to the following conditions:

- Design flow of proposed groundwater discharge shall not exceed 0.52272 mgd.
- The long term application rate to the soil absorption system (SAS) shall not be greater than 5.0 gpd/ft^2.
- The proposed SAS shall be constructed within the footprint indicated in the 2014 report and prior to construction of the SAS, soil evaluation and percolation testing shall be scheduled for witnessing by MassDEP.
- The Towns Public Supply Well #2 is not active per classification and records of the MassDEP Drinking Water Program.
- Unforeseen changes to the hydrogeologic conditions or changes to the proposed effluent loading location will render the Permit void and a new Permit Application, BRP WP83, will need to be submitted.
- An Initial Groundwater Monitoring Well and Groundwater Quality Report that establishes baseline water quality must be submitted prior to any discharge of wastewater.

The discharge rate of 0.52272 mgd cited in the MassDEP letter is based on the 2014 report indicating an infiltration basin area of 2.4 acres or 104,544 ft^2 and a long-term application rate of 5.0 gpd/ft^2 from MassDEP guidance.

On March 24, 2015, representatives of MassDEP, the MFN Regional Wastewater District and CDM Smith met to discuss the 2014 report and MassDEP comments. As noted above, a conditional approach was agreed upon to move this program forward.

Since the wastewater needs for the MFN Wastewater District was identified as 1.0 mgd, additional analysis was conducted in April 2015 which assessed a larger infiltration basin area so as to achieve the 1.0 mgd recharge rate. The analysis included the infiltration basin area from the 2014 report and additional infiltration basins immediately to the south/southeast to achieve a total recharge rate of 1.0 mgd. **Figure 1** shows the field data collected in the area of the Pine Street site and the proposed locations for the infiltration basins.

Groundwater Flow Modeling Basis

A fully three-dimensional, numerical groundwater flow and particle-tracking model was developed as part of the 2008 report to evaluate effluent loading at the Pine Street and Crane Street sites. The model was used to estimate impact to offsite areas such as wetlands, ponds, vernal pools and the Town of Norton's municipal water supply well.

The model was updated and calibrated in 2014 based on the data collected during the fall 2013 field investigation of the Pine Street site. The design recommendation of the 2014 report was that the Phase I area could accommodate 1.0 mgd at a design application rate greater than 5.0 gpd/ft^2 with no adverse impacts to adjacent areas.

Per agreement with MassDEP, the calibrated 2014 groundwater flow model was used to run predictive simulations to evaluate the potential impacts of discharging to the larger area of 200,000 ft^2 at an application rate of 5.0 gpd/ft^2 to achieve the recharge capacity of 1.0 mgd. Details regarding the groundwater flow model are provided in Section 3 of the 2014 report.

Predictive Simulation Results

A predictive steady-state simulation was used to evaluate the effluent load application scenario of 1.0 mgd infiltration on approximately 200,000 ft^2. As with the 2014 predictive simulations, the infiltration area was limited to the elevated plateau area of the site. The proposed infiltration basin areas are shown on **Figure 1**. The potentially limiting factors, which were assessed as part of the 2014 report, were also evaluated for this application scenario with a larger infiltration area. These factors include seasonal high water levels, separation distance, water table rise in adjacent areas (e.g., vernal pools and abutting residences), and predicted time-of-travel to the Norton water supply well. The results of the evaluation are discussed below.

Seasonal High Water Levels - The groundwater flow model was calibrated to water levels measured during October through November 2013. Based on long-term water level data collected

at an "upland" USGS well, the water levels during this period were lower than average. Consequently, the water levels produced by the groundwater flow model will represent lower than average water table elevations. To accommodate for this, seasonal high water level conditions were evaluated. The difference of 3.93 feet indicates how much higher the median seasonal high water level would be than the conditions to which the model was calibrated at the site. Section 4.3.4 of the 2014 report describes the method used to calculate this increase in water table that accounts for seasonal fluctuations in the water table. When evaluating separation distance below the footprint of the infiltration basins or the impact to vernal pools and abutting residences, approximately 4-feet was added to the predicted water table under effluent loading conditions to assess the impact of seasonal variability.

This 4-feet of seasonal fluctuation is considered a conservative estimate of how much the water table can vary. It should be noted that water levels will be monitored for at least one year prior to effluent loading in order to determine site-specific seasonal variability.

Separation Distance - Water table mounding was evaluated by plotting the "separation distance", or depth-to-water, defined as the vertical distance between the simulated water table with effluent loading and the ground surface. Separation distances below the footprint of the simulated infiltration basins were calculated assuming the basin surface would be approximately at the existing ground surface elevation. The primary criterion applied during the predictive simulation process involved the maintenance of a minimum separation distance of 4 feet at all locations within the infiltration basin areas. This criterion served as a goal, based on applicable regulatory guidance for subsurface wastewater effluent recharge.

Figure 2a shows the separation distance at the site with no effluent loading. The water table is 30 – 40 feet below ground surface throughout most of the infiltration basin area. **Figure 2b** shows the simulated separation distance throughout the site based on a loading rate of 1.0 mgd at an application rate of 5.0 gpd/ft^2. The minimum separation distance of 10 feet within the footprint of the infiltration basins allows for the 4-feet separation distance required by MassDEP as well as the additional 4 feet that represents seasonal high groundwater conditions. Thus, separation distance at the infiltration basins is not assessed to be a limiting factor for this application scenario.

Impact of Water Table Rise on Adjacent Areas – The impact of water table rise at the near-by residences and vernal pools was evaluated. The 2014-calibrated groundwater model and as-built drawings of the septic systems for the abutting properties, which were obtained from the Norton Board of Health, were used to evaluate the impact of water table rise.

At 170 Pine Street (the residence closest to the proposed basin area), the simulated water table in the vicinity of the house before effluent loading was approximately 25 feet below ground surface. Taking into account seasonal high fluctuations, the water table could be as shallow as 21 feet below ground surface. The basement floor elevation, as shown in the as-built drawing for this property, is 7.5 feet below ground surface. The separation distance between the water table and the basement floor prior to effluent loading is about 13.5 feet during the seasonal high groundwater levels. After effluent loading, the predicted water table rise was approximately 4 feet. Based on this rise, the separation distance between seasonal high water level and the basement floor is about 9.5 feet.

At 174 Pine Street (farther from proposed basin area, near Pine Street Pond), the simulated water table in the vicinity of the house before effluent loading is approximately 5.9 feet below ground surface. Taking into account seasonal high fluctuations, the water table could be as shallow as 1.9 feet below ground surface. No basement is identified in the as-built drawing for this house. There was very little change to the water table elevation after effluent loading. This is likely due to the proximity of this house to the Pine Street Pond and associated wetlands, which control local water levels.

Based on the predictive simulations, no adverse impacts to the abutting properties are expected.

As shown on the Site Map (Figure 1-1) in the 2014 *Pine Street Site Hydrogeological Evaluation Report*, there are two certified vernal pools off of the southwest edge of the Pine Street site access road within a privately-owned parcel. The rise in water table near these vernal pools was examined to determine whether the higher water table disrupts the wet-dry cycle that is essential to the vernal pool ecosystem. The water table with no effluent loading is about 3.1 feet below ground surface in the area of the vernal pools during a dry period. With effluent loading, the simulation modeling indicates a predicted rise of 1.7 feet, which would result in the water table rising to 1.4 feet below ground surface, thus maintaining sufficient vertical separation during seasonal dry periods.

Though no adverse impact is predicted at the vernal pools, as stated previously, water levels will be monitored for at least one year prior to effluent loading. Well MW-105, which is near the vernal pools, will be monitored for seasonal fluctuations.

Time-of-Travel to Water Supply Well - The potential for infiltrated effluent to enter the Town of Norton's water supply well was examined by simulating the migration of infiltrated effluent from locations around the edge of the infiltration area. A particle-tracking simulation method was used for this evaluation.

The current MassDEP regulations indicate that there should be at least two years of travel time from the site to a permitted water supply well; therefore, the predictive simulation results were examined to ensure a minimum 2-year time-of-travel from any point within the simulated basin footprint to the nearest public water supply well, Well #1, identified as likely to be in operation in the future (Well #2 is permanently offline). **Figure 3** shows the non-dispersive particle tracks from various places around the proposed infiltration basin area after 5 years. Based on this simulation, most of the particles migrate to surface water bodies and wetlands within a year, without migrating directly to the well. There was one particle that moved towards the well but even after 5 years was still almost 1,000 feet from Well #1. Thus, time-of-travel to the water supply well is not a limiting factor for this effluent application scenario.

Conclusion

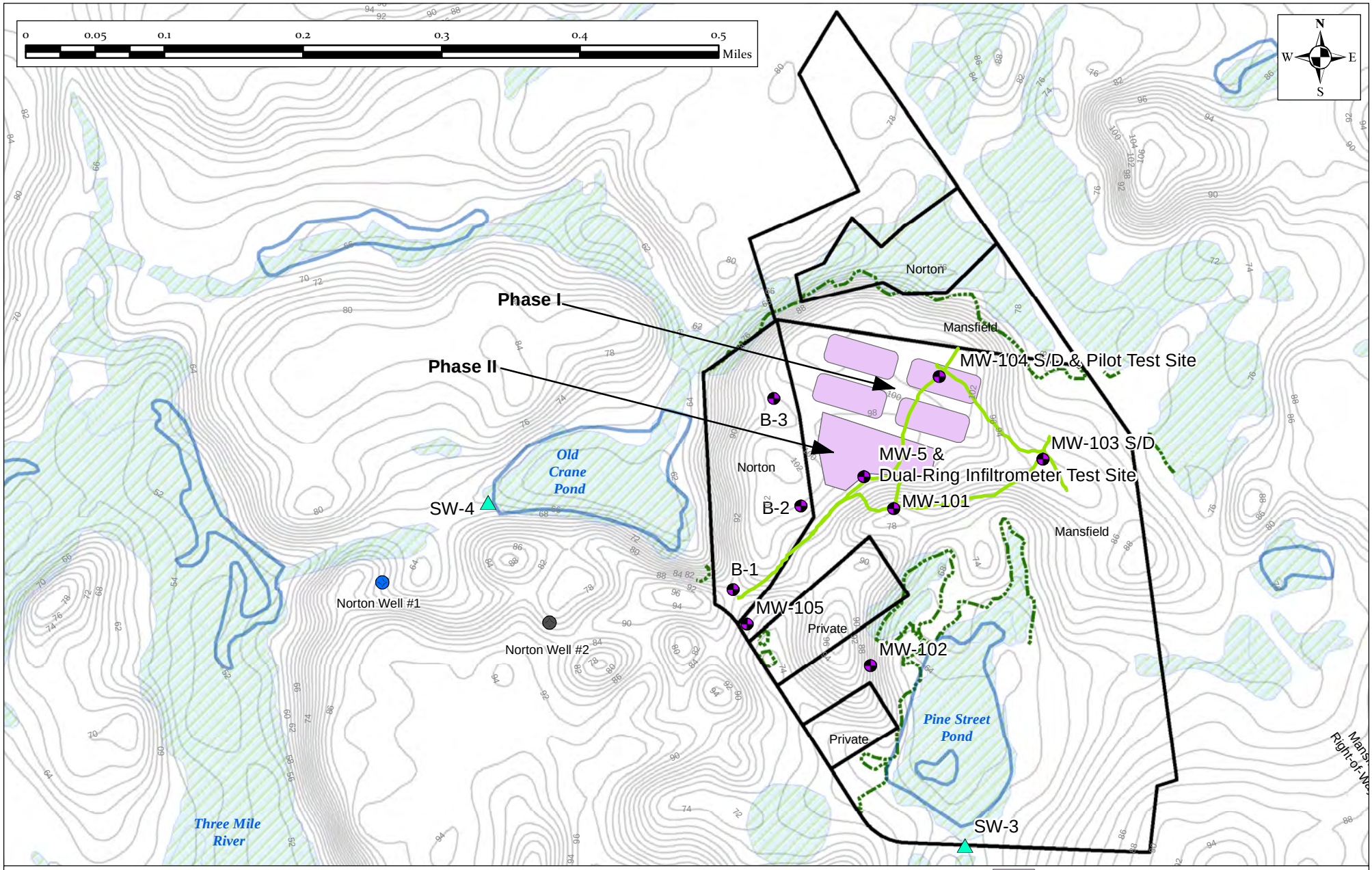
This memorandum describes supplemental groundwater analysis that was conducted in April 2015 to supplement the analysis that was conducted in 2014 and documented in the 2014 report. This supplemental analysis was conducted in response to MassDEP concerns over utilizing a long-term

application rate over their guidance value of 5.0 gpd/ft^2 despite pilot testing data indicating that the SAS could sustain a higher application rate. The results of the analysis indicate that an application scenario of applying 1.0 mgd to a 200,000 ft^2 infiltration basin area at an application rate of 5.0 gpd/ft^2 would:

- Maintain more than 4 feet of separation distance at the footprint of the infiltration basins, even under seasonally high groundwater conditions;
- Avoid adverse impacts on surrounding properties or vernal pools; and
- Take longer than the 2 years time-of-travel (per MassDEP guidance) to the nearest active public water supply well.

Figure 4 shows the design layout of the Phase I and Phase II infiltration basins, including access roads to allow for proper operations and maintenance. Based on these results, the MFN Regional Wastewater District will move forward with construction of the Phase I infiltration basins as shown on the original design in the 2014 report. Subsequently, during the first year of operations with the Phase I basins, a full-scale loading test will be performed to determine whether the Phase II basins are necessary.

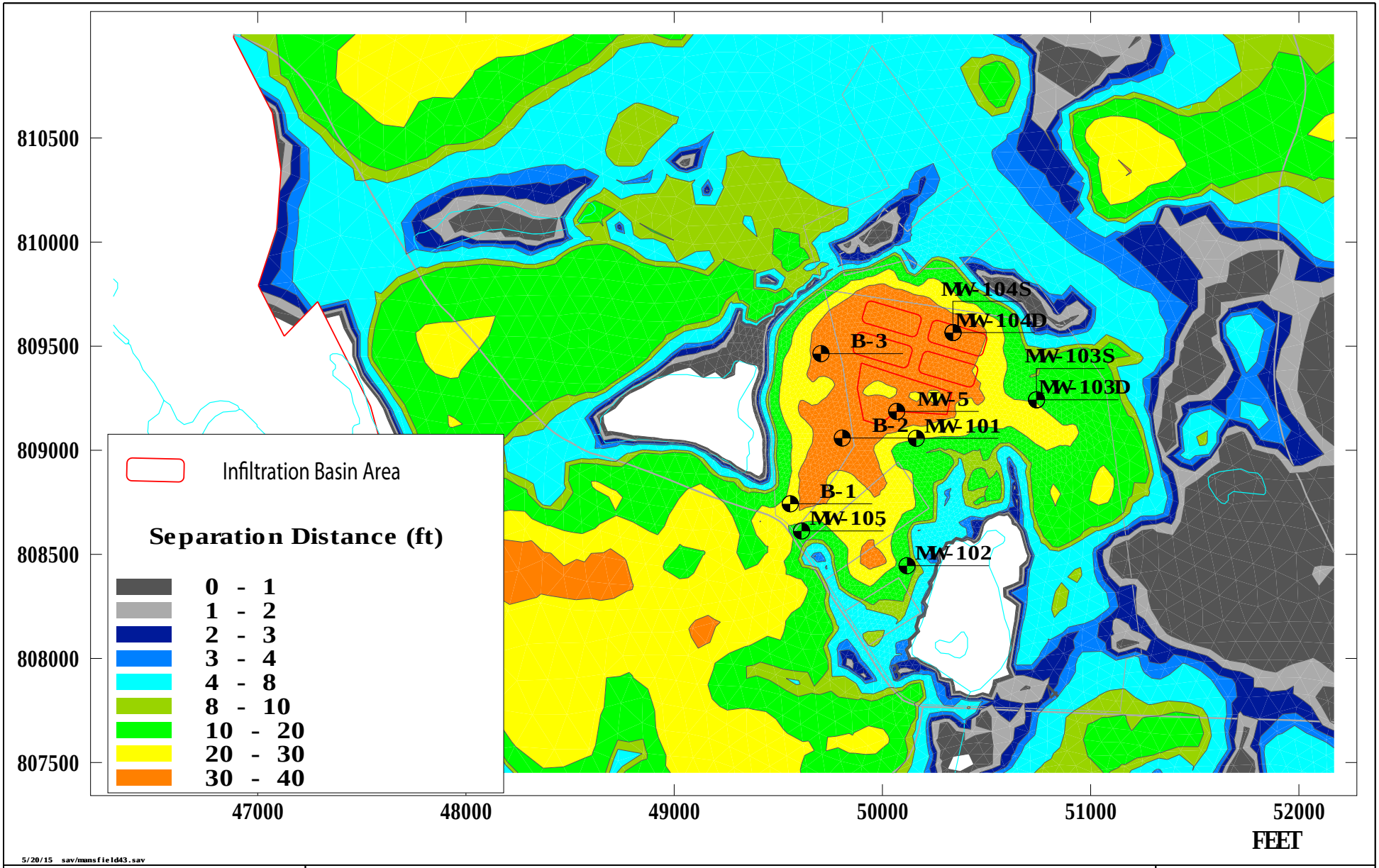
cc: Lee Azinheira, Executive Director, MFN Regional Wastewater District
Ed Sanderson and David Young, CDM Smith
David Johnston, MassDEP, SERO



CDM Smith

Existing Field Observation Locations & Proposed Infiltration Basin Areas
Pine Street Site in Norton, MA

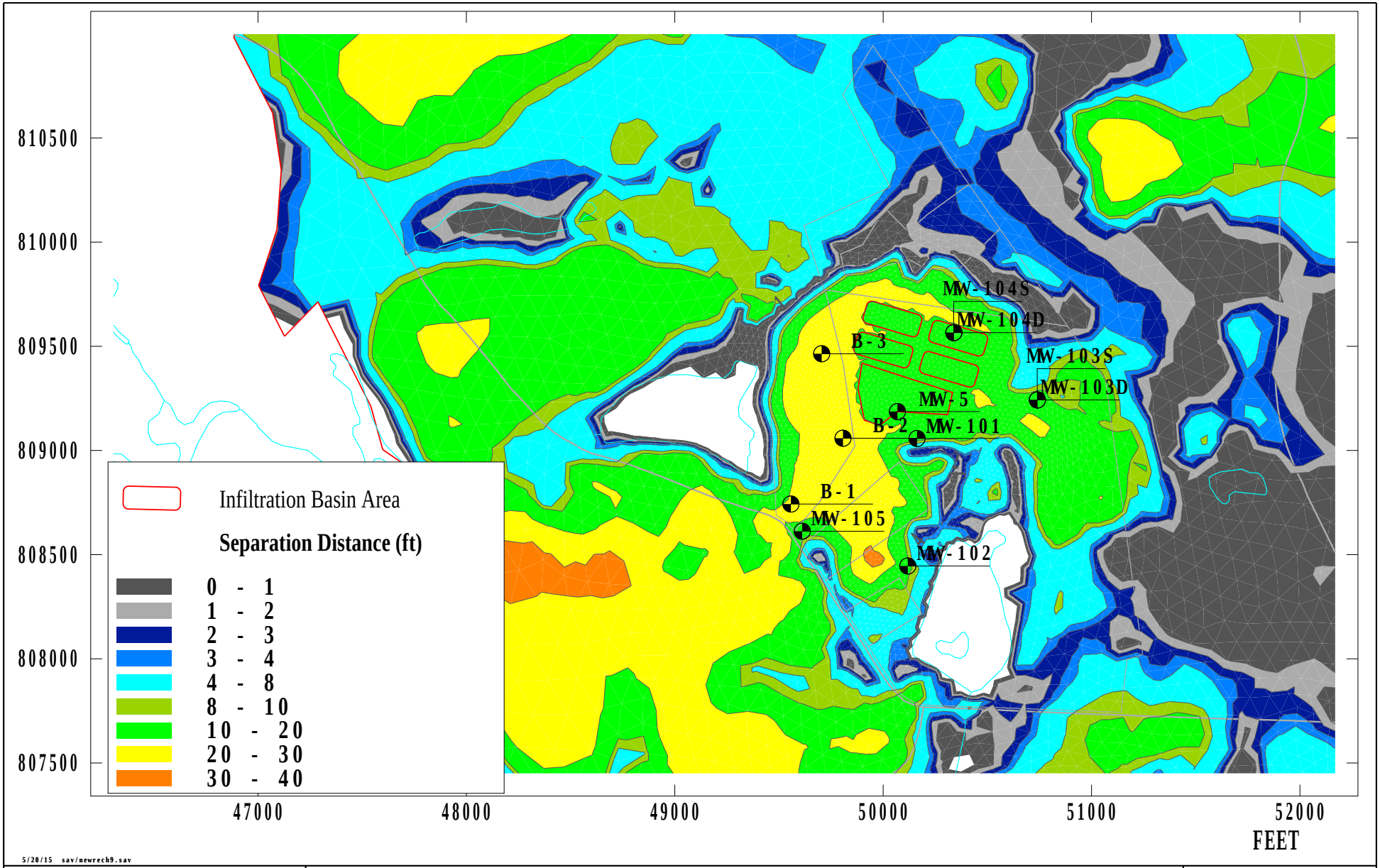
Figure
1



CDM Smith

Existing Conditions (No Effluent Loading)
Simulated Separation Distance (ft) between Water Table and Ground Surface
Pine Street Site - Norton, MA

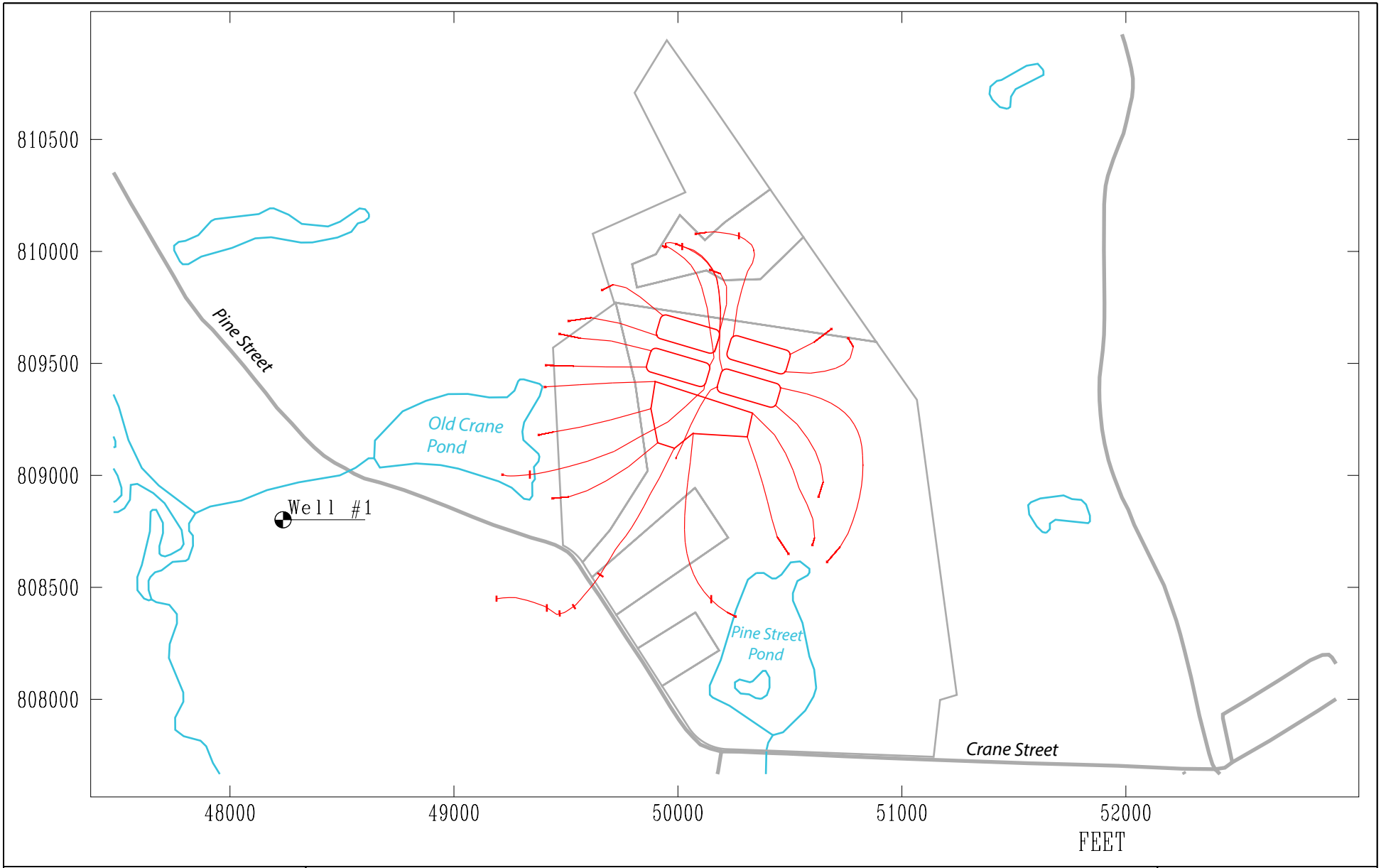
FIGURE 2a



CDM Smith

Effluent Application Scenario (1.0 mgd on ~200,000 sf at 5 gpd/sf)
Simulated Separation Distance (ft) between Water Table and Ground Surface
Pine Street Site - Norton, MA

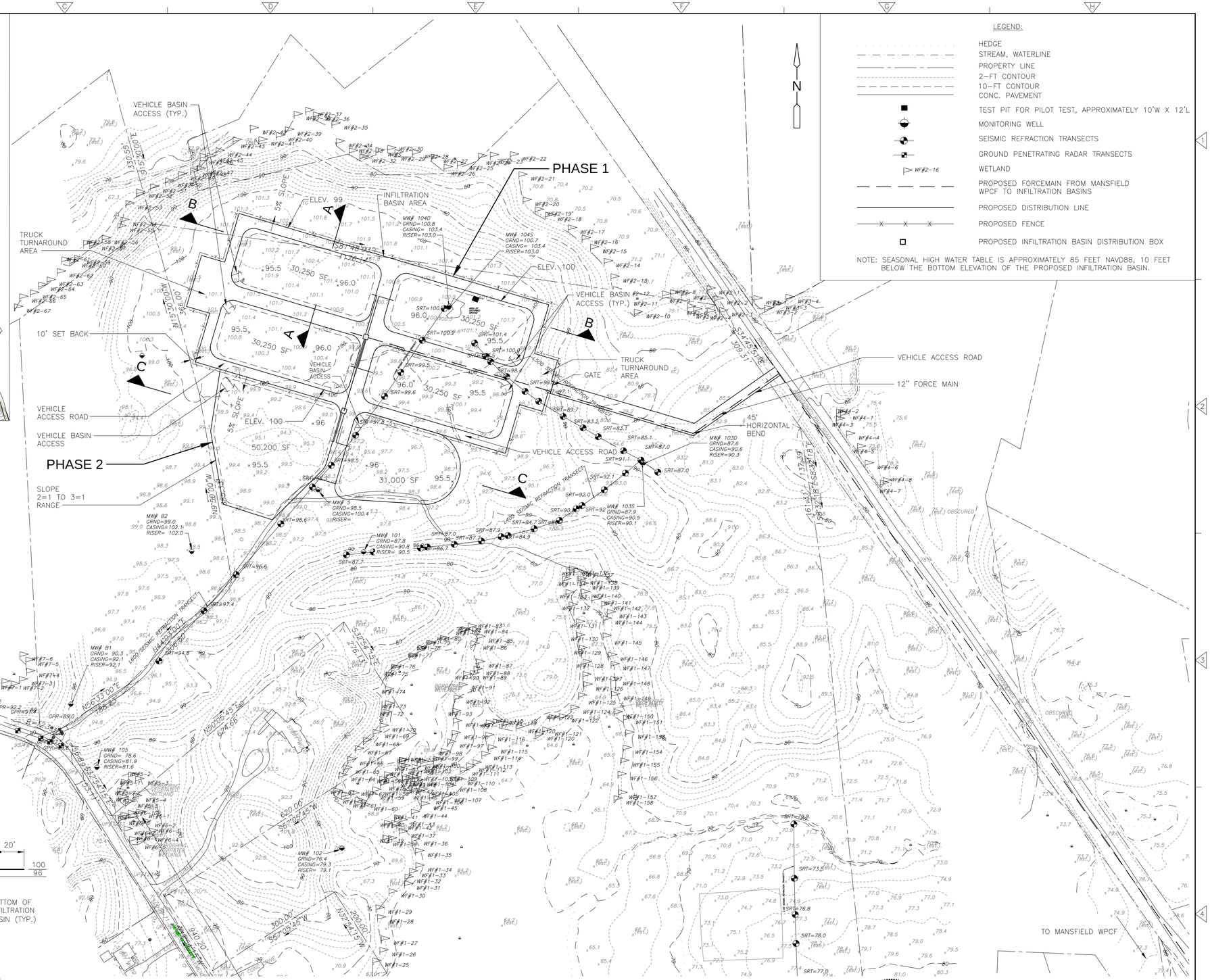
FIGURE
2b



CDM Smith

Effluent Application Scenario (1.0 mgd on ~200,000 sf at 5 gpd/sf)
Simulated Time-of-Travel Groundwater Flow Pathlines
5-Year Predictive Simulation
Pine Street Site - Norton, MA

Figure
3



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: D. YOUNG
DRAWN BY: T. PETRUKHIN
SHEET CHK'D BY: E. SANDERSON
CROSS CHK'D BY: D. YOUNG
APPROVED BY: E. SANDERSON
DATE: AUGUST 2014

CDM Smith
50 Hampshire Street
Cambridge, MA 02139
Tel: (617) 452-6000

MANSFIELD WPCF

PINE STREET SITE
EFFLUENT RECHARGE BASINS
RECOMMENDED PLAN

FIGURE 4

PROJECT NO. 0201-99387
FILE NAME: C006STPL
SHEET NO. 1

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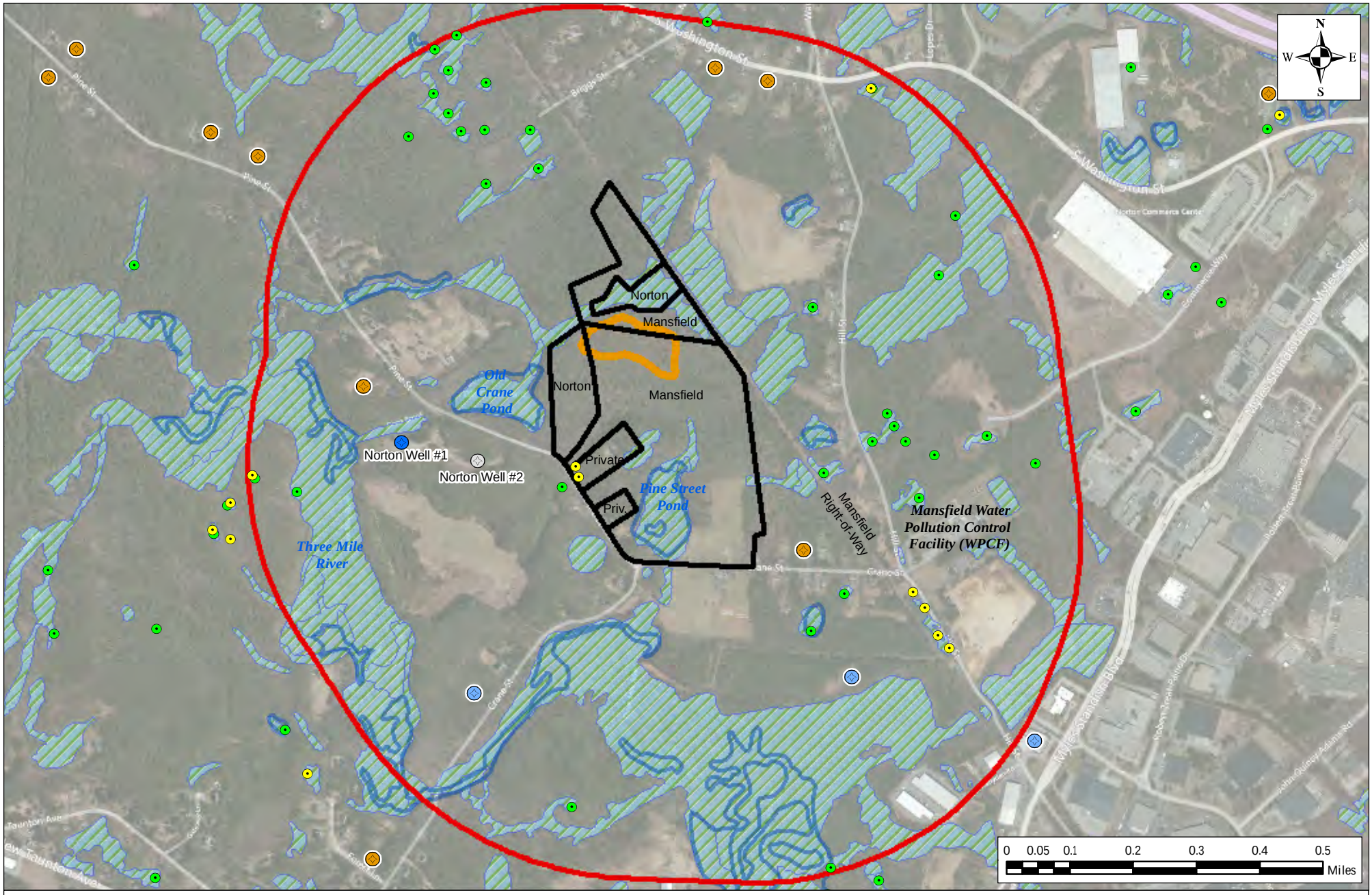

LEGEND

- Active Well - Norton Public Water Supply Well #1
- Off Line Well - Norton Well #2
- Private Potable Wells
- Private Non-Potable Wells
- NHESP Certified Vernal Pools
- Potential Vernal Pools
- 0.5 Mile Buffer
- Plateau Area
- Surface Water
- DEP Wetlands
- Parcel Boundaries

CDM Smith

Site Map
Pine Street in Norton, MA

From 2014 Report with locations of vernal pools

Figure
1-1

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

February 24, 2015

Lee Azinheira, Director,
Mansfield Department of Public Works and
Executive Director of MFN Regional
Wastewater District
6 Park Row
Mansfield, Massachusetts 02048

RE: NORTON – Pine Street Site,
BRP WP 83, Approval of Hydrogeologic
Evaluation Report,
Transmittal Number X260877

Dear Mr. Azinheira:

The Massachusetts Department of Environmental Protection (MassDEP) has completed its review of the hydrogeological evaluation report dated May 2014 and submitted on your behalf by CDM Smith. The report summarizes the results of a hydrogeologic evaluation conducted by CDM Smith to support a future Groundwater Discharge Permit Application for a proposed discharge to the Pine Street Site in Norton, MA (the "Report"). The evaluation was conducted in accordance with the scope of work submitted by CDM Smith on July 15, 2013 and approved by MassDEP on February 25, 2014.

The evaluated discharge location is the Reilly Property known as the Pine Street Site. The site is located to the east of Norton Wells #1 and #2. Currently, only Well #1 is operated for water supply purposes and Well #2 is reported to be "planned to be abandoned". The Pine Street site is entirely outside the Zone II of Well #1. Well #2 is located within the Zone II for Well #1. It should be noted that during a model simulation, 1 (one) particle track did enter the Zone II of Well #1 after 4 (four) years time of travel. This did not exceed the 2 (two) year time of travel in MassDEP regulations and is therefore more conservative than required.

Soil tests and borings performed within the foot print of the proposed soil absorption system (SAS) are reported to have encountered sand and gravel of varying grade and were deemed suitable for the purpose of a discharge of this type. The wells were installed by Soil Exploration, Inc., a drilling company situated in Leominster, Massachusetts (May 13th to 19th, 2008).

The proposed subsurface disposal system was evaluated at a design flow of 1.0 MGD gallons per day. Soil evaluation and percolation testing of the proposed site supports a long term application rate of 9.6 gallons/day/square foot. The area required for the discharge is 104,544 square feet.

The SAS design was evaluated by CDM Smith. A site plan of the proposed SAS is contained in the referenced Report as Fig 4.1.

Estimated mounded seasonal high groundwater beneath the proposed SAS is at an approximate elevation of 85.5 feet. The bottom of bed elevations of the proposed disposal bed(s) are approximately at the 95.5 foot elevation. These elevations provide more than the required four feet of unsaturated separation between the top of the mounded seasonal high water table and the base of the proposed disposal beds.

Hydrogeologic simulations for this study were provided using the DYNSYSTEM groundwater modeling software which includes DYNFLOW (single-phase groundwater flow) and DYNTRACK (solute transport). DYNFLOW is a fully three-dimensional, finite element groundwater flow model. This software has been developed and utilized by CDM (CDM-Smith). Of note is Section 3.4.3, Water Supply Wells: "The Town of Norton's water supply pumping well, Well #1, was the only active pumping well represented in the groundwater model. Well #1 was represented as a specified flux at a node that corresponds to the horizontal and vertical coordinates of the well screen. Since the simulation was run at a steady state, the specified flux at Well #1 was set to the average pumping rate of 200 GPM." It was stated in the report that the Town plans to abandon the second well. MassDEP records indicate Well #2 (Source ID 4218000-02G) is not an active water supply well and cannot be placed into service.

The long term monitoring plan (Section 6 of the Report) proposes a monitoring well network that consists of 6 monitoring wells and additional monitoring of the vernal pool(s);

- MW-101 – Downgradient of the proposed effluent recharge area and upgradient of the nearest, private property; monitor water level rise near private property.
- MW-102 – Downgradient of the proposed effluent recharge area and upgradient of the other private property near the site; monitor water level rise near private property and wetlands.
- MW-103S – Monitor water level rise and water quality east of the site.
- MW-104S – Provide water quality data in the shallow aquifer below the effluent recharge site, monitor mounding at the recharge site.
- MW-104D – Provide water quality data in the deep overburden aquifer at the effluent recharge site, monitor mounding at the recharge site.
- MW-105 – Provide water quality data immediately upstream of the Norton well field property, provide water levels for monitoring the vernal pools.

Pursuant to 314 CMR 5.09 (1) (f), MassDEP hereby approves the hydrogeologic report submitted by CDM-Smith and authorizes the applicant to apply for a BRP WP 79, Individual Groundwater Discharge Permit, subject to the following conditions:

- The design flow of the proposed groundwater discharge shall not exceed 0.52272 million gallons per day

- The long term application rate to the SAS **shall not be greater than 5.0 gallons/day/square foot.** Upon submission of sufficient rounds of water level data to demonstrate the propagation of the mound (and superimposed upon the seasonal high water level) and sufficient demonstration that adverse impacts to sensitive receptors shall not occur the proponent may request an adjustment of the loading rate approved herein.

- The proposed SAS shall not be constructed until a Groundwater Discharge Permit has been obtained from MassDEP. The proposed SAS shall be constructed within the footprint indicated on Hydrogeological Evaluation Report Pine Street Site Norton, Massachusetts. **Prior to construction of the SAS, soil evaluation and percolation testing shall be scheduled for witnessing by MassDEP.**

- The Town's Public Supply Well #2 (Source ID 4218000-02G) is not active as per classification and records of the MassDEP Drinking Water Program.

- Should any changes to the hydrogeologic conditions not foreseen in this report occur, or should changes in the location of the discharge be proposed, this Permit is voided and a new Permit Application, BRP WP83, shall be submitted.

- An Initial Groundwater Monitoring Well and Groundwater Quality Report must be submitted to this office prior to any discharge of wastewater. This report must include;

    - a final surveyed site plan with the location of the SAS, all monitoring wells and all appropriate elevation data,
    - boring logs and well construction details for all monitoring wells, and
    - The analytical results of the groundwater samples collected from the final groundwater monitoring wells. These results will establish the baseline groundwater quality for the site.

Please be advised that this approval is not a Groundwater Discharge Permit. It does, however, authorize the project proponent to submit an Individual Groundwater Discharge Permit application for the discharge described at the evaluated location. MassDEP requires that the Individual Groundwater Discharge Permit application be accompanied by a MassDEP Transmittal form and include all required supporting documentation. Included in the supporting documentation shall be a certification from a Massachusetts Registered Professional Engineer that the approved Hydrogeological Report has been reviewed and accurately reflects site conditions as of the date of the permit application. Information on any changes noted during the review shall be included in the Engineering Report that accompanies the application. Please be advised, the submittal of plans and specifications may be required at anytime during the review of the permit application.

If you have questions regarding the comments and conditions of this approval, please contact Steve Hallem of our Boston office at 617-292-5681 or David Burns of this office at 508-946-2738.

Sincerely,

Jeffrey E. Gould, Chief
Bureau of Water Resources

G/SH

Ecc: MassDEP-SERO
Attn: David Johnston, DRD, BWR
David Burns, BWR
Kermit Studley, BWR

MassDEP-Boston
Attn: Steve Hallem, BWR
David Ferris, Director, WPP, BWR

Cc: CDM Smith
50 Hampshire Street
Cambridge, MA 02139
Attn: David F. Young, P.E., VP

Mansfield Board of Health
6 Park Row
Mansfield, MA 02048
Attn: Scott Leite, Health Agent

P:Gould\Mansfield Hydrogeo Approval ltr-sh-G2.doc

REPORT

Hydrogeological Evaluation Report

Pine Street Site
Norton, Massachusetts

Prepared for

Town of Mansfield, Massachusetts

May 2014

CDM Smith

CDM Smith

50 Hampshire Street
Cambridge, Massachusetts 02139
tel: 617 452-6000
fax: 617 452-8000

May 28, 2014

Mr. Jeffrey E. Gould
Massachusetts Department of Environmental Protection
Bureau of Resource Protection
20 Riverside Drive
Lakeville, MA 02347

Subject: Mansfield Water Pollution Control Facility (WPCF)
Pine Street Site Hydrogeological Evaluation Report

Dear Mr. Gould:

On behalf of the Town of Mansfield (Town), CDM Smith Inc. (CDM Smith) is pleased to submit the *Pine Street Site Hydrogeological Evaluation Report*. The report analyzes the potential use of the Pine Street site as an effluent recharge site as part of the regional wastewater solution for Mansfield, Foxborough, and Norton. The work has been conducted in accordance with the scope of work approved by the Massachusetts Department of Environmental Protection (MassDEP) on February 25, 2014. As documented in the hydrogeological evaluation report, the Pine Street site has a total recharge capacity of at least 1.0 mgd. The report also addresses comments MassDEP provided on August 31, 2010 after reviewing the report titled *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton*, submitted in September 2008 as a precursor to the current more detailed evaluation.

The Town is currently in Phase 2 of its comprehensive wastewater management planning (CWMP) process. Various wastewater treatment and disposal alternatives have been evaluated to date, including WPCF expansion alternatives, possibly satellite treatment facilities, and potential effluent recharge sites. Coupled with this analysis, Mansfield, Foxborough, and Norton have been working together to establish a regional wastewater district as the mechanism used to manage, operate and maintain the WPCF treatment and disposal services for the three towns in the future. As a result of these efforts, the Mansfield-Foxborough-Norton (MFN) District agreement will become effective in July 2014, established as a body politic and corporate and political subdivision of the Commonwealth of Massachusetts. Through the CWMP process, expansion of the WPCF to treat an additional 1.0 mgd with effluent disposal recharged at the Pine Street site has proved to be the most viable wastewater management alternative.

Per the requirements listed in the February 25, 2014 scope approval letter, this hydrogeological evaluation report is being submitted with the following additional documents:

- MassDEP Transmittal Form for Permit Application and Payment, Transmittal No. X260877;
- BRP WP 83 Application, including the Application to Prepare a Hydrogeological Evaluation; brief responses to the Hydrogeological Evaluation Report Guidance requirements and related Attachments to guide readers to the exact location of the most relevant information; and a completed Application Completeness Check List; and
- A surveyed site plan prepared and stamped by a professional engineer identifying the locations/footprints of the primary and reserve disposal areas; the location of all test pits and percolation tests conducted as part of the hydrogeological investigation; the locations and top-of-casing/top-of-PVC elevations of all borings/monitoring wells installed as part of the investigation and of all existing, on-site monitoring wells used in the investigation; and the location of monitoring wells proposed as part of the groundwater monitoring plan (note that no additional wells are proposed to be installed as part of the groundwater monitoring plan; existing wells will be used).

In regards to additional specific requirements listed in the February 25, 2014 scope approval letter, discussion of downgradient sensitive receptors and current groundwater quality downgradient of the proposed effluent discharge location is found in Section 2; discussion of anticipated impacts on downgradient sensitive receptors and groundwater quality is found in Sections 4 and 5; and a description of the proposed groundwater monitoring well plan is found in Section 6.

We look forward to discussing this application package as the first step in developing a future groundwater discharge permit application for effluent infiltration basins at the Pine Street site. We will be in touch soon to schedule a meeting to review this document with you. If you have any questions in the meantime, please call me at 617-452-6544.

Sincerely,

David F. Young, P.E., BCEE
Vice President
CDM Smith

Cc: Lee Azinheira, Town of Mansfield
David Burns, MassDEP-SERO
Kermit Studley, MassDEP-SERO
Steve Hallem, MassDEP-Boston
Alan Slater, MassDEP-Boston
Ed Sanderson, CDM Smith
Bob Schreiber, CDM Smith
Buvana Ramaswamy, CDM Smith

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Enter your transmittal number → X260877
Transmittal Number

Your unique Transmittal Number can be accessed online: http://mass.gov/dep/service/online/trasmfrm.shtml

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: DEP, 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 WP 83
1. Permit Code: 7 or 8 character code from permit instructions

Wastewater - Groundwater Discharge Permits
2. Name of Permit Category

Hydrogeological Evaluation Report for Mansfield WPCF effluent infiltration basins
3. Type of Project or Activity

B. Applicant Information – Firm or Individual

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

Azinheira
2. **Last Name** of Individual

Lee
3. **First Name** of Individual

4. MI

6 Park Row
5. Street Address

Mansfield
6. City/Town

MA
7. State

02048
8. Zip Code

(508) 261-7330
9. Telephone #

10. Ext. #

Same as above
11. Contact Person

lazinheira@mansfieldma.com
12. e-mail address (optional)

C. Facility, Site or Individual Requiring Approval

Mansfield Water Pollution Control Facility (for Pine Street Infiltration Basins Site)
1. Name of Facility, Site Or Individual

Intersection of Hill Street and Crane Street
2. Street Address

Norton
3. City/Town

MA
4. State

02766
5. Zip Code

(508) 285-5746
6. Telephone #

7. Ext. #

8. DEP Facility Number (if Known)

MA0101702
9. Federal I.D. Number (if Known)

10. BWSC Tracking # (if Known)

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

Edward C. Sanderson
1. Name of Firm Or Individual

50 Hampshire Street
2. Address

Cambridge
3. City/Town

MA
4. State

02139
5. Zip Code

617-452-6582
6. Telephone #

7. Ext. #

Same as above
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: EOEA #13388
   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–Groundwater Discharge Permit Program

BRP WP 83 Application to Prepare a Hydrogeological Evaluation

X260877
Transmittal Number #

MA0101702
Facility ID/Permit # (if known)

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.

1. Applicant Information:

Lee Azinheira, Director of Public Works, Town of Mansfield, MA
Name — Company Name (If applicable)

6 Park Row
Address

Mansfield — MA
City/Town — State

(508) 261-7330 — 02048
Telephone — Zip Code

lazinheira@mansfieldma.com
Email address

2. Applicant Contact Information (if different from above):

Edward C. Sanderson — CDM Smith
Contact Name — Company Name (If applicable)

Senior Planner/Engineer
Title

50 Hampshire Street
Address

Cambridge — MA
City/Town — State

617-452-6582 — 02139
Telephone — Zip Code

sandersonec@cdmsmith.com
email address

B. Project Information

1. Has a pre-scoping meeting been held with MassDEP personnel?

☒ Yes ☐ No If yes, date of pre-scoping meeting: See 8/31/2010 pre-scoping letter in Attachment 3

2. Has a public notice been placed in the Environmental Monitor that the scope of work has been prepared and will be submitted to MassDEP in accordance with 314 CMR 5.09(1)(b)?

☒ Yes ☐ No If yes, date of Environmental Monitor: 3/12/2014

3. Is there a discharge presently located on the site?

☐ Yes ☒ No If yes, answer the following:

When did the discharge begin? Date of startup: N/A

Description of discharge:

The Mansfield WPCF current NPDES Permit No. MA0101702 allows for 3.14 mgd effluent discharge to Three Mile River. Expansion of the WPCF will require effluent discharge via infiltration basins. The proposed Pine Street infiltration basins site is proposed for infiltration of up to 1.0 mgd. Currently there is no discharge at the Pine Street site.

B. Project Information (cont.)

4. Improvements - Are you required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operation of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to; permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.

☒ Yes ☐ No

If yes, answer the following:

Description of order or agreement (include enforcement document number, if applicable):

In July 2013, the US EPA issued a draft NPDES permit (MA0101702) that supersedes the Mansfield WPCF's current NPDES Permit issued April 9, 2004. Once the draft permit becomes effective, the Permittee has 1 year to submit a status report, 2 years to complete design, and 3 years to initiate construction to achieve new total nitrogen and total phosphorus permit limits

Identification No. of Affected Treatment Facility MA0101702

Description of Project

Upgrade the Mansfield WPCF to meet nitrogen and phosphorus limits and expand the facility to treat an additional flow of 1.0 mgd.

Currently awaiting final NPDES permit
Final Compliance Date

C. Site Information

1. GPS Coordinates:

   a) Enter Latitude and Longitude to the nearest whole second for the proposed site.

   Latitude: 41 degrees, 57'25" N Longitude: 71 degrees, 9'23"W

   b) Provide a narrative description of the site and the feature to be permitted. As an example: "The site is on the west side of Main Street, the third building north of High Street. The disposal field lies 100 feet off the southwest corner of the building." **- See Attachment 1**

   c) Attach a site map based on the MassGIS Coordinate Information Tool that clearly indicates the site. The Coordinate Information Tool is available at http://maps.massgis.state.ma.us/images/dep/xyinfo/get_xy.html. **- See Attachment 1**

Massachusetts Department of Environmental Protection
Bureau of Resource Protection–Groundwater Discharge Permit Program

BRP WP 83 Application to Prepare a Hydrogeological Evaluation

X260877
Transmittal Number #

MA0101702
Facility ID/Permit # (if known)

C. Site Information (cont.)

2. Provide a topographic map or maps of the area extending at least to one mile beyond the property boundaries of the site which clearly show the following: **- See Attachment 1**

   1) The legal boundaries of the site;
   2) All hazardous waste management facilities;
   3) All springs and surface water bodies in the area, plus all drinking water wells within one mile of the facility which are identified in the public record or otherwise known to you.
   4) All Zone II's or IWPA's.

3. Please list any public or private drinking water supply wells within 2,500 feet of the proposed site:

Well Location	Type of Well (Public/Private)	Status (Active/Inactive)	Safe Yield
See Attachment 1			

D. Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I will be responsible for publication of public notice of the applicable permit proceedings identified under 314 CMR 2.06(1)(a) through (d)."

Signature of Applicant

Lee Azinheira
Printed Name of Applicant

5/21/14
Date Signed

Edward C. Sanderson
Name of Preparer

617-452-6582
Telephone

Senior Planner/Engineer
Title of Preparer

sandersonec@cdmsmith.com
email

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Groundwater Discharge Permits

BRP WP 83 Hydrogeologic Evaluation Report
Instructions and Supporting Materials

Table of Contents

- introduction
- guidance
- application fact sheet
- completeness checklist

Introduction

MassDEP *Permit Applications*, as well as *Instructions & Support Materials*, are available for download from the MassDEP Web site at mass.gov/dep in two file formats: Microsoft Word™ and Adobe Acrobat PDF™. Either format allows documents to be printed.

Instructions & Support Materials files in Microsoft Word™ format contain a series of documents that provide guidance on how to prepare a permit application. Although we recommend that you print out the entire package, you may choose to print specific documents by selecting the appropriate page numbers for printing.

Permit Applications in Microsoft Word™ format must be downloaded separately. Users with Microsoft Word™ 97 or later may complete these forms electronically.

Permitting packages in Adobe Acrobat PDF™ format combine *Permit Applications* and *Instructions & Support Materials* in a single document. Adobe Acrobat PDF™ files may only be viewed and printed without alteration. *Permit Applications* in this format may not be completed electronically.

REQUIREMENTS TO OBTAIN A GROUNDWATER DISCHARGE PERMIT

The MassDEP Groundwater Discharge Permit Program regulates the location, construction, operation and monitoring of wastewater treatment plants designed for flows exceeding 10,000 gallons per day. New systems, unpermitted systems and some systems to be modified will undergo a review process that will assure compliance with 314 CMR 5.00 and will result in the issuance of a groundwater discharge permit. The hydrogeologic evaluation of the site is the first part of that process.*

Scope of Work:

Prior to the submission of the BRP WP 83 application form, the applicant will have a pre-scoping meeting with MassDEP. Following this meeting, the applicant will develop and submit to Mass DEP a scope of work for a hydrogeologic investigation in accordance with 314 CMR 5.09 that is specific to the proposed site, including consideration of downgradient receptors. Upon MassDEP approval of the scope of work, the applicant will then prepare a hydrogeologic evaluation report consistent with that scope.

Hydrogeologic Evaluation Report and BRP WP 83 application:

The completed hydrogeologic evaluation report will be submitted to the Mass DEP with the BRP WP 83 application form, the fee and other required materials. Once MassDEP has approved the report submitted with the BRP WP 83 application form, the applicant will then be able to apply for a groundwater discharge permit through the submittal of the appropriate groundwater discharge permit application.

**Please note: There may be instances where site constraints would require a discharge of less than 10,000 gallons per day of treated sanitary wastewater to obtain a groundwater discharge permit.*

BRP WP 83 Hydrogeologic Evaluation Report Guidance

To obtain a groundwater discharge permit, owners of new systems, unpermitted systems, and some systems to be modified must complete the following requirements:

1. Hydrogeologic Assessment
   Soils shall be described using the standard Title 5 soil evaluation techniques. Soil evaluations shall be performed by a Massachusetts Certified Soil Evaluator ("CSE"). Data from test pits to be considered in the hydrogeologic evaluation must be witnessed by a CSE. Site geology shall be determined by a variety of subsurface exploratory techniques that include the use of test pits, borings, piezometers, and observation wells. Hydrologic parameters may be estimated from an analysis of lithologic data, sieve analysis, in-situ permeability testing and pumping tests. This includes regional and historic information regarding the site. This will also include noting adjacent surface water feature and the potential interaction.

   See soil borings and geophysical investigations in the *Hydrogeological Evaluation Report*, Appendix A and B, respectively.

   Provide the following:

   a. Locus map and site plan at a suitable scale (such as 1"=40')
      i. Provide USGS maps available (topographic map, surficial geology map, hydrologic atlas)

         For USGS topographic map, see Figure 1-1: Site Locus Map, of the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Assessments*, completed in September 2008 and attached in the *Hydrogeological Evaluation Report* as Appendix H.

         A surficial geology map is found in Attachment 1. Hydrologic and hydrographic features are mapped according to the digitized USGS 1:25,000 topographic quadrangle maps and enhanced detail as part of the MassGIS/MassDEP dataset.

      ii. Include well and surface water PWS protection areas (such as, but not limited to; Zone II's, IWPA's, Surface Water Protection Zones)

         A well and surface water PWS protection areas map is found in Attachment 1. The effluent application zone is wholly outside of the MassDEP-approved, Town of Norton Zone II area. The site is within the boundaries of an Interim Wellhead Protection Area (IWPA) that was defined prior to the Zone II approval and thus has been superseded. The site is beyond the boundaries of any Surface Water Protection Zones.

      iii. Include areas of sensitive habitats (such as, but not limited to ACEC's, vernal pools, mapped habitat areas)

         For vernal pools, see Figure 1-1: Site Map, in the *Hydrogeological Evaluation Report*. The site is located within the Three Mile River Watershed and was designated an Area of Critical Environmental Concern inland region.

   b. Previous subsurface work, such as, but not limited to;
      i. Soil and water quality

         Subsurface soil quality was not sampled. Surface water and groundwater quality sampling is discussed in Section 2.4.6 of the *Hydrogeological Evaluation Report*. Water quality field readings and laboratory data are provided in Appendix E of the *Hydrogeological Evaluation Report*.

Previous subsurface work is also found in the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Assessments*, completed in September 2008 and attached in the *Hydrogeological Evaluation Report* as Appendix H.

ii. As built diagrams and logs

As-built diagrams were not developed. Subsurface logs are provided in Appendix A of the *Hydrogeological Evaluation Report*.

iii. Water table fluctuation (high, low and adjusted seasonal high water using MassDEP approve method)

Seasonal high water levels are discussed in Section 4.2.4 and Appendix G of the *Hydrogeological Evaluation Report*.

iv. Tidal influences to water levels (if any)
There are no tidal influences to water levels near the site.

c. Determine the contributing watershed area

The contributing watershed area is defined by the Hydrologic Unit Code 10-digit identifier for the Wading River. A map of the contributing watershed, set by the edge of Old Crane Pond, as defined by the USGS Streams tats tool is found in Attachment 1.

d. Locate public and private wells within ½ mile of the site
   i. Indicate type of well (public/private, bedrock or sand/gravel and depth)

Public and private wells are mapped in Figure 1-1: Site Map of the *Hydrogeological Evaluation Report* based on data provided by the Norton Board of Health.

e. Indicate areas of potential water supply development (such as, but not limited to mapped medium and high yield aquifers)

According to communications with the Town of Norton Water & Sewer Superintendent, there are no potential plans to expand water supply development.

f. Determine private wells within ½ mile radius of proposed discharge location and whether it is up, down or cross gradient under natural and discharge conditions

Private wells within a ½ mile radius of the proposed discharge location are mapped in Figure 1-1: Site Map of the *Hydrogeological Evaluation Report* based on data provided by the Norton Board of Health. Norton Well #1 is downgradient of the discharge location.

g. Provide past use or nearby use which may have resulted in water quality or site specific conditions pertinent to development.
   i. This may include past or current waste site clean up activities.
   ii. Areas which may be subject to cleanup standards under MGL 21E

A Phase I Environmental Site Assessment was completed for the site and is attached as Appendix I to the *Hydrogeological Evaluation Report.* There are a total of 62 sites located in the Town of

Norton on MassDEP's database. There are eight sites listed on the MassDEP database which are located within one mile of the Property, however all sites have achieved closure under the MCP.

h. Depth to bedrock

Depth to bedrock information is provided as part of the geophysical investigations. Documentation is provided in Appendix B of the *Hydrogeological Evaluation Report*.

i. If bedrock encountered during exploration, depth, fracture and joint pattern

Investigation of the bedrock depth, fracture, and joint pattern was not performed.

2. Nutrient Analysis.
   a. If located within a MassDEP approved Zone II or an IWPA, determine the impact the discharge may have on the public supply well(s).

   A well and surface water PWS protection areas map is found in Attachment 1. The effluent application zone is wholly outside of the MassDEP-approved, Town of Norton Zone II area.

   b. If located adjacent surface water, assess potential impacts to that water with respect to nitrogen or phosphorus.

   Potential impacts to adjacent surface water with respect to nitrogen and phosphorous are discussed in Section 2.4.6 of the *Hydrogeological Evaluation Report*.

3. Soil Evaluation and Subsurface Testing
   a. Provide Certified Soil Evaluator logs and summaries for the site
      i. Perc tests and logs

      Percolation tests were not performed. Certified Soil Evaluator logs were not supplied.

      ii. Tests witnessed by MassDEP

      Soil evaluation and subsurface testing was not witnessed by MassDEP.

   b. Provide additional test data such as sieve tests, double ring or other approved tests.

   Sieve test results and procedures are discussed in Section 2.2.4 and further document in Appendix D of the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Assessments*, completed in September 2008 and attached in the *Hydrogeological Evaluation Report* as Appendix H. Similarly, double-Ring Infiltrometer testing is discussed in Section 2.2.6 and further documented in Appendix E of the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Assessments*, completed in September 2008 and attached in the *Hydrogeological Evaluation Report* as Appendix H.

   c. Indicate on a site map the location of the tests

   Within the proposed site, the sieve and infiltration tests were performed at MW-5. Figure 2-1: Field Observations, in the *Hydrogeological Evaluation Report*, shows this location.

d. Soil boring data including split spoon and core logs (if applicable)

See soil borings and geophysical investigations in the *Hydrogeological Evaluation Report*, Appendix A and B, respectively. Core logs were not retrieved and documented.

e. Well construction (per MassDEP Standards)
   i. As built diagrams

   As-built diagrams were not developed. Subsurface logs with well construction diagrams are provided in Appendix A of the *Hydrogeological Evaluation Report*.

   ii. Water levels

   Static water levels are documented in Section 2.2.5 of the of the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Assessments*, completed in September 2008 and attached in the *Hydrogeological Evaluation Report* as Appendix H. Static water levels are also documented in Section 2.4.5 of the *Hydrogeological Evaluation Report*. Time-varying water levels associated with the pilot load test are described in Section 2.4.7 and Appendix D of the *Hydrogeological Evaluation Report*.

   iii. Water quality (pH, Specific Conductance if available or required)

   Water quality field readings and laboratory data are documented in Appendix E of the *Hydrogeological Evaluation Report*.

f. Any onsite monitoring such as VOC vapor analysis, specific conductance, pH of the water.

Onsite monitoring of VOCs was not performed. Conductance and pH were sampled and documented in Appendix E of the *Hydrogeological Evaluation Report*.

4. Groundwater Monitoring Program
   a. Indicate location and construction of monitoring wells
      i. Provide locations and elevations of wells and the corresponding measuring point elevation for ground water levels.

      Monitoring locations are documented on Figure 2-1 and Section 2.2.5 of the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Assessments*, completed in September 2008 and attached in the *Hydrogeological Evaluation Report* as Appendix H. They are also documented on Figure 2-1 and Section 2.4.5 of the *Hydrogeological Evaluation Report*. The measuring point elevations for the ground water wells are shown on the Surveyed Site Plan included with the *Hydrogeological Evaluation Report*.

ii. Wells to be constructed according to Standard Methods for Monitoring Wells (MassDEP BWSC publication)

Existing well construction diagrams are provided in Appendix A of the *Hydrogeological Evaluation Report*. Any additional wells installed for monitoring will be constructed in a similar manner.

iii. Assess groundwater flow

(1) Vertical gradient

At MW-104, the observed change in head over the vertical column is 0.1 feet. The vertical distance between the MW-104 shallow and deep wells is 36 feet. The vertical gradient is 0.003 ft/ft.

(2) Flow direction

Flow direction maps for pre- and post-recharge scenarios are found in Attachment 1.

(3) Permeability of the soils and aquifer

Hydraulic properties of the aquifer materials are discussed in Table 3-2 of the *Hydrogeological Evaluation Report*.

(4) Groundwater flow rate

Based on the entire groundwater model domain area of 2.0 square miles and a natural recharge rate of 20 inches/year, the groundwater flow rate through the model is approximately 254,430 ft^3/day. Based on the plateau area of 5.1 acres and a natural recharge rate of 20 inches/year, the groundwater flow rate is estimated to be approximately 1014 ft^3/day. Based on an effluent application area of 2.7 acres and a natural recharge rate of 20 inches/year, the groundwater flow rate is estimated to be approximate 537 ft^3/day.

(5) Interaction of overburden/bedrock with respect to groundwater flow to determine infiltration and pumping effects.

Section 4.3 of the *Hydrogeological Evaluation Report* describes the pre- and post-recharge conditions.

(6) Estimate seasonal high groundwater (using approved methods)

Seasonal high groundwater levels are discussed in Section 4.2.4 of the *Hydrogeological Evaluation Report*.

b. indicate if the well is upgradient, cross gradient or downgradient of the discharge

The monitoring wells are downgradient of the discharge location.

c. indicate the sampling frequency and list of analytes to be sampled

Section 6 of the *Hydrogeological Evaluation Report* describes the monitoring plan, sampling frequency, and list of analytes.

5. Time of Travel Calculation
   a. Applicable if within a public water supply protection area (including, but not limited to Zone II's, IWPA's and Surface Water Protection Areas)
      i. Assess potential input into surface water and if that surface water is intercepted by a PWS.

      A well and surface water PWS protection areas map is found in Attachment 1. The effluent application zone is wholly outside of the MassDEP-approved, Town of Norton Zone II area.

   b. Calculate the time of travel from the discharge to the public water supply

      The time of travel from the discharge site to the public water supply is greater than two years as discussed in Section 4.3.3 of the *Hydrogeological Evaluation Report*.

   c. Provide the calculations or model results indicating the methodology used

      Time of travel calculations from the discharge site to the public water supply is discussed in Section 4.2.2 of the *Hydrogeological Evaluation Report.*

6. Final Site Report
   a. Show final grade and the relationship to seasonal high water and under loading conditions

      The proposed final grade of the infiltration basins are shown on the Surveyed Site Plan included with the *Hydrogeological Evaluation Report*.

   b. Mounding analysis and relationship to topography and final site grade.

      Predicted separation distance, or distance between the water table and the ground surface/current site grade, are discussed in Section 4.3.3 of the *Hydrogeological Evaluation Report*.

   c. Provide cross sections (one parallel and one perpendicular to ground water flow direction, indicating system bottom, seasonal high water and projected mound).

      A geologic cross section, perpendicular to the flow direction, is presented as Figure 3-2 in the *Hydrogeological Evaluation Report*. A geologic cross section, parallel to the flow direction, is found in Attachment 1.

   d. Well locations of all wells including those submitted under previous work, including as built diagrams and logs.

      As-built diagrams were not developed. Subsurface logs with well construction diagrams are provided in Appendix A of the *Hydrogeological Evaluation Report*.

      Monitoring locations are documented on Figure 2-1 and Section 2.2.5 of the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Assessments*, completed in September 2008 and attached in the *Hydrogeological Evaluation Report* as Appendix H. They are also documented on Figure 2-1 and Section 2.4.5 of the *Hydrogeological Evaluation Report*.

e. Pre and Post loading ground water flow maps

Pre- and post-recharge scenario ground water flow maps are described in Section 4.3 of the *Hydrogeological Evaluation Report*.

f. Show other important site modifications and structures, including but not limited to;
   i. Detention, retention ponds

      No detention or retention ponds are being installed or modified.

   ii. Wells (Potable, irrigation, injection, Ground Source Heat Pump)

      Aside from monitoring wells, no other production wells are being installed.

   iii. Buildings (note if the building have basements)

      No buildings are being installed or modified.

   iv. Roads and streets

      No roads or streets were installed or modified as part of the development of the *Hydrogeological Evaluation Report. An access road will be added during construction of the infiltration basins and is shown conceptually on the* Surveyed Site Plan included with the *Hydrogeological Evaluation Report*.

7. Include section of summary, conclusions and recommendations
   a. Additional site characterization

   b. Site feasibility

      The site is considered feasibly for the purposes of effluent application. Conclusions and recommendations are discussed in Section 5 of the *Hydrogeological Evaluation Report*.

   c. Potential impacts and mitigation (if any)
      i. To nearby property

         Potential impacts to nearby property are described in Section 4.3.3 of the *Hydrogeological Evaluation Report*.

      ii. To ground water or surface water supply

         Potential impacts to ground water or surface water supply are described in Section 4.3 of the *Hydrogeological Evaluation Report*.

      iii. To nearby sensitive receptors (including, but not limited to; rare species habitats, and vernal pools)

         Potential impacts to nearby sensitive receptors are described in Section 4.3.3 of the *Hydrogeological Evaluation Report*. However, further investigation of such impacts must be further defined in respect to the vernal pool species tolerance to slight changes in water table.

iv. Location of existing or proposed compliance monitoring wells.

No compliance monitoring wells are within the study area.

The publication *Standard References for Monitoring Wells* is available at the State House Bookstore: http://www.sec.state.ma.us/spr/sprcat/agencies/310.htm.

Monitoring Well Proposals

The following is a list of information to be submitted to the MassDEP Regional Office location (Primary Permit Location) for Hydrogeologic Report applications with monitoring well proposals and with post-installation details. Monitoring wells are required in order to receive a groundwater discharge permit. See MassDEP publication *Standard References for Monitoring Well*s, Publication No. WSC-310-91, and 314 CMR 5.00.

Monitoring well proposals must include:

1. a locus map indicating the regional location of the sites. A USGS 1:25000 Scale 7 1/2 minute Topographic Series quadrangle sheet is most appropriate.

   Monitoring locations are documented on Figure 2-1 of the *Hydrogeological Evaluation Report*.

2. a site map to include:

   a) location of proposed and existing monitoring wells, borings, test pits, deep holes and subsurface work;

      Monitoring locations are documented on Figure 2-1 of the *Hydrogeological Evaluation Report*.

   b) cultural features (buildings, roads, leachfields, existing wells, subsurface utilities, etc.);

      Cultural features are documented on Figure 2-1 of the *Hydrogeological Evaluation Report*.

   c) assumed groundwater flow directions.

      Flow direction maps for pre- and post-recharge scenarios are found in Attachment 1.

3. any written descriptions of subsurface conditions expected to be encountered, e.g. published surficial geologic, bedrock, or hydrogeologic atlases (USGS), existing drillers' or geologists' logs, test pit or deep hole test results with percolation rates.

   Subsurface logs are provided in Appendix A of the *Hydrogeological Evaluation Report*. Depth to bedrock information is provided as part of the geophysical investigations. Documentation is provided in Appendix B of the *Hydrogeological Evaluation Report.* Previous subsurface work is also found in the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Assessments*, completed in September 2008 and attached in the *Hydrogeological Evaluation Report* as Appendix H.

4. a well construction detail describing **construction materials** and **installation technique** must be included. Construction details shall conform with the well construction guidelines concerning construction and screen placement. *(See attached diagram.)*

   As-built diagrams were not developed. Subsurface logs with well construction diagrams are provided in Appendix A of the *Hydrogeological Evaluation Report*.

These materials must be submitted to and accepted by the MassDEP prior to the installation of the monitoring well(s). The MassDEP reserves the right to request additional information on a case-by-case basis if in its opinion the sensitivity of the potentially impacted area warrants additional investigation.

Following the acceptance of the monitoring well plan by the MassDEP regional office and the installation of the well(s), the following materials must be submitted:

1. A site plan including:

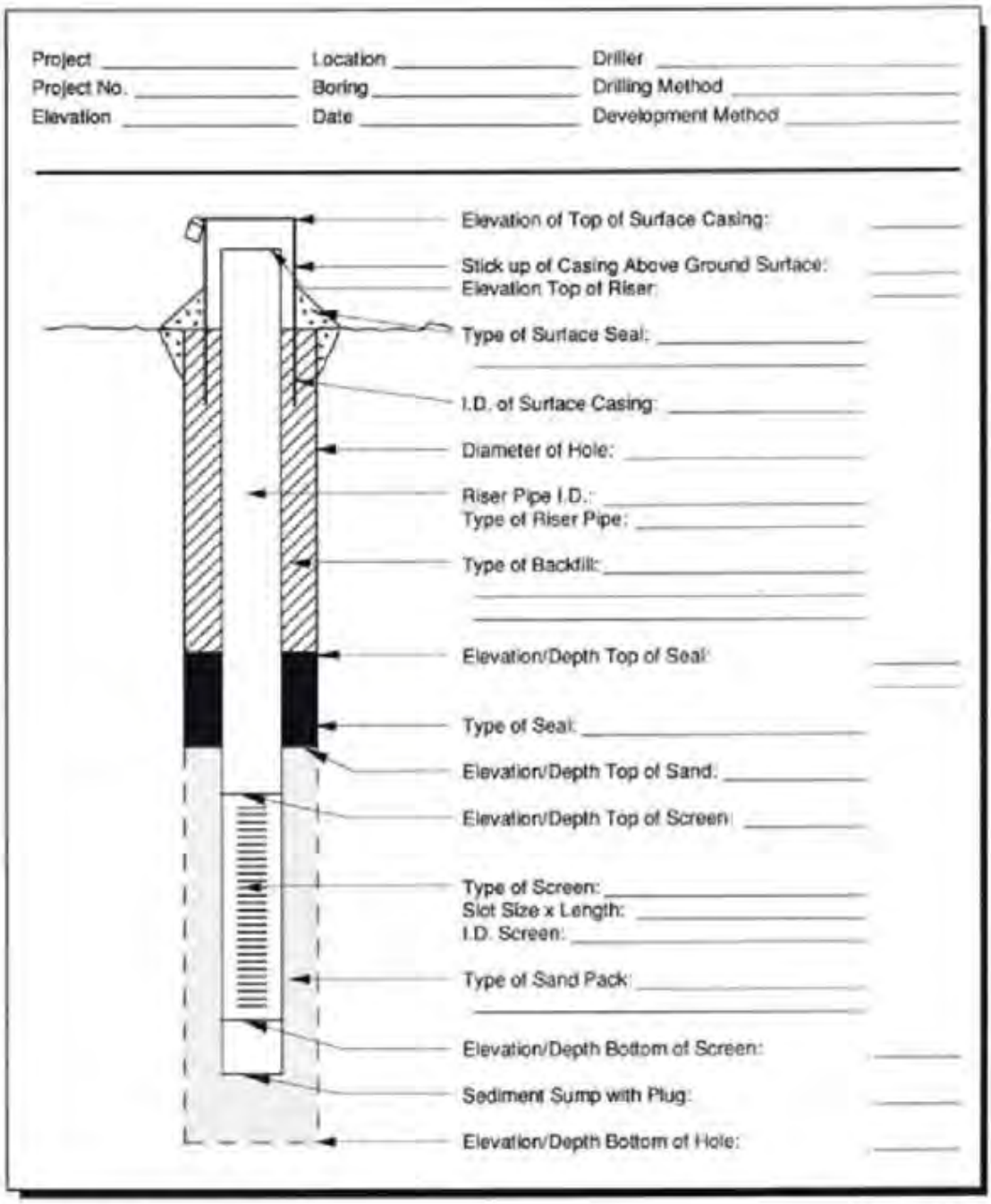
    a) all the features described in section 2a;
    b) the as-built well locations;
    c) groundwater contours and elevations based on monitoring well data.

2. Geologists' and drillers' logs for all monitoring wells.

3. Monitoring calculations describing potential mounding below the discharge.

4. A geologic cross-section utilizing three monitoring wells and including relevant features such as leaching fields, existing and proposed stormwater detention basins, subsurface utilities, streams, roadways, etc.

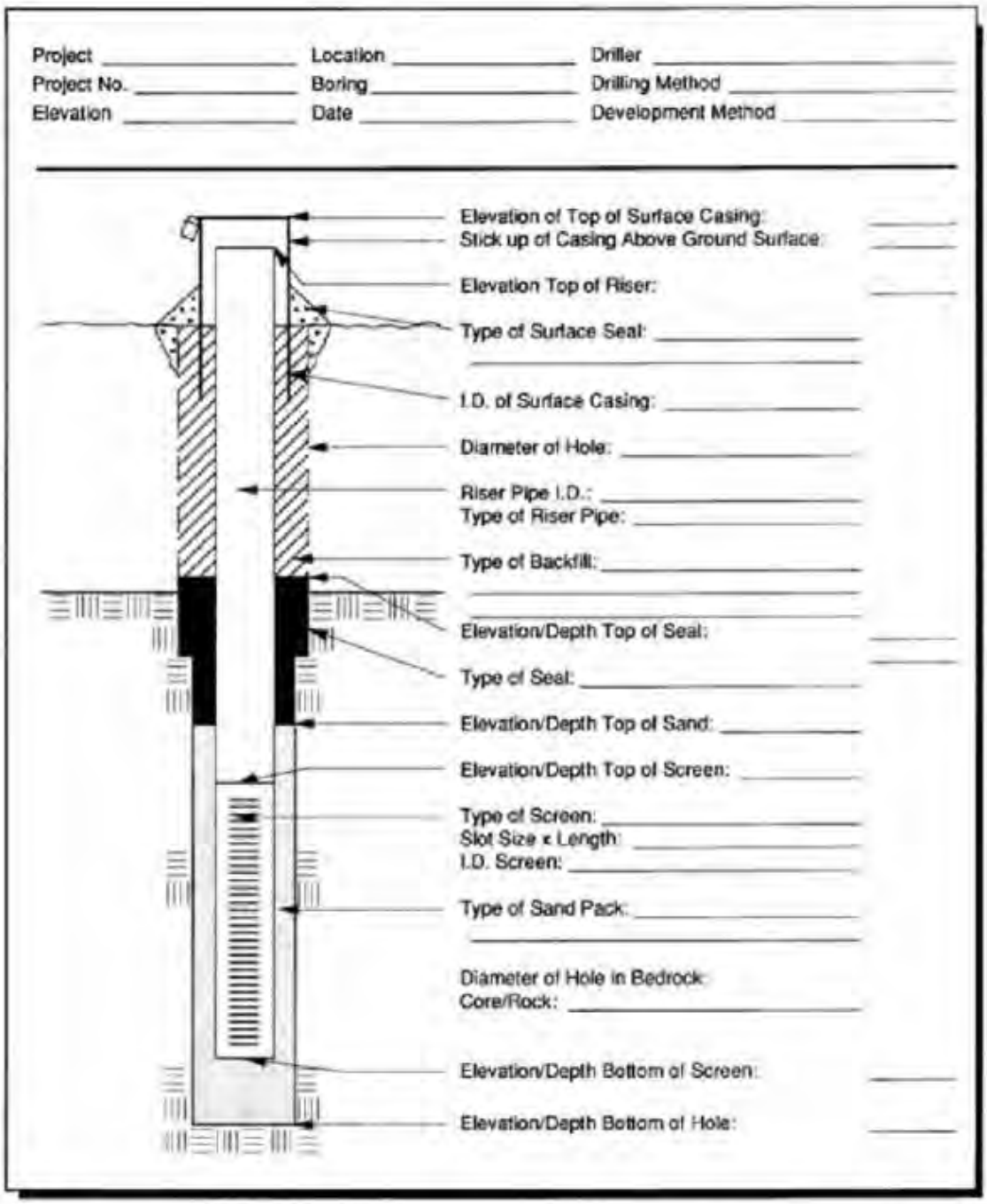
5. A background sampling of the monitoring wells for, at a minimum, the following parameters: water level, ph, specific conductance, alkalinity, nitrogen series, total phosphorus, orthophosphate, chloride and sodium.



Source: MADEP

Figure 4.4-2

Example of an As-built Overburden Monitoring Well Form
(From WSC #91-310: Standard References for Monitoring Wells)



Source: MADEP

Figure 4.4-3
Example of an As-built Bedrock Monitoring Well Form
(From WSC #91-310: Standard References for Monitoring Wells)

1. **What is the purpose of this report approval?**

   This report approval is a prerequisite for the issuance of a permit to discharge treated sanitary wastewater in excess of 10,000 gallons per day (gpd) or to discharge treated wastewaters otherwise subject to a groundwater discharge permit. This report approval serves to protect the public health, welfare, and the environment through the control of these discharges onto or into the ground. If, following this report approval, the permittee intends to apply for either an Individual or General Groundwater Discharge Permit, the approved report will be a part of the permit application submittal.

   Statutory authority for this permit is stated in MGL Chapter 21 Section 43. Regulatory authority for these permits is stated in 314 CMR 5.00.

2. **Who must apply?**

   Any individual, business, or organization required to obtain a groundwater discharge permit is subject to the approval of a scope of work and hydrogeologic evaluation pursuant to MGL c. 21, s. 43 and 314 CMR 5.00 (unless exempted in 314 CMR 5.05).

3. **What other requirements should be considered when applying for these report approvals?**

   The applicant must show evidence that a public notice has been placed in the Environmental Monitor stating that a scope of work has been prepared and has been submitted to MassDEP. Additionally, if the site is located within the Zone II or Interim Wellhead Protection Area (IWPA) of a ground water source of potable water for a public water system, the applicant must show evidence that the public water system has been notified in writing by certified mail when the scope of work and the Hydrogeologic Evaluation Report have been submitted to MassDEP.

4. **Where should the application be sent?**

   The **application form with an original signature** in ink should be sent to the Wastewater Management Program at the appropriate MassDEP Regional Office (Primary Permit Location). Find your region at: http://www.mass.gov/eea/agencies/massdep/about/contacts/.

   A **copy of the application** should be sent to the MassDEP Boston Office (Reserve Copy Location) at:

   Department of Environmental Protection
   Wastewater Management Program
   1 Winter Street, Boston, MA 02108

   A **copy of the MassDEP Transmittal Form and the Fee** for the application should be sent to:

   Department of Environmental Protection
   P.O. Box 4062
   Boston, MA 02211

5. **What is the application fee?**

   BRP WP 83 Preparation of a Hydrogeologic Evaluation.....$10,005

6. Where can I get a copy of the timelines?

The timelines are available on the MassDEP Website:
http://www.mass.gov/eea/agencies/massdep/service/approvals/timely-action-fees-and-payments.html

7. What is the annual compliance fee?

Current Annual Compliance Fees can be found at the MassDEP Website:
http://www.mass.gov/eea/agencies/massdep/service/approvals/timely-action-fees-and-payments.html

8. How long is this report approval in effect?

There is no fixed time limit when this approval would expire. However, at the time of submission of a groundwater permit application for an Individual Permit or a Notice of Intent for General Permit coverage, the permittee must certify whether the conditions upon which the approval was based have changed. If the answer is that conditions have changed, then an additional technical evaluation may be required to determine if the existing approval should remain in force or an amended approval is necessary.

9. How can I avoid the most common mistakes made in applying for this report approval?

a. Answer all questions on the application form and indicate "not applicable" (N/A) where appropriate. One copy of all application forms must have an original signature in ink.

b. Applications for BRP WP 83 must include:

1) Copy of the approved scope of work.

2) Copy of the public notice from the Environmental Monitor that the scope of work has been submitted.

3) If the proposed site is within a Zone II or Interim Wellhead Protection Area, a copy of the notice to the public water system notifying them that a scope of work and, when appropriate, that the Hydrogeologic Report has been submitted to the Department.

c. Submit fee and one copy of the MassDEP Transmittal Form to: Department of Environmental Protection, PO Box 4062, Boston, MA 02211.

10. What are the regulations that apply to these report approvals? Where can I get copies?

These regulations include, but are not limited to:

a. Groundwater Discharge Regulations, 314 CMR 5.00.
b. Timely Action and Fee Provisions, 310 CMR 4.00.
c. Administrative Penalty Regulations, 310 CMR 5.00.

These may be purchased at:

State House Bookstore
Room 116
Boston, MA 02133
617-727-2834

State House West Bookstore
436 Dwight Street
Springfield, MA 01103
413-784-1376

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Groundwater Discharge Permits
BRP WP 83 Hydrogeologic Evaluation Report

Application Completeness Check List

☒ The MassDEP Transmittal Form is completed. If the applicant is a municipality, "Fee Exempt" has been selected from among the Special Provisions under the Amount Due section of the Transmittal Form.

☒ The Hydrogeologic Evaluation Report Application Form is properly filled out by the applicant and the consultant engineer and signed in ink.

☒ A copy of the public notice from the Environmental Monitor that the scope of work has been prepared and submitted to MassDEP in accordance with 314 CMR 5.09 .

☒ A copy of the Scope of Work and the MassDEP approval letter is included with the application.

☒ The Hydrogeologic Evaluation Report is included with the application.

☐ If the site is within the Zone II or Interim Wellhead Protection Area of a ground water source of potable water for a public water system, a notice has been sent to the public water system notifying them that a scope of work and, when appropriate, that the Hydrogeologic Evaluation Report has been submitted to MassDEP in accordance with 314 CMR 5.09.

Not applicable

To submit the application package:

☒ Checklist items have been completed.

☒ Send one copy of the application along with one copy from the MassDEP Transmittal form to:

Department of Environmental Protection
Southeast* Regional Office
Wastewater Management Program
*Find your region: www.mass.gov/dep/about/region/findyour.htm

☒ Send one copy of the application along with a photocopy of the MassDEP Transmittal page to:

Department of Environmental Protection
Wastewater Management Program
1 Winter Street, Boston, MA 02108

☐ Send fee of:

$10,005 for BRP WP 83;

in the form of a check or money order made payable to *Commonwealth of Massachusett*s, along with one copy from the MassDEP Transmittal Form to:

Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

Fee Exempt

Attachment 1

Miscellaneous Items Not Included in Hydrogeological Evaluation Report

1.1 BRP WP 83 Application to Prepare a Hydrogeological Evaluation

The following information supplements the information included in the *BRP WP 83 Application to Prepare a Hydrogeological Evaluation*.

Section C.1.b) Narrative Description of the Site

The Pine Street site consists of two Mansfield-owned parcels in Norton, Massachusetts that are currently accessed from the north side of Pine Street. The site encompasses a combined area of approximately 65.6 acres of primarily wooded land and a few unpaved, dirt roads. The main access road to the site and a few other cleared paths wide enough for vehicle access existed at the site prior to the 2013 field data collection effort. The infiltration basins lie in the north central portion of site, approximately 500 feet west of the eastern property line.

Sections C.1.c) and C.2 Site Information Map

The Site Information Map provided herein is a map of the site and extends one mile beyond the property boundaries of the site showing the following:

- The legal boundaries of the site;
- All hazardous waste management facilities;
- All springs and surface water bodies in the area, plus all drinking water wells within one mile of the facility, which are identified in the public record or otherwise known; and
- All zone IIs or IWPAs.

Section C.2 List of Drinking Water Supply Wells

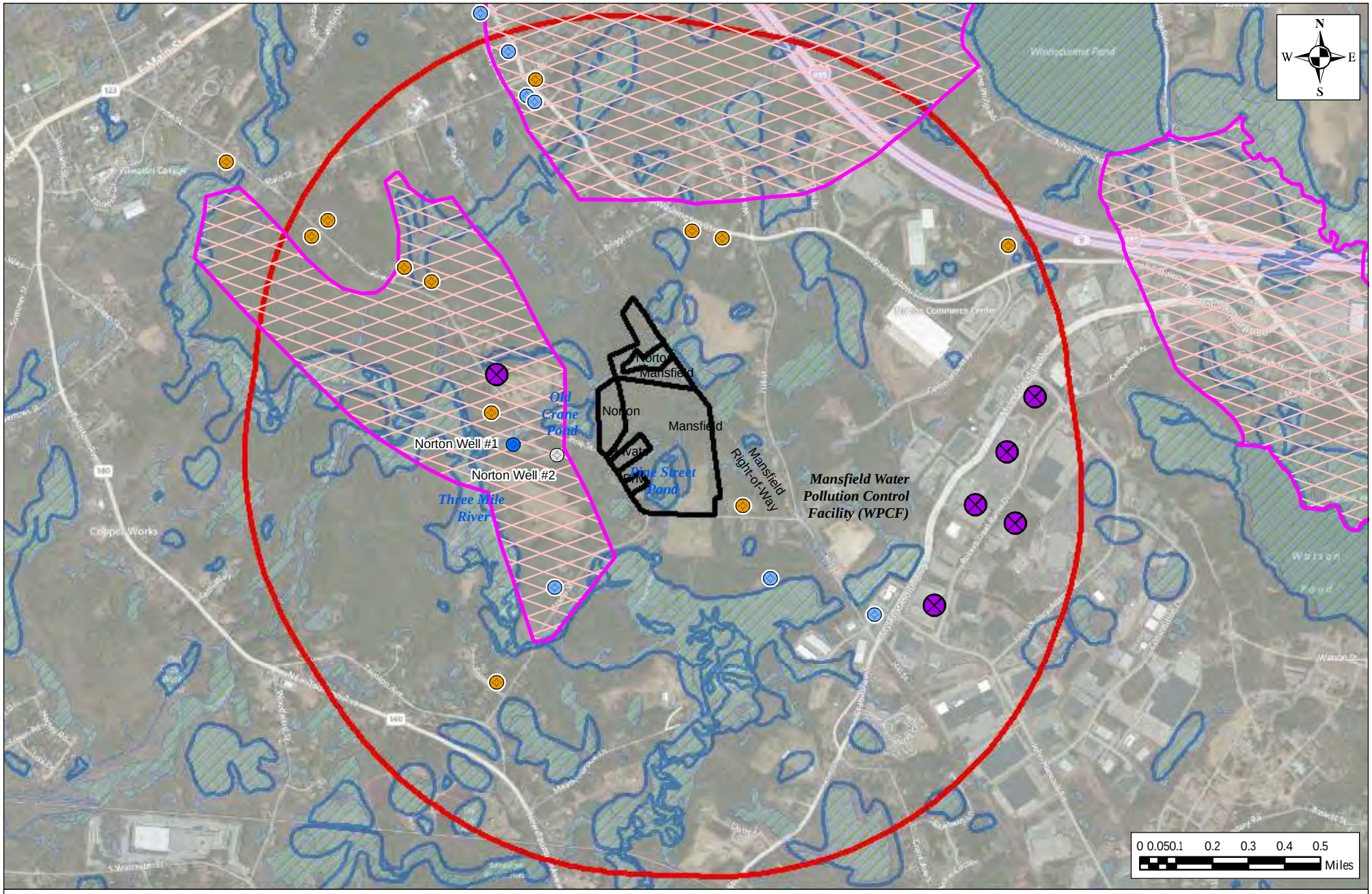
Public and private drinking water supply wells within 2.500 feet of the proposed site are listed below:

Well Location	Type of Well (Public/Private)	Status (Active/Inactive)	Safe Yield
Norton Public Supply Well #1	Public	Active	No information provided
Norton Public Supply Well #2	Public	Inactive	No information provided

110 Crane Street	Private/Non Potable	Active	No information provided
125 Crane Street	Private/Potable	Active	No information provided
131 South Washington Street	Private/Non Potable	Active	No information provided
139 South Washington Street	Private/Non Potable	Active	No information provided
155 Pine Street	Private/Non Potable	Active	No information provided
38 Crane Street	Private/Potable	Active	No information provided

1.2 BRP WP 83 Hydrogeological Evaluation Report Guidance

The majority of the information listed in *BRP WP 83 Hydrogeological Evaluation Report Guidance* is found in the *Hydrogeological Evaluation Report*. However, some miscellaneous items not found in the *Hydrogeological Evaluation Report* or discussed in response to the *BRP WP 83 Hydrogeological Evaluation Report Guidance* is found on the maps in this attachment, including surficial geology, Zone II delineations, contributing watershed area, pre and-post infiltration loading groundwater flow paths, and a parallel cross-section to groundwater flow direction.



Active Well - Norton Public Water Supply Well #1
Off Line Well - Norton Well #2
Private Potable Wells
Private Non-Potable Wells
State Hazardous Waste Sites
DEP Approved Zone IIs
1.0 Mile Buffer
Legal (Parcel) Boundary
Surface Water
DEP Wetlands

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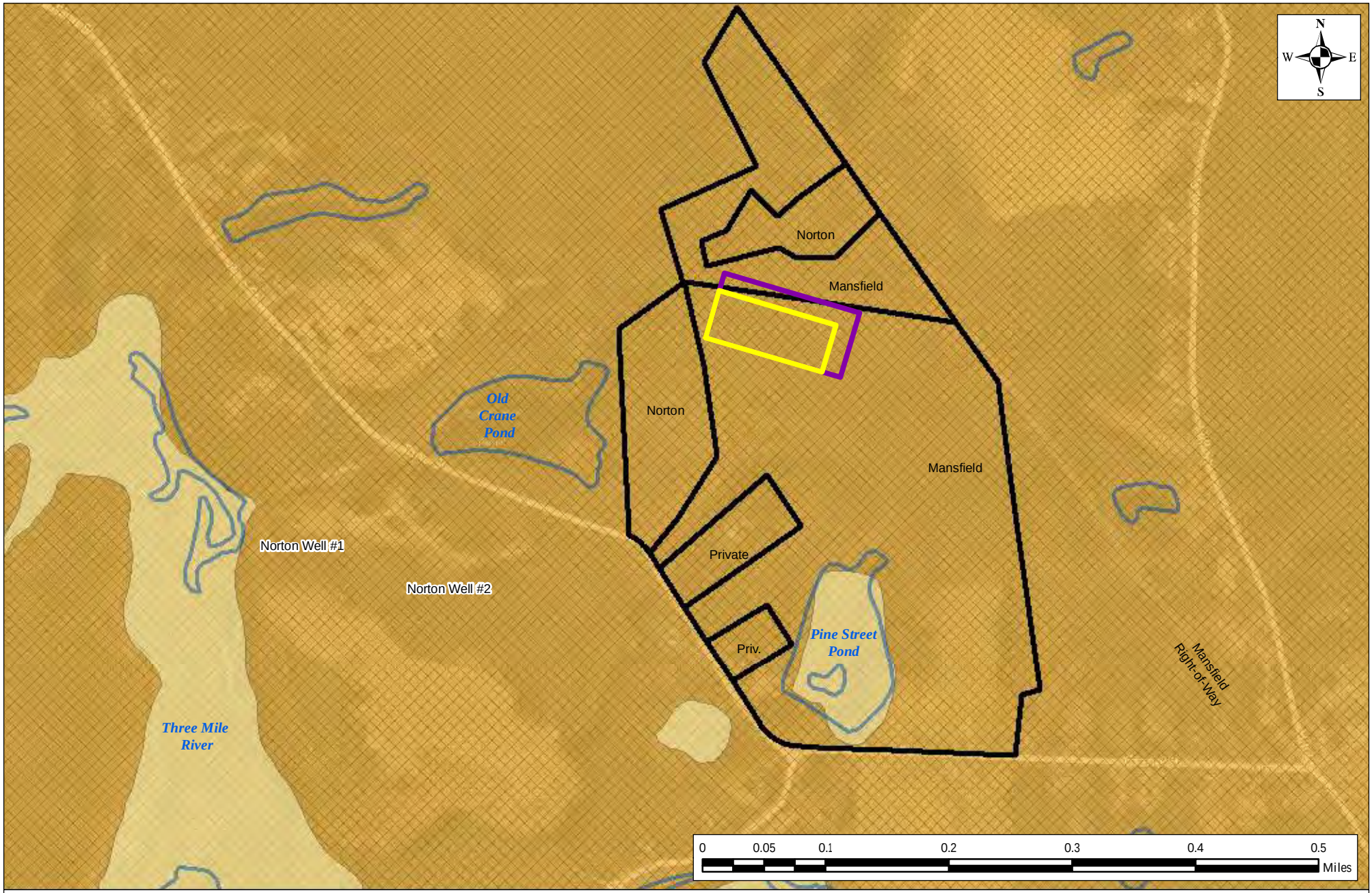
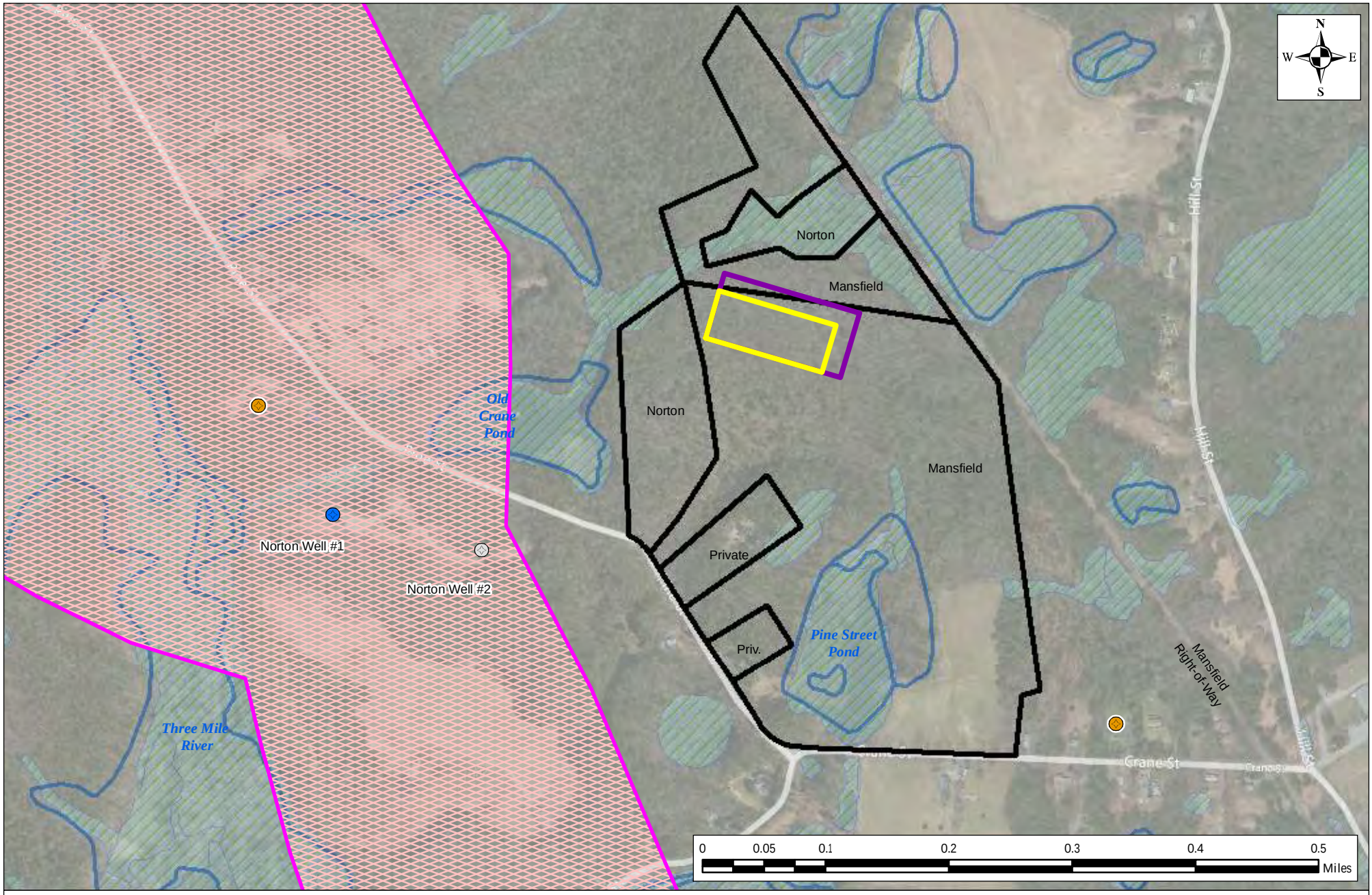
Site Information Map
Pine Street in Norton, MA



Thin Till
Coarse Glacial Stratified Deposits
Post Glacial Swamp and Marsh Deposits
Effluent Application Zone (1.0 mgd/2.4 acres)
Effluent Application Zone (1.5 mgd/4.0 acres)
Parcel Boundaries
Surface Water

CDM Smith

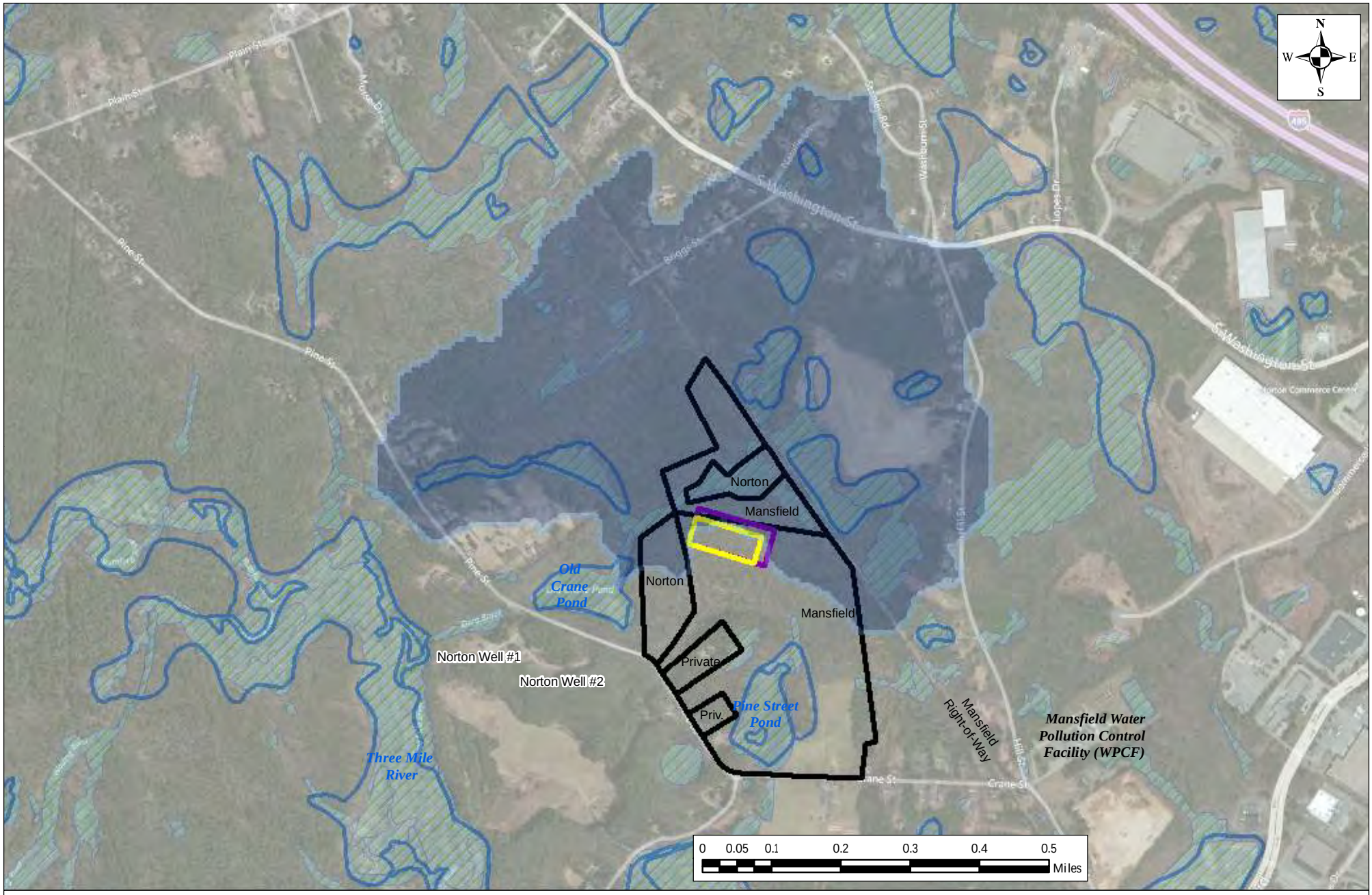
Surficial Geology
Pine Street in Norton, MA



Active Well - Norton Public Water Supply Well #1
Off Line Well - Norton Well #2
Private Potable Wells
Private Non-Potable Wells
Effluent Application Zone (1.0 mgd/2.4 acres)
Effluent Application Zone (1.5 mgd/4.0 acres)
Parcel Boundaries
Surface Water
DEP Wetlands
DEP Approved Zone IIs

CDM Smith

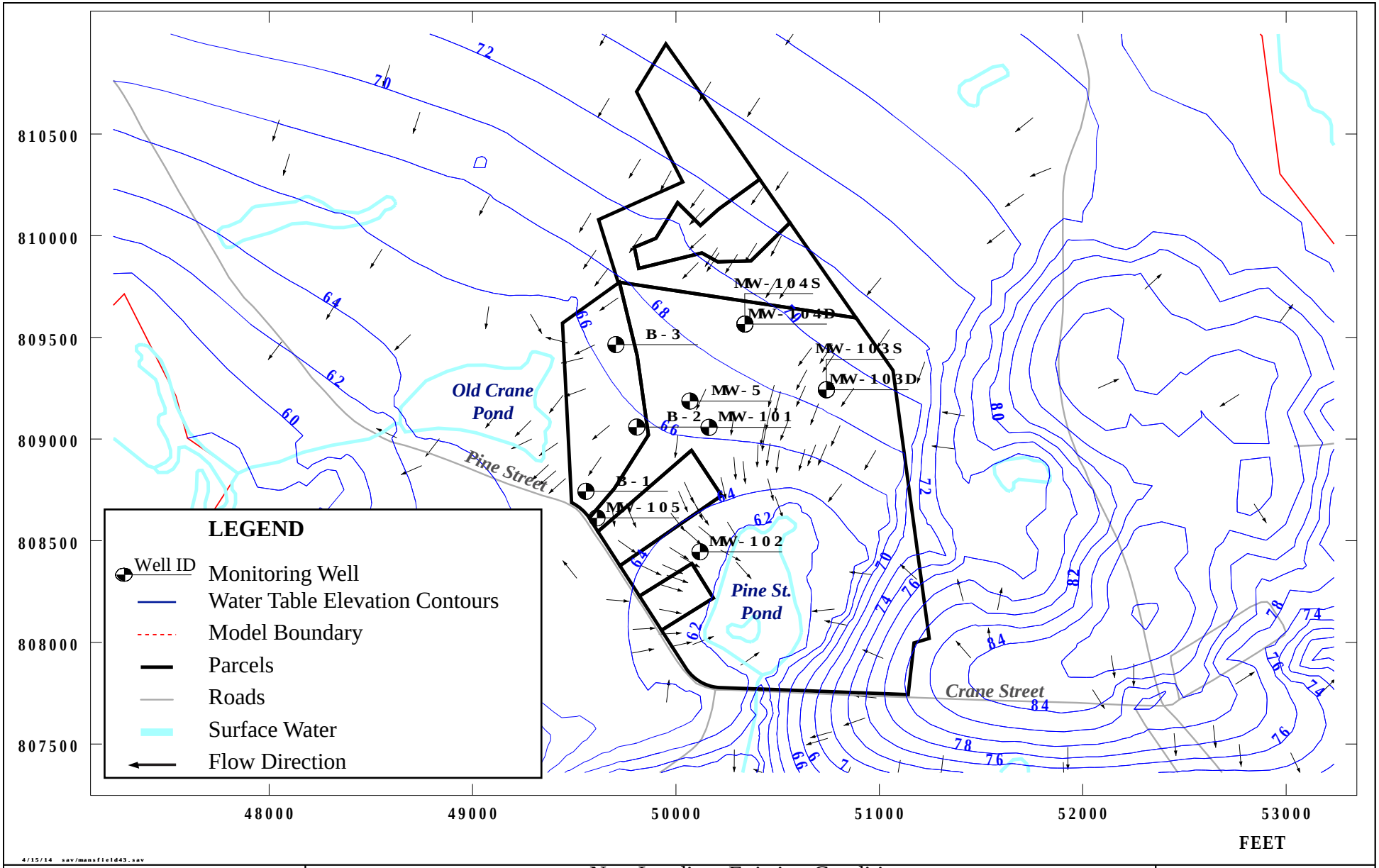
Zone II Delineation
Pine Street in Norton, MA



Contributing Watershed
Effluent Application Zone (1.0 mgd/2.4 acres)
Effluent Application Zone (1.5 mgd/4.0 acres)
Parcel Boundaries
Surface Water
DEP Wetlands

CDM Smith

Contributing Watershed
Pine Street in Norton, MA



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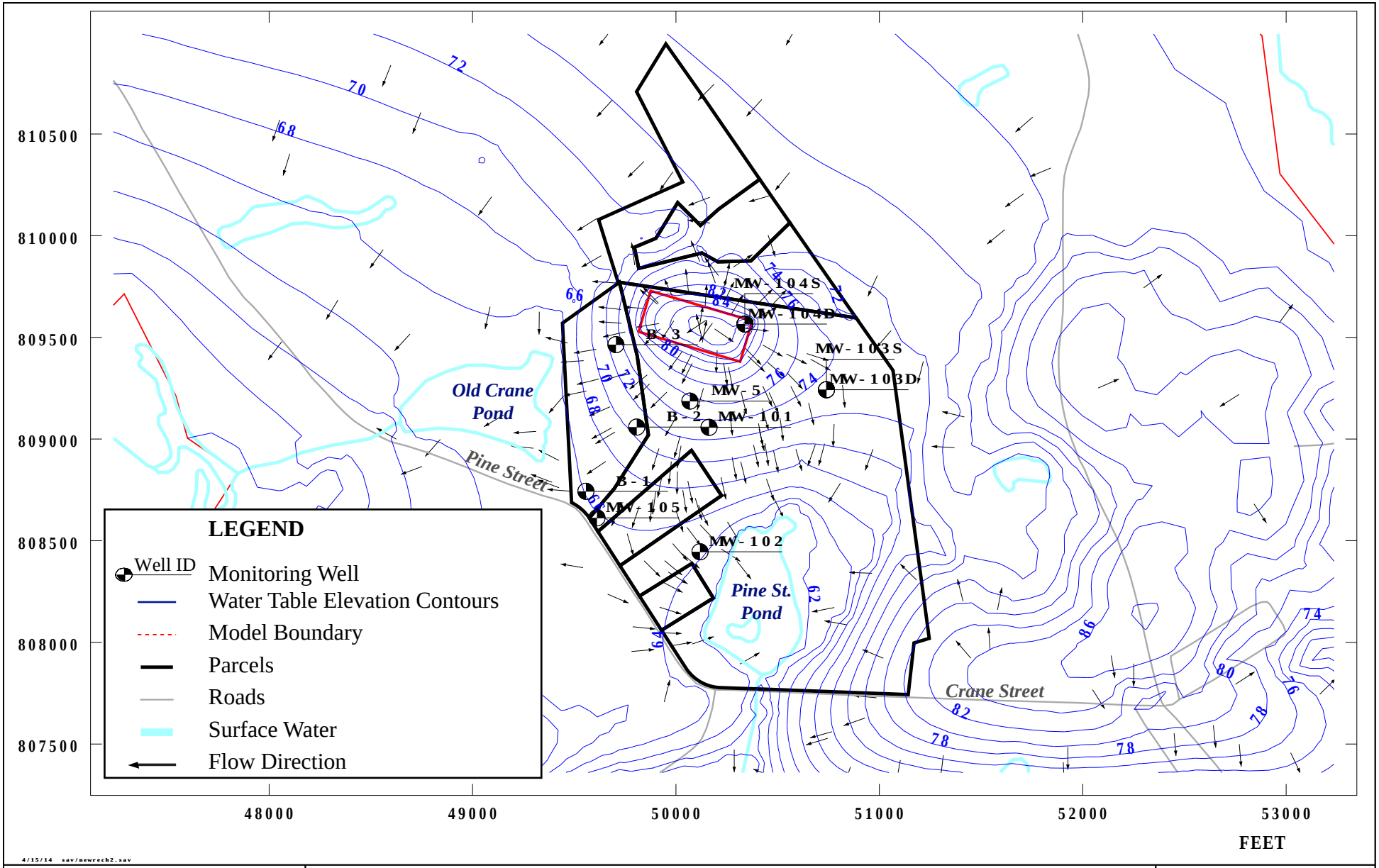
Non-Loading, Existing Conditions
Simulated Water Table Elevations and Flow Paths

Pine Street Site, Norton, MA

FIGURE
4-4



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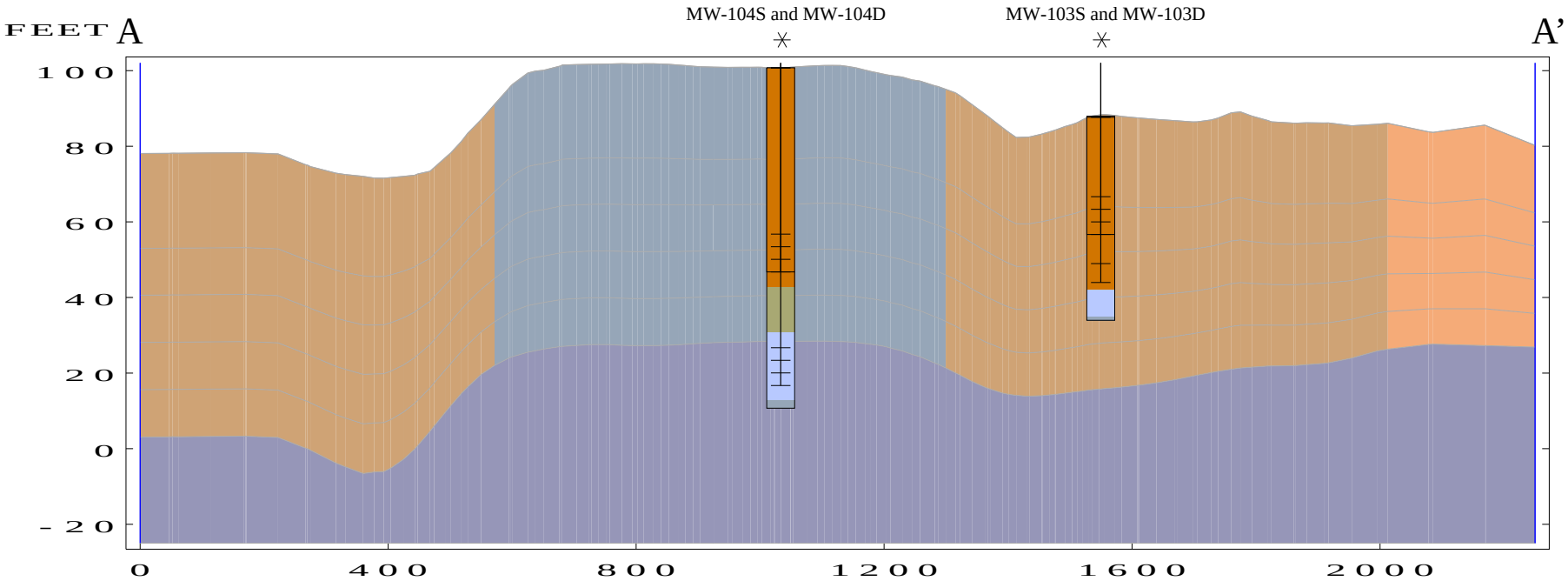
Effluent Recharge Scenario (1.0 mgd/2.4 acres)
Simulated Water Table Elevations and Flow Paths

Pine Street Site, Norton, MA

FIGURE
4-4



MATERIALS CROSS-SECTION AA

- Bedrock Valley Medium to Fine Sand
- Unconsolidated Glacial Drift High K Deposit
- Bedrock

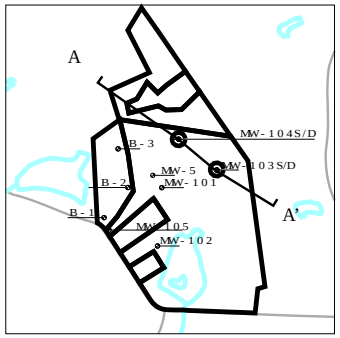
WELL LOG LEGEND

- Till
- Sand & Silt
- Sand
- Silt
- Bedrock

- MONITORING WELL
- GROUND SURFACE
- TOP OF SCREEN
- BOTTOM OF SCREEN

PROJECTED 225 FT

CROSS SECTION AA



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Northwest to Southeast Cross-Section

Pine Street Site, Norton, MA

Attachment 2

Scope of Work Public Notice from Environmental Monitor

PUBLIC NOTICE OF HYDROGEOLOGIC EVALUATION SCOPE OF WORK PURSUANT TO 314 CMR 5.09(1)(b)

Pursuant to 314 CMR 5.09(1)(b), public notice is hereby given that a Scope of Work for a Hydrogeologic Evaluation has been prepared and submitted to the Massachusetts Department of Environmental Protection, Southeast Region Main Office at 20 Riverside Drive, Lakeville, MA 02347. The Scope of Work was prepared on behalf of the Town of Mansfield as an extension of the Town's Comprehensive Wastewater Management Planning process, EOEA No. 13388. Additional information regarding this Scope of Work may be obtained by contacting Edward C. Sanderson at CDM Smith, 50 Hampshire Street, Cambridge, MA 02139 or 617-452-6000.

Attachment 3

Approved Scope of Work and MassDEP Approval Letter

From: Sanderson, Edward
Sent: Monday, July 15, 2013 11:11 AM
To: Burns, David (DEP)
Cc: Young, David F.
Subject: FW: Mansfield Effluent Infiltration Basin Prelim Design and Permitting

Dave,

Per my email from late May (below) and phone message earlier this morning, Mansfield is looking to move forward with completing its regional effluent disposal study and begin preliminary design of effluent infiltration basins. The draft effluent study was completed in September 2008 and DEP provided comments on August 31, 2010.

I am attaching the final scope of work, which was signed by Mansfield in late June.

Thanks,
Ed

Edward C. Sanderson, PE, AICP, LEED AP | CDM Smith | 50 Hampshire Street, Cambridge, MA 02139 | Tel/Fax 617-452-6582 | sandersonec@cdmsmith.com | cdmsmith.com

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From: Sanderson, Edward
Sent: Wednesday, May 29, 2013 4:55 PM
To: 'Burns, David (DEP)'
Cc: Young, David F.
Subject: Mansfield Effluent Infiltration Basin Prelim Design and Permitting

Hi Dave,

Mansfield is looking to move forward with completing its regional effluent disposal study and begin preliminary design of effluent infiltration basins. The draft effluent study was completed in September 2008 and DEP provided comments on August 31, 2010 (see attached PDF). I am also attaching our draft scope of work, which we believe responds to DEP's comments and sets a course of action to gain state and local permitting approval for effluent infiltration basins. We are fine tuning Task 1.0 with our surveyor subcontractor this week and plan to submit to the Town of Mansfield next week so that they can allocate proper funding. If you have comments on the scope of work please let me know.

Thanks,
Ed Sanderson

Edward C. Sanderson, PE, AICP, LEED AP | CDM Smith | 50 Hampshire Street, Cambridge, MA 02139 | Tel/Fax 617-452-6582 | sandersonec@cdmsmith.com | cdmsmith.com

EXHIBIT A
TO AGREEMENT
BETWEEN
OWNER AND ENGINEER
FOR
STUDY, REPORT AND DESIGN SERVICES

This is an Exhibit attached to and made a part of the Agreement dated June 27, 2013, between the Town of Mansfield, Massachusetts (OWNER) and CDM Smith Inc. (ENGINEER) for professional services.

1.0 ENGINEER'S SERVICES

Task 1.0 Topographic Survey

ENGINEER will subcontract and coordinate with a Massachusetts licensed land surveyor sub-consultant for preparation of a topographic survey to the red hatched limits (approximately 50 acres) shown in Exhibit B. The surveyor sub-consultant tasks will include:

1.1 Coordinate with WSP Sells and extend their ground control to locations necessary for photogrammetric mapping. Control will be established using GPS technology;

1.2 Process the field data and transmit the control data to the photogrammetric sub-consultant;

1.3 Contract with a photogrammetric sub-consultant to compile topography of the approximately 50 acres at a scale of 1" = 40' with a 1 foot contour interval;

1.4 Provide a survey party on site to obtain topography in areas obscured by conifer growth and locate additional site features. Features to be located include:

1.4.1 Wetland flags and vernal pools flagged by the ENGINEER. Survey sub-consultant will add the wetlands to the existing conditions plan;

1.4.2 Street curb lines (or edge of traveled way), driveways, buildings, utility poles, transmission towers, fences, drainage features including inlet and outlet structures at Old Crane and Pine Street Ponds, and visible utilities;

1.4.3 Obtain record information from private utility companies, public utility agencies and the OWNER for the project area and compile the size, material, elevations, high or low pressures and type of utility and other pertinent information and display the information on the survey;

1.4.4 Approximately 5-10 borings and monitoring well locations;

1.4.5 Points describing the geometry and edges of the test basin, approximately 10' wide x 10' long x 2' deep with side slopes of 3:1;

1.4.6 Points describing the location and extent of the geophysical survey described in Tasks 2.2.3 and 2.2.5 and shown in Exhibit C. The geophysical survey sub-consultant will flag transects and land surveyor sub-consultant will provide ground surface elevations along transects.

1.5 Prepare a final existing conditions plan of the site in both digital and paper copy in accordance with ENGINEER's requirements; and

1.6 Transmit the final product to the ENGINEER for their use. Digital data files – all maps and databases shall be prepared in formats suitable for running in AutoCAD Land Development Desktop (LDD)

drawing (.DWG) format. Data to be captured, and associated layer design, shall be as outlined by the ENGINEER.

1.7 NGVD 1929 datum shall be used for elevation, and NAD 1988 for location. Alternative datum systems can be used if the survey sub-consultant prefers, and the surveyor will provide correction factors to convert from the datum(s) used for the survey to the project datum(s), if needed.

Task 2.0 Hydrogeological Follow-up Tasks

To satisfy the requirements of the MassDEP comment letter dated August 31, 2010, addressing the draft report titled "Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane and Pine Street Assessments" prepared by the ENGINEER in September 2008, the ENGINNER will complete the following tasks:

2.1 Pilot Testing

2.1.1 ENGINEER will prepare guidance materials, including design of the pilot test basin characteristics, requirements for the water source, and operational plans and guidance in the form of a memorandum. The implementation plan will also include identification of the testing location, based on the results of the September 2008 report, as well as site conditions, and other implementation and operations factors listed below. The test basin will be designed to take advantage of site conditions so that it can be as shallow as possible, and across an area that is relatively flat, to limit access and health and safety issues;

The memorandum will also address site security issues and a Health and Safety Plan update from previous CWMP field work. It is assumed that fencing or other semi-permanent access-restriction will not be needed. ENGINEER will coordinate with the OWNER in securing the site at the end of each work day;

A pilot test basin location will be verified via field visits to be conducted along with the OWNER and the drilling subcontractor. Subcontracts will be executed with a driller under Task 2.2.2;

2.1.2 Two planning meetings will be conducted jointly by the OWNER and ENGINEER at the beginning of the implementation phase. The first planning meeting will be held between the OWNER and ENGINEER, and the second with the Town of Norton Conservation Agent and appropriate MassDEP personnel, so that environmental constraints can be identified as well as basic implementation and operational requirements and preferences. The ENGINEER will modify the implementation/operations memorandum as needed following each planning meeting and during any subsequent daily communications;

The ENGINEER will provide an agenda and documentation material for each planning meeting, and email documentation of other meetings (such as daily preparation on-site meetings and phone calls) that result in adjustments to the implementation or operational plans;

2.1.3 The OWNER's WPCF will serve as the source of water. The driller subcontracted by the ENGINEER will transport water to the infiltration test basin using a water truck, owned and operated by the driller;

2.1.4 The ENGINEER will identify the most appropriate location for the pilot test based on field reconnaissance data collected during Task 2.1.5. A figure identifying this area will be provided to the OWNER for the purpose of conducting the test basin excavation;

2.1.5 A set of new monitoring wells will be installed at the pilot test basin site by the drilling subcontractor as directed by the ENGINEER prior to construction of the test basin. The wells will complement existing wells, so that the test basin has at least one well adjacent to it or near at

least two of its four sides; and, there will be one additional well strategically located based on considerations including predicted mounding magnitudes versus distance and rates of rise as well as site factors such as cleared pathways and the relative distance/direction to existing monitoring wells. In addition, at the location of at least one monitoring well at the testing site, a deeper well will be installed for measuring vertical head difference;

ENGINEER will hire a drilling subcontractor who will drill a designated number of borings at the proposed pilot testing site and install a monitoring well. The drilling work and associated oversight will be conducted under Task 2.2.2, but the planning and staking of boring/well locations will be performed under Task 2.1.5 because of the focus on pilot testing purposes. The characteristics of the new monitoring wells – including the shallow / water table and deeper / paired wells – are described within Task 2.2. To expedite the process, MassDEP will be invited to participate in the field visits for staking locations of field work activities. ENGINEER will use GPS-based coordinates during the field visit to record all staked locations, including pilot testing area; monitoring wells and pilot test basin will be located by survey sub-consultant under Task 2.2.3.

2.1.6 The pilot test infiltration basin will be excavated and formed using OWNER-supplied equipment and labor, using rough design sketch-work by the ENGINEER and with on-site guidance by the ENGINEER during construction. The size of the basin is anticipated to be approximately 10’ wide x 10’ long by 2’ deep with 3:1 side slopes. Any changes to the pilot test basin designed under Task 2.1.4 will be discussed with OWNER.

2.1.7 ENGINEER will conduct the pre-testing tasks listed below for initial measurement of the water table and for obtaining hydraulic property estimates based on testing of the new wells. Also, the ENGINEER will install, calibrate, and test-run water level recorders and prepare them for the testing period at the selected site;

The ENGINEER will install, calibrate, and test-download data from a water level recorder in at least two of the monitoring wells at the pilot testing site, to be monitored during the pilot testing period. The ENGINEER will also set up the water level recorders to run immediately ahead of the testing period, and they will be run for a minimum of 3 days and a maximum of one week prior to the start of pilot testing at the pilot test basin. The ENGINEER will also install a staff gauge at the pilot test basin to allow for manual reading of the depth of water in the basin during testing.

2.1.8 On the first day of the pilot testing week at the testing site, the ENGINEER and the subcontracted driller, along with the designated representatives from the OWNER, will conduct a brief application test run. This will help identify challenges that need to be addressed, while also providing site-specific training of the driller’s staff. Based on adjustments needed, the ENGINEER will submit a revised plan of operations, in the form of manual and/or electronic edits of the guidance memorandum, for immediate use;

2.1.9 The ENGINEER will submit adjustments to the operational guidance documentation within 24 hours after significant adjustments are made. In addition, the ENGINEER will conduct a full round of water level readings from the wells with recorders in them and other existing monitoring wells at the site.

2.1.10 ENGINEER and subcontracted driller will continue performing the pilot test at the testing site for a minimum period of one (1) day and a maximum period of five (5) days in total. The ENGINEER will provide edited versions of the operations memorandum if needed due to significant adjustments in the operations that may be made.

2.1.11 During active pilot testing at the site, the ENGINEER will conduct manual water level readings at least hourly, or more frequently, and the ENGINEER will download data from the water level recorders at the end of each day. The ENGINEER will evaluate the collected water level data, and on the days before the latest allowable testing-day for each site (assumed to be a Friday), the ENGINEER will determine whether the testing should continue;

The criteria for termination of the pilot testing will be finalized before the testing proceeds but after the monitoring wells are installed and all distances between the wells and the test basin are known – and only after the rate of application can be estimated based on the achievable filling-draining rate of the water truck. Initial criteria have been established, based on a unit response approach that includes normalization according to actual expected flow rates. The testing will be terminated on the latest day allowed for testing, no matter what the measured responses have been;

2.1.12 Upon completion of the testing at the testing site, the ENGINEER will conduct one final round of manual water level readings and data downloads from the monitoring wells. Then, the ENGINEER and subcontracted driller will meet to discuss the close-out of operations at each site, so that the driller can provide information that may need to be considered by the ENGINEER in reporting the results of the testing. This will also provide the basis for the ENGINEER and driller to inform the OWNER that the pilot testing is finished, and to provide the OWNER with information that would help the OWNER with restoring the test-basin site appropriately. The OWNER will provide manpower and equipment to reshape the test-basin areas at the site, following completion of the pilot testing;

The recorders will be re-started by the ENGINEER immediately after downloading data on the last day of testing at the site, and they will be run over a period from the end of testing until the start of the following week at a minimum, or to the end of the week at a maximum. Then, the ENGINEER will conduct one final download of the recorder data and one final round of manual water level readings at the pilot testing site;

2.1.13 The ENGINEER will analyze the data collected during the pilot testing period, and the data from initial hydraulic testing and well-installations. The analysis efforts will include desktop evaluations for establishing estimated hydraulic properties, which will be used in Task 2.2 for updating the 3D groundwater flow model developed for the "Regional Effluent Disposal Alternative Study for Mansfield , Foxborough, and Norton (MFN): Crane and Pine Street Assessments" prepared by the ENGINEER in September 2008;

The ENGINEER will also use the results of the data-evaluation to produce a recommended design loading rate for each site. This estimated loading rate will be based solely upon the hydraulic limitations revealed at the site by the pilot testing. Other considerations, such as potential mounding impacts on nearby natural and man-made features, and the time-of-travel to water supply wells, will be evaluated in Task 2.2 based upon 3D groundwater flow modeling;

2.1.14 The ENGINEER will produce a draft section of the Hydrogeologic Report that documents the set-up and performance of the pilot testing at the selected site, the results of analyzing the data, and recommendations related to full-scale implementation and operations, including a draft pre-design estimate of the testing site's maximum capacity and long-term average loading rate;

The ENGINEER will submit the draft report section to the OWNER for review and approval. The ENGINEER will meet with the OWNER to discuss comments, and then produce a revised draft report-section and deliver it to the MassDEP; and

2.1.15 The OWNER and ENGINEER will meet with MassDEP personnel and the Town of Norton Conservation Agent to discuss their comments on the report and recommendations for full-scale

implementation. Based on this meeting, the OWNER and ENGINEER will discuss the outcome to agree on the full-scale design characteristics. The ENGINEER will then develop a final revised version of the report section, which will be used to guide the preliminary design of the full-scale system, which will be simulation-tested through 3D groundwater flow modeling within Task 2.2 below.

2.2 Groundwater Impacts Evaluation

The ENGINEER will update the original model from the "Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane and Pine Street Assessments" through calibration to the transient conditions during the pilot testing period. Following calibration, the ENGINEER will use the updated flow model to conduct predictive simulations for re-estimating the capacity of the entire site under full-scale implementation conditions. Particular tasks include:

2.2.1 The ENGINEER will perform planning and implementation of groundwater fieldwork, using the mapping of initially-planned data-collection locations as shown in Exhibit C. This task includes selection of the most likely locations for effluent recharge, as well as identifying the final locations for field work activities. The best locations are generally the furthest eastern portions of the available land areas in the most elevated and/or plateau-like zones. The locations will be verified via field visits to be conducted along with the drilling and surveying subcontractors. This task will also include mapping of the work proposed and subcontract management. The proposed fieldwork is described in the next set of tasks. This task also includes the identification and staking of boring/piezometer locations, surface water elevation measurement stations, and a description of the method for pond water quality characterization purposes in terms of the likely locations for gaining access to the ponds. The surface water elevations of the two ponds bordering the site will be obtained at their outlet structures, while the pond water quality characterization will be accomplished via rowboat traverses. The plans will be presented in a letter proposal to the OWNER and then to the MassDEP, following approval by the OWNER. One meeting with MassDEP personnel will be conducted to confirm the field work approach and specific plans. To expedite the process, the MassDEP will be invited to participate in the field visit for staking locations of field work activities. GPS-based coordinates will be recorded during the field visit for all staked locations.

2.2.2 A drilling subcontractor to the ENGINEER will drill seven (7) borings on the site, and install monitoring wells in each one. Two borings will be drilled to bedrock or refusal in till. The monitoring wells will have 10-ft screens installed from 10 to 20 feet below the water table for the shallow borings, and for the deeper borings, mid-way between the bedrock surface and the bottom of the paired shallow monitoring well, or a deeper screened interval assumed to be from 40 to 50 feet below the water table. Each shallow boring that is not paired with a deeper one will be sampled continuously from the ground surface to 10 feet below the water table, and then at 5-foot intervals from there to the bottom of the hole. The same process will be used in drilling the deep borings. The shallow borings will be drilled to 20 feet below the water table or to bedrock/refusal, whichever comes first. ENGINEER will log the drilling along with the driller, and will approve the screen and filter pack selected by the driller. Split-spoon samples will be retrieved for possible vertical permeability and/or grain-size distribution testing for characterizing a low-permeability layer found previously on a portion of the site. These geologic sediment samples will not be tested but will be preserved for possible future testing, pending the results of the pilot testing.

2.2.3 The ENGINEER will use GPS equipment to record point locations of monitoring stations and geophysical survey points for facilitating and ensuring that the surveyor sub-consultant can find the identified points.

2.2.4 The ENGINEER will measure water levels in the piezometers and at the surface water elevation stations. In addition, water depths in the certified vernal pools on the site and along Pine Street will be measured, if standing water exists in them, and if not, "dry" conditions will be recorded. Two rounds of manually-measured readings will be conducted, with the first round performed at least one week after the new monitoring wells have been installed and developed, and at least one week prior to the start of pilot testing; the second round will be conducted at least one week after pilot testing ends. Manual measurements will be performed in all of the newly installed wells, and in as many of the pre-existing wells within the study area that can be accessed and measured successfully. Water levels will also be recorded manually at each of the surface water elevation stations.

2.2.5 The ENGINEER will hire a geophysical surveying company to perform geophysical surveying for estimating aquifer thickness and extent, and to help define the presence of low-permeability layering that could influence loading rate capacity, while also helping to identify the ambient water table depth and elevation. Two days of radar-based surveying will be conducted, for estimating the depth of aquifer sediments at the potential effluent recharge site; another two days of geophysical surveying will be conducted using a seismic-based technique, for helping to identify geologic sediment layering, the water table depth/elevation, and to confirm the depth to bedrock. A geophysical surveying subcontractor will be procured, who will perform this field work along open pathways, as available given existing vegetation and as cleared in advance for drilling of monitoring wells and performance of infiltration pilot tests. The currently-planned geophysical survey lines are shown in Exhibit C. They are situated and aligned for characterizing subsurface conditions within the most critical zones of the site, including initial engineering concepts for basin layout and example candidate pilot testing locations, as well as the transect between the likely final infiltration basin areas and toward groundwater recharge zones – including the pond to the south, and the Town of Norton well field to the west. Ground-truth efforts will include linking the survey lines with newly drilled and previously drilled borings/wells. The subcontractor will submit a technical letter report, which will be attached to the ENGINEER's reporting as an appendix. The subcontractor's report will include mapping and cross-sections depicting transect-alignments of each survey, and the identified subsurface conditions along transects. Special emphasis will be placed on identification of shallow low-permeability layering, shallow bedrock, ambient water table depth/elevation, and ground-truthing results.

2.2.6 The ENGINEER will perform hydraulic testing of the installed monitoring wells. The testing will consist of slug testing of each well newly installed as part of this program as well as re-testing the operable existing wells at the property, for a total of up to 10 to 12 tested wells. The slug test results will be analyzed using standard methods, to produce estimates of horizontal hydraulic conductivity for the screened intervals of each tested well.

2.2.7 The ENGINEER will conduct groundwater quality sampling and surface water quality characterization of the two ponds that border on the site, for determining background, pre-loading conditions.

The groundwater sampling will be conducted in a single round, at least one week after the new monitoring wells have been installed and developed. This sampling event will be coincident with the first round of water level elevation readings. Field readings of temperature, pH, and specific conductivity will be performed, and samples will be extracted and sent to a laboratory for testing, for the set of analytes listed below.

Regarding surface water quality characterization, a monthly program of pond-based data-collection will be executed by the ENGINEER from July through October 2013, which is typically the maximum growth period for pond ecology. At each pond, an access point will be established and used for launching a rowboat. During the first event, traverses of the pond will be

performed for measuring pond depths, which will provide the basis for determining the location in each pond at which to conduct water quality measurements. GPS equipment will be used for recording the location of each depth reading, and the location of the designated water quality sampling location.

After that location is identified, the rowboat will be positioned there, and used to collect a sample for laboratory testing, to record probe-sensed parameters at multiple depths, and to estimate light-penetration depth. Two surface water samples will be collected from two (2) appropriate depths during each event, for a total of up to 16 samples from the ponds – two from each pond from July through October 2013 for a total of four (4) monthly samples. In addition, a probe will be lowered and raised, for sensing and recording values of temperature, dissolved oxygen, and specific conductivity; and, a Secchi disk will be lowered and raised for estimating light-penetration depth.

The ENGINEER will send the water quality samples to a State-certified laboratory. The laboratory analyses of groundwater and surface water samples will include testing for concentrations of phosphorus (orthophosphate) and nitrogen (nitrate-nitrite, ammonia, and TKN), chlorophyll-a, and boron.

2.2.8 The ENGINEER will update the conceptual and analytical models of the site, based on the new data collected as well as consideration and incorporation of groundwater modeling efforts during previous project stages. The fully 3D groundwater flow and effluent recharge / time-of-travel modeling will continue to be based on the ENGINEER's publicly-available, proprietary DYNFLOW and DYNTRACK simulation codes. The flow model will be updated to account for the new information on bedrock depth, and the possibility of lower-permeability layering that could influence infiltration capacity and lateral groundwater flow.

The flow model calibration will be updated primarily by using the pilot testing results, by producing an acceptable comparison between observed water table mounding and simulated values. This calibration exercise will be conducted in transient mode, resulting in hydrographs of mounding amounts that will be the basis of comparison.

In addition, steady-state modeling will be used for helping update the model calibration, so that water levels collected within the wider site area can be used, and thereby demonstrate that the model is adequately simulating flow from the site toward downgradient discharge points. Therefore, the water levels collected during the resting periods before and after the pilot testing will be used as calibration targets. The pumping tests documented for the Norton Wells #1 and #2 will be used once again for helping define aquifer hydraulic parameters.

Accurate ground surface elevations are needed for ensuring adequately representative surface and bedrock elevations in the flow model, in the zones between surveyed elevation points. If a new flyover is conducted as part of the overall CWMP process (under a separate work plan) and the results made available in time, they will be used in the modeling. For areas within the model domain that do not have new flyover-generated surface elevations, digital elevation model data from the USGS or the State GIS database will be used. The most critical zone for laterally-detailed definition of surface elevations is the area where the higher-elevation portion falls off toward the south and southwest, dropping down to the elevations where the residences are located. This is because that sloping zone is where the modeling will be used for checking for potential groundwater slope break-out.

2.2.9 The ENGINEER's modeling team will use the groundwater flow model to help establish the preliminary design of land application facilities on the properties under the OWNER's control. This process will involve coordination between the modeling team and the ENGINEER's design engineering team. It will generally consist of the delineation of the effluent recharge basins, the

simulation-based testing of necessary application rates for recharging the treated wastewater, and the consideration of constraints that involve mounding of the water table at the site and on nearby land, potential break-out of groundwater along the steep slopes bordering the land application zones, time-of-travel to the Town of Norton's well field, and the migration of nutrients from the wastewater effluent after mixing with ambient groundwater and natural recharge.

The ENGINEER's modeling team will test various land application scenarios, consisting of a range of total discharge rates that will be provided by the ENGINEER's design team who are developing estimates of wastewater flow rates. In addition, the modeling team will work with the design team to establish feasible extents of the infiltration areas.

Various types of constraints on land application will be evaluated through the modeling, and used to fine-tune the preliminary design of the land application facilities. Seasonal high water table and average conditions will be evaluated in the groundwater model, using the so-called "Frimpter Method" to establish the amount of water level rise above average ambient conditions for setting the typical seasonal high level. For each predictive simulation, the estimated water table elevations will be mapped, and predicted water table mounding will be evaluated to determine whether a sufficient depth to water is maintained beneath the land application facilities. In addition, the impacts of water table rise will be assessed at the nearby certified vernal pools and residences. At the vernal pools, it would be unacceptable for the water table rise to produce permanently-inundated conditions, and at the residential properties, the water table should not rise to an elevation that would produce a risk of basement seepage. The modeling will also predict whether slope break-out would occur, along the steep land that borders the application areas. While slope break-out may be acceptable if it is shown to be naturally-occurring already during the field surveying, it is assumed that it is not occurring now and thus will be avoided.

Particle tracking will be used for checking whether water quality related criteria are being met, including constraints related to potable groundwater supply pumping and also surface water impacts. Particle tracking will be used by running the DYNTRACK model, using flow field characterization from the DYNFLOW model. For addressing the water supply related criterion, the modeling will provide estimated times-of-travel from the infiltration basins to the Town of Norton water supply wells. According to current MassDEP guidance, the minimum time-of-travel needs to be two years. Dispersion will not be simulated directly, but will be accounted for by setting a minimum time-of-travel of 2.5 years. Also as a conservative assumption, the time-of-travel constraint will be applied in relation to the Town of Norton's well field.

For assessing potential impacts on surface water quality, the particle track simulations could be used to define whether applied wastewater would migrate and discharge to one or both of the nearby ponds, and if so, the additional, non-background nutrient discharge rate under full-scale, long-term loading conditions could be predicted. Complete attenuation of phosphorus will be assumed, whereas nitrate will be assumed to migrate unimpeded. Therefore, if one or both of the ponds is estimated to be nitrogen-limited (unusual for this area), then the nitrate loading rate would be estimated and used to assess whether a reduction would be needed. If neither pond is nitrogen-limited, then this assessment would not be needed; however, the relative percentage of effluent discharge to each outlet point will still be computed and reported. The outlet points will include one or both of the ponds, the Town of Norton well field, and various segments of the Three Mile River and local tributaries. If the predictive modeling indicates that the wastewater discharge would produce an unacceptable condition with regard to one or more of the constraints described above, the applied effluent loading rate will be reduced and/or the location of the recharge adjusted. Revised predictive simulations would be run using the adjusted design, and if any unacceptable condition persists, further adjustments and re-simulations will be conducted until all constraints are met.

For expediting this process in regard to allowable mounding below the full-scale infiltration basins, simulations will be conducted in which the water table elevation is held constant at exactly the allowable depth. In this situation, the flow model will produce a discharge-to-groundwater rate that represents the maximum possible, given that constraint. Then, further predictive simulations for the scenario (in which the basin shape is defined) will include specification of loading rates that are less than the maximum rate, because mounding will be accentuated in the center of each basin versus the edges. This will ease the iterative process by directly simulating the maximum possible loading rate at each basin, while also producing the maximum off-site impacts in terms of all other constraints – vernal pool inundation, impacts on residential basements, slope break-out of seepage, and time-of-travel to the water supply well field.

Based on meeting all constraints with an acceptable preliminary design, a final estimated maximum effluent loading volume and location for the site will be produced. In addition, the predictive simulations will include estimation of the percentage of effluent that will flow through the groundwater and then discharge to the local surface water bodies, including the wetlands to the south, and the tributaries and main stem of the river flowing past the Norton well field.

2.2.10 The ENGINEER will produce a technical report on the groundwater fieldwork and groundwater modeling based assessment activities. The hydrogeological study and design/operations recommendations reporting will be produced as a technical memorandum.

The memorandum will meet all requirements of the MassDEP in regard to hydrogeological study reporting. It will also include recommendations for design stage efforts that will lead to final delineation of infiltration basins and setting of loading rates. The recommendations will address baseline, pre-implementation background monitoring as well as operational monitoring and performance tracking, focused on groundwater-related impact constraints. Thus, issues related to water table mounding, slope break-out, time-of-travel (including use of tracers), and surface water quality impacts will be incorporated in the recommendations for monitoring.

The results of the groundwater-related investigations will be presented to the OWNER at the time the initial draft report. After addressing review comments from the OWNER, three draft copies will be submitted to MassDEP for review and approval. Then, after addressing MassDEP comments and obtaining approval of the final version, the groundwater-related reporting will be provided to the OWNER.

2.2.11 Technical review sessions will be conducted according to the ENGINEER's QA/QC guidelines. QA activities will be performed by an ENGINEER-designated Groundwater Modeling Technical Director, including a kick-off technical meeting, another session following submittal of pilot testing results, and then two sessions during the remainder of the project – one during the initial stages of conceptual and numerical model updating, and the second after scenarios have been evaluated but before a draft report has been written.

Task 3.0 Groundwater Discharge Permit

3.1 ENGINEER will prepare a groundwater discharge permit application at the completion of Task 2.0 and after receiving approval of the hydrogeological study of the Reilly Property site; and

3.2 ENGINEER will attend up to three (3) meetings with MassDEP to resolve any issues related to approval of the groundwater discharge permit.

Task 4.0 Conceptual Design of Infiltration Basins

ENGINEER will develop a conceptual design of infiltration basins and related pumping station and force main in preparation for a site plan review submittal to the Town of Norton Planning Board for use of the Reilly Property for wastewater effluent recharge. Task 4.0 includes the following subtasks:

4.1 ENGINEER will size infiltration basins based on projected hydraulic loading rates;

4.2 ENGINEER will complete cut and fill calculations and stormwater calculations for the size, location, and number of infiltration basins;

4.3 ENGINEER will develop a grading plan;

4.4 ENGINEER will develop a schematic layout of the infiltration basins distribution box and related piping;

4.5 ENGINEER will develop schematic layouts of SCADA and lighting and access roadways and identify related preliminary design issues;

4.6 ENGINEER will size pumping station and force main and identify most feasible location to avoid utility conflicts;

4.7 ENGINEER will attend up to three (3) meetings with OWNER and/or MassDEP to discuss infiltration basin conceptual design related issues; and

4.8 Technical review session for conceptual infiltration basin design according to ENGINEER's QA/QC guidelines.

Task 5.0 Site Plan Review

To meet the requirements of the Town of Norton's Zoning Bylaw, Article XV, Section 15.4, for approval of a site plan, the ENGINEER will complete the following site plan review tasks:

5.1 ENGINEER will develop a site plan and also identify vernal pools and soil types;

5.2 ENGINEER will prepare an erosion and sedimentation control plan;

5.3 ENGINEER will prepare a stormwater management plan;

5.4 ENGINEER will prepare an operation and maintenance plan;

5.5 ENGINEER will develop a technical memorandum summarizing the proposed infiltration basin project;

5.6 ENGINEER will provide eight (8) copies of the site plan to the Planning Board and one (1) additional copy to each of the following departments: Building Inspector, Police Department, Fire Department, Conservation Commission, Board of Health, Water and Sewer Commission, and Highway Department; and

5.7 ENGINEER will attend up to three (3) meetings with the Norton Planning Board and/or other boards or departments.

Task 6.0 Environmental Permitting

6.1 Wetland Delineation & Vernal Pool Identification

6.1.1 ENGINEER will complete a desktop delineation using published data to evaluate existing conditions to determine presence/absence of wetlands and identify approximate wetland boundaries. Data to be reviewed will include: USGS Quadrangle, NRCS Soils Maps, FEMA Flood Maps, National Wetland Inventory (NWI) Maps, aerial photos, and MassGIS hydrography data layer;

6.1.2 ENGINEER will delineate wetlands in the field pursuant to the Corps Wetland Delineation Manual and the Northeast Regional Supplement and the Massachusetts Bordering Vegetated Wetland Delineation Manual. Optimal time of year to conduct wetland delineation is during the growing season. Wetland flags will be located by survey sub-consultant;

6.1.3 ENGINEER will conduct field investigations during the spring 2014 season to identify presence of vernal pool habitat in the project area. Observations will be conducted to document presence, or absence, of obligate vernal pool indicator species such as amphibian egg masses (e.g. Ambystoma maculatum or Rana sylvatica); and

6.1.4 ENGINEER will prepare a Field Completion Memorandum in two parts (wetlands and vernal pools) to document findings from both the desk top delineation and field investigations.

6.2 ANRAD and Permitting Plan

6.2.1 ENGINEER will prepare and submit an Abbreviated Notice of Resource Area Delineation (ANRAD) to secure Conservation Commission concurrence of the delineated wetland boundary. The Field Completion Memorandum in Task 6.1.4 will provide the basis for the application. It is anticipated that conditional approval will be granted pending the evaluation of vernal pools in spring 2014. Abutters will be identified and notified per regulations; and

6.2.2 ENGINEER will review the conceptual design of infiltration basins and the environmental constraints including but limited to wetland resources, to identify potential permits and evaluate environment permits needed to construct the proposed infiltration basins. Permits reviewed will include local, state and federal permits and the permitting plan will present a sequence and anticipated schedule to prepare applications and receive permits/authorizations.

6.3 Meetings / Site Visits

6.3.1 ENGINEER will prepare for and attend up to two (2) Conservation Commission meetings and one (1) Conservation Commission site visit to support the ANRAD review process.

Task 7.0 Project Management

ENGINEER will provide overall coordination and administration of the project, subcontract management, progress reports, periodic communications with the client, project invoicing, technical and quality reviews, and budget and scope tracking.

2.0 OWNER'S RESPONSIBILITIES

2.1 The responsibilities of the OWNER as described in the Agreement are amended and supplemented as follows:

2.1.1 Assist ENGINEER in coordinating with Town of Norton representatives to acquire available information noted in the tasks above and to acquire necessary access issues to perform the tasks described.

2.1.2 Assist ENGINEER in distributing information developed to other pertinent stakeholders (Town of Foxboro representatives, etc.).

2.1.3 Perform implementation and operational work-efforts as described in the previous section of this document, including provision of a water-source system, construction of the test basin, operation of the test-loading, and returning the testing-site to acceptable condition following cessation of testings.

2.1.4 Conduct document reviews, discussion of comments, and meetings for reaching consensus on approach, details of implementation and operations, and development and documentation of recommendations for design of a full-scale system at the site.

3.0 TIME PERIOD FOR PERFORMANCE

The time periods for the performance of ENGINEER's services as set forth in this Agreement are as follows:

The services defined in Tasks 1.0 through 7.0 shall be completed within ___ days from date of this agreement. Specific tasks will be completed as follows:

Task 1.0 – Summer/Fall 2013 and follow-up in May 2014 addressing Task 6.1.3

Task 2.1 – Summer/Fall 2013

Task 2.2 – Summer/Fall 2013

Task 3.0 – Assuming MassDEP approval of hydrogeo report by November 2013, and Task completed by December 2013

Task 4.0 –December 2013

Task 5.0 –March 2014

Tasks 6.1.1 and 6.1.2 – Summer 2013

Task 6.1.3 – March/April 2014

Task 6.1.4 – Two parts, addressing Task 6.1.1 and Task 6.1.2 in Summer 2013 and Task 6.1.3 in April 2014

Task 6.2.1 – Summer 2013

Task 6.2.2 – December 2013

Task 6.3 – Summer 2013 with some follow-up April 2014

Task 7.0 – July 2013 to May 2014

4.0 METHOD OF PAYMENT

4.1 OWNER shall pay ENGINEER based on monthly invoices prepared in accordance with the following paragraphs. Services of ENGINEER shall be paid by the "Salary Cost" method. The total budget, for estimating purposes, shall not exceed $346,000 and shall not be exceeded without written authorization from the OWNER. For information purposes only, the estimated costs by Task are estimated to be as follows:

Task 1.0 Topographic Survey	$34,000
Task 2.0 Hydrogeological Tasks: Pilot Testing & GW Impacts Evaluation	$180,000
Task 3.0 Groundwater Discharge Permit	$24,000
Task 4.0 Conceptual Design of Infiltration Basins	$38,000
Task 5.0 Site Plan Review	$26,000
Task 6.0 Environmental Permitting	$29,000
Task 7.0 Project Management	$15,000
Total Project Budget	**$346,000**

4.2 Services of ENGINEER shall be paid by the "Salary Cost" method. OWNER agrees to pay ENGINEER as follows:

- For work done by the ENGINEER, payment shall be made at the salary cost of such services for employees, plus 130 percent of the salary cost for overhead and profit, plus actual out-of-pocket expense costs.
- "Salary Cost" is defined as the cost of salaries (including sick leave, vacation, and holiday pay applicable thereto) for time directly chargeable to the project, plus unemployment, excise, and payroll taxes; and contributions for social security, employment compensation insurance, retirement benefits, and medical and other group insurance benefits.
- "Actual out-of-pocket expense costs" are all costs other than salary costs that are incurred during the progress of work. The actual out-of-pocket expense costs include air fare, automobile rental if required, mileage charges, parking, tolls, taxi, meals, lodging, telephone, printing and reproduction costs, and other miscellaneous costs incurred specifically for this project.
- For in-house computer usage, in-house word processor usage, in-house laboratory analyses, and rental of field equipment, payment shall be made at the ENGINEER'S regular rates.
- ENGINEER shall not provide services which, if invoiced, would exceed any budgetary limit in the Cost Summary Table, and OWNER shall not be invoiced above any such budgetary limit, unless additional funding is authorized by OWNER.

5.0 SPECIAL PROVISIONS

OWNER has established the following special provisions and/or other considerations or requirements in respect of the Assignment, which supersede Articles 1 through 7 where applicable

1. Following the first paragraph on Page 1 of the Standard Form of Agreement, <u>ADD</u> the following paragraph:

   "The Contract Documents, which comprise the Contract between the OWNER and the ENGINEER are made a part hereof and consist of the following:

   1. This Agreement.
   2. Certificate of Insurance.
   3. Any modifications, including Addenda or Amendments, duly executed and delivered after execution of this Agreement."

2. ARTICLE 5 – GENERAL CONDITIONS

a. Section 5.4 Use of Documents:

   i. DELETE Section 5.4.1 and substitute the following:

   All records, documents, working papers, calculations, computer programs, computer data, drawings, plans and specifications of every type ("Documents") prepared by the ENGINEER or its subcontractors pursuant to this Agreement, whether or not delivered to the OWNER, and all equipment, materials, items or objects of any kind acquired by the ENGINEER pursuant to this Agreement and reimbursed by the OWNER, whether or not delivered to the OWNER are property of the OWNER and upon request shall be delivered to the OWNER upon the termination of this Agreement or at the OWNER's request prior thereto. The ENGINEER shall at all times develop, index and file such Documents in an orderly, logical manner. Both during the term of this Agreement and after its termination, the ENGINEER may not

distribute or publish such Documents or information derived from them without the prior written approval of the OWNER. Any such reuse of such Documents by the ENGINEER, or any person or entity to whom the ENGINEER may furnish such Documents, shall be at the ENGINEER's sole risk. Reuse of Documents by the OWNER for other than their intended use without written authorization by the ENGINEER shall be at the OWNER's risk. Subject to the provisions of this Agreement, the ENGINEER, at the ENGINEER's expense, may keep copies of all documents prepared by the ENGINEER under this Agreement for the purpose of the ENGINEER's permanent records.

ii. DELETE Section 5.4.5.

b. Section 5.7 Limitation of Liability: DELETE this Section in its entirety and substitute the following:

5.7 Indemnity

5.7.1 The ENGINEER shall indemnify and hold harmless the OWNER, its officers, agents and employees, from and against all claims, causes of action, suits, losses, damages and expenses, including, but not limited to, attorneys' fees, to the extent caused by and arising out of or resulting from, in whole or in part, negligent acts, errors or omissions, fault, or breach of contractual duties to the OWNER by the ENGINEER and anyone employed by it (including, but not limited to, subcontractors and their employees), in performance of this Agreement.

5.7.2 The ENGINEER shall also indemnify the OWNER for all expenses incurred by the OWNER in the defense, settlement or satisfaction of the claims, causes of action, or suits, including expenses of attorneys. The ENGINEER shall require that every subcontractor indemnify the OWNER to the same extent that the ENGINEER is required to indemnify the OWNER under this Agreement. The ENGINEER shall defend the OWNER, with counsel reasonably acceptable to the OWNER, against any claim, cause of action, or suit described in this Section, in which event, the ENGINEER shall not, without obtaining express advance permission from the General Counsel of the OWNER, raise any defense involving in any way jurisdiction of the tribunal, immunity of the OWNER, governmental nature of the OWNER or the provisions of any statutes respecting suits against the OWNER, such defense to be at the ENGINEER's expense.

5.7.3 The foregoing obligations shall not be construed to limit or nullify any other obligations of indemnification running to the OWNER which would otherwise exist.

c. Section 5.13 Insurance: At the end of the paragraph, ADD the following:

The amounts of insurance shall be as follows:

(i) <u>Worker's Compensation Insurance</u>

The ENGINEER shall carry insurance furnishing benefits in accordance with Chapter 152 of the Massachusetts General Laws or such other worker's compensation requirement as may pertain.

(ii) <u>Liability Insurance</u>

The ENGINEER shall carry insurance coverage for employer's liability, general liability, including broad form coverage and automobile liability. Such coverage may be provided through a combination of primary and umbrella insurance.

(iii) <u>Basic Professional Liability Insurance</u>

The ENGINEER shall carry professional liability insurance coverage for negligent acts, errors and omissions in an amount of not less than Three Million Dollars ($3,000,000.00), in the aggregate. Such insurance shall extend to the ENGINEER and to its legal representatives in the event of death,

dissolution or bankruptcy. Such insurance shall specifically extend to any of the liabilities assumed under this Agreement, any negligent act, error or omission in the performance of services under this Agreement, committed or alleged to have been committed by the ENGINEER, its agents, subcontractors, subsidiaries or employees, or any other person or entity for whom the ENGINEER is responsible and to the ENGINEER's responsibility for the negligent acts, errors and omissions of its subcontractors. Such coverage shall be in effect from the date services are first provided under this Agreement and shall be maintained in force until the later of (i) the completion of the ENGINEER's services under this Agreement or (ii) official acceptance of the Project by the OWNER and shall be maintained for an additional period of six (6) years after the later of (i) the completion of the ENGINEER's services under this Agreement or (ii) official acceptance of the Project by the OWNER.

d. Section 5.19 Subcontractors: At the end of the sentence, ADD the following:

"with approval of the OWNER."

3. ARTICLE 6 – DEFINITIONS

6.1.8 Reimbursable Expenses: After the sentence, ADD:

"Reimbursable expenses consist of the following types of anticipated expenses only when directly associated with the project: vehicle rental, insurance and operating costs, field equipment rental or purchase if specifically required by the project, field supplies, field computers, cell phones and pagers - calls and monthly service, office equipment and supplies, travel and mileage specifically associated with the project, postage, printing, office phone charges. All equipment specifically purchased for the project shall become the property of the Town."

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE
20 RIVERSIDE DRIVE, LAKEVILLE, MA 02347 508-946-2700

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

IAN A. BOWLES
Secretary

LAURIE BURT
Commissioner

August 31, 2010

Lee Azinheira, Director
Department of Public Works
6 Park Row
Mansfield, MA 02048

RE: MANSFIELD/FOXBOROUGH/NORTON
Hydrogeological Proposal Approval

Dear Mr. Azinheira:

The draft report titled "Regional Effluent Disposal Alternate Study for Mansfield, Foxborough, and Norton (MFN) / Crane Street and Pine Street Assessments" and dated September 2008, by Camp Dresser & McKee Inc., describes the efforts to date to characterize the Crane Street and Pine Street sites for potential wastewater disposal. The report presents soil boring data, water level data, site characteristics and maps. It also presents groundwater model simulations conducted at various hypothetical wastewater flow rates and the response of the aquifer to these various loads.

The groundwater model simulations predicted significant mounding of groundwater at all simulated discharge rates. All simulations predicted mound heights, which, when applied to the seasonal high groundwater level, were within approximately 2 feet of the ground surface rather than the minimum required 4 feet of vertical separation.

The report also proposes some additional field work that would benefit the further characterization of the sites. The data from activities such as loading tests and a more accurate survey measurement of the topography would improve the accuracy of the model to better predict the vertical separation between the observed groundwater mound and the ground surface. The report is acceptable and the proposals for additional work are also acceptable. Additional water level measurements should be collected. Further characterization of water levels at or near the Town of Norton's water supply Well #1 is recommended to further refine potential interaction of the project with the water supply well. The assessment using particle tracks in the model is also helpful. The Department would like to clarify the position that the 4 foot vertical separation between the simulated groundwater mound, which includes the seasonal high groundwater level adjustment, with the ground surface must be maintained.

This information is available in alternate format. Call Donald M. Gomes, ADA Coordinator at 617-556-1057. TDD# 866-539-7622 or 617-574-6868.

DEP on the World Wide Web: http://www.mass.gov/dep
Printed on Recycled Paper

The Department with its acceptance of the report considers the proposals for additional work as the "scope of work" for the Crane Street and Pine Street sites. The hydrogeologic evaluation for the subject sites must be performed in accordance the Department's guidelines (please see 314 CMR 5.09). At this time a public notice for each site must be placed in the Environmental Monitor. The next step in the permit process is to submit the results of your hydrogeologic evaluation under the permit application "BRP WP 83 Hydrogeologic Evaluation Report".

Very truly yours,

Jonathan E. Hobill
Acting Regional Director
Bureau of Resource Protection

KS/JH/jm
cc: Kermit Studley, DEP-SERO

ec: David Young, CDM
Jeff Gould, DEP-SERO
Stephen Hallem, DEP Boston
Jack Hamm, DEP Boston

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

DEVAL L. PATRICK
Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

February 25, 2014

Mr. Edward C. Sanderson, PE
C D M Smith, Inc.
50 Hampshire Street
Cambridge, Massachusetts 02139

RE: MANSFIELD – Mansfield WWTF;
Approval of Hydrogeologic Evaluation
Scope of Work

Dear Mr. Sanderson:

The Massachusetts Department of Environmental Protection (MassDEP) has completed its review of the hydrogeologic evaluation scope of work prepared and submitted by your office to support a future groundwater discharge application for a proposed effluent infiltration basin for the Proposed Town of Mansfield, Foxborough and Norton Wastewater Treatment facility located in Mansfield, Massachusetts. The final scope of work document was submitted to MassDEP on July 15, 2013 and outlines the tasks that will be completed to assess the soil and groundwater conditions at the proposed discharge location. The document is also to address comments MassDEP provided on August 31, 2010, after reviewing the report entitled "Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane and Pine Street Assessments" prepared by C D M in September 2008. The information gathered during this investigation will be used to determine the suitability of the site for the future discharge of upward of approximately 1.0 MGD of treated sanitary effluent, as may be determined.

MassDEP has determined that the C D M Smith, Inc. submission is complete and hereby approves its scope of work subject to the following comments and recommendations:

- Upon the completion of the activities outlined in the approved scope of work, C D M Smith, Inc. shall prepare and submit a hydrogeologic evaluation report to MassDEP. A MassDEP Transmittal Form and a complete BRPWP 83 application shall accompany the report. The report shall comply with the requirements outlined in the Hydrogeologic Evaluation Report Guidance that accompanies the BRPWP 83 application packet. C D M Smith, Inc. shall contact MassDEP to discuss hydrogeologic report requirements that may not be applicable to this project.

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TDD# 1-866-539-7622 or 1-617-574-6868
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

- C D M Smith, Inc. shall identify the downgradient sensitive receptors that may be impacted by the proposed discharge and assess the current groundwater quality downgradient of the proposed discharge. Additionally, C D M Smith, Inc. shall discuss any anticipated impacts to these downgradient receptors and to overall downgradient groundwater quality.

    - C D M Smith, Inc.'s hydrogeological evaluation report documenting the results of the proposed investigation shall include a surveyed site plan prepared and stamped by a professional engineer. At a minimum the surveyed site plan will identify and document:

        - The locations/footprints of the primary and reserve disposal areas,

        - The locations of all test pits and percolation tests conducted as part of the hydrogeological investigation,

        - The locations and top-of-casing/top-of-PVC elevations of all borings/monitoring wells installed as part of the investigation and of all existing, on-site monitoring wells used in the investigation, and

        - The proposed locations of monitoring wells to be installed as part of the approved groundwater monitoring plan.

      This surveyed site plan, along with an approved maximum daily discharge volume, will be referenced in MassDEP's Site Approval Letter. Any soil absorption system installed at the site shall be constructed within the footprint indicated on the plan and the discharge volume limited to that contained within the Site Approval Letter.

    - A groundwater monitoring well plan capable of identifying and assessing any impacts to groundwater flow and quality resulting from a discharge of effluent at the approved location. Monitoring wells installed as part of the site investigation may be utilized provided they are appropriately located and constructed in accordance with MassDEP's *Standard References for Monitoring Wells.* Additional well locations shall be proposed if needed to monitor impacts to nearby sensitive receptors.

- C D M Smith, Inc. shall notify the Southeast Regional Office at least one week prior to conducting any significant, on-site field work so that a MassDEP representative may be present if necessary.

If you have questions regarding the comments and conditions of this approval, please contact Steve Hallem of our Boston office at 617-292-5681 or David Burns of this office at 508-946-2738.

Sincerely,

Jeffrey E. Gould
Bureau of Resource Protection

G/

Ecc: MassDEP-SERO
Attn: David Burns, BRP
Kermit Studley, BRP

MassDEP-Boston
Attn: Steve Hallem, BRP
Alan Slater, BRP

Cc: Mansfield DPW
6 Park Row
Mansfield, MA 02048
Attn: Lee Azinheira, Director

Mansfield Board of Health
6 Park Row
Mansfield, MA 02048
Attn: Scott Leite, Health Agent

Insert Map Pocket

Executive Summary

Purpose of Evaluation

The Town of Mansfield (the Town) is in the process of evaluating alternatives for disposing of treated wastewater effluent as part of its Phase2 Comprehensive Wastewater Management Plan (CWMP) process and subsequent expansion of the Mansfield Water Pollution Control Facility (WPCF). In the future, these facilities would be owned and operated by the Mansfield-Foxborough-Norton (MFN) Regional Wastewater District, scheduled to become effective in July 2014.

In 2008, CDM Smith completed the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Site Assessments* to evaluate the potential feasibility of these sites for wastewater effluent disposal. Since the 2008 investigation, the Town has purchased the Pine Street property, shown on **Figure 1-1**. Additional site-specific field data collection tasks were conducted at the Pine Street site from August through November 2013. The evaluation of effluent loading impacts using an updated groundwater model was conducted between December 2013 and February 2014. The purpose of this report is to summarize the data collected; discuss the results of the effluent loading analyses conducted; identify a monitoring plan for establishing baseline water quality and determining any impact to water quality as a result of effluent recharge at the Pine Street site; and prepare a preliminary design for effluent recharge of 1.0 million gallons per day (mgd) at the Pine Street site.

Summary of Data Collection

A work plan describing the hydrogeologic field data collection and data evaluation efforts was provided to the Massachusetts Department of Environmental Protection (MassDEP) for review on July 15, 2013 and formal approval was received on February 25, 2014. The following field tasks were completed as part of the hydrogeologic evaluation:

- Install 7 monitoring wells to obtain information on aquifer properties, water level, and water quality.
- Complete geophysical surveying of the upland area of the site to estimate bedrock surface throughout the site.
- Complete aquifer property testing to establish a range of hydraulic properties of the aquifer in the groundwater model.
- Complete topographic surveying to define the ground surface in the groundwater model.
- Measure water levels to calibrate the groundwater model.
- Sample surface water and groundwater to determine whether ponds are nutrient limiting and to establish existing water quality.

- Complete pilot load test to evaluate the loading capacity of the overburden aquifer at the Pine Street site and estimate a loading rate for designing infiltration basins.

Summary of Assessment and Results

The numerical groundwater flow and particle-tracking model that was developed as part of the 2008 effort to evaluate effluent loading at the Pine Street and Crane Street sites was updated based on the site-specific data collected during the 2013 Pine Street field investigation. The model was calibrated based on water level data collected in October through November 2013 and during the pilot loading test. The following significant changes were made to the model:

- The low-permeability layer (that was included in the 2008 model as a result of a layer of silt noted at a monitoring well at the Pine Street site) was removed since none of the continuous soil sample borings at the newly installed monitoring well locations identified this layer. It was determined that this was a localized lens.

- The horizontal and vertical hydraulic conductivity of the high-permeability sand and gravel deposit was increased based on the aquifer testing at MW-104S and substantiated through calibration at the existing and newly installed monitoring wells.

The calibrated model was used to estimate impact to on- and off-site areas as a result of effluent recharge at the Pine Street site plateau area. There are several limiting factors which were investigated because they could potentially limit effluent loading at the site. A scenario of recharging 1.0 mgd over an area of 2.4 acres, which equates to a loading rate of 9.6 gpd/ft^2, was simulated and evaluated for the following potentially limiting factors:

- **Seasonal high water levels** were considered when running predictive simulations. It was estimated that the median seasonal variability could be as much as 4 feet.

- The **separation distance** between the elevated water table after effluent recharge and the ground surface at the recharge site was approximately 11.7 feet. Based on the August 2010 letter from Massachusetts Department of Environmental Protection (MassDEP), a 4-feet separation distance is required. The 11.7-feet separation distance allows for seasonal high fluctuations (4 feet) as well as the 4-feet separation distance.

- **Time-of-travel** to the Town of Norton's municipal well field establishes effluent discharge limits. Based on this effluent recharge scenario, the time of travel from the edge of the effluent loading area to Norton's water supply well Zone II was greater than two years, resulting in over a four year travel time to the well under maximum flow parameters.

- The evaluation of the **surface water quality** data focused on which nutrient, nitrogen or phosphorus, is likely to control undesirable biological growth in the ponds down-gradient of the potential infiltration site. Based on results in Section 2.4.6 Surface Water and Groundwater Quality Sampling, the ponds adjacent to the proposed effluent loading site are phosphorus-limiting and thus, do not pose a deterrent to effluent recharge at the site.

- Water level at the certified **vernal pools** was evaluated to determine the impact of water table rise due to effluent recharge. Based on the simulated water table rise at the vernal pools near the Pine Street site entrance, it is likely that the vernal pools will maintain appropriate seasonal wet and dry conditions. As part of the Monitoring Plan proposed in Section 6, water level monitoring at MW-105, the monitoring well closest to the vernal pools, will provide data to better evaluate seasonal water level fluctuations at the vernal pools and the impact of effluent recharge.

- Presence of a **lower permeability sediment layer** – as indicated above, this layer was not identified at any of the newly installed wells so this layer was not included in the revised model and is not expected to be a limiting factor with regard to effluent recharge.

As indicted by the assessment above, the scenario of loading 1.0 mgd of treated effluent on 2.4 acres achieves the established criteria.

Further evaluations were conducted to determine whether future needs of 1.5 mgd could be accommodated at the Pine Street site. A predictive simulation that applied 1.5 mgd on 4.0 acres of upland area was run. Though the straight application of 1.5 mgd caused water table mounding that yielded less than the required separation, a spatially-targeted, variable application of this same 1.5 mgd did allow for the required separation distance.

Additionally, a preliminary basin design scenario with 1.0 mgd applied on four effluent recharge basins of approximately 0.7 acres each was simulated. There is spacing between the basins for road access and the bottom of the basins is at an elevation of 95.5 feet NAVD88, representing a surface graded approximately 2.5 – 4 feet below existing grade. This predictive simulation estimated a 10-feet separation distance from the highest point of the mounded water table to the bottom of the graded effluent recharge basin, indicating that it is feasible to discharge 1.0 mgd at the Pine Street site and meet minimum separation requirements.

A groundwater monitoring plan which identifies sampling locations and frequencies is provided. The plan also specifies baseline monitoring that would occur prior to effluent recharge and long-term monitoring to be conducted once effluent recharge has commenced.

Section 1
Introduction

1.1 Objectives

The Town of Mansfield (the Town) is working with the Towns of Foxborough and Norton to evaluate effluent recharge sites for use as part of the Mansfield Water Pollution Control Facility (WPCF) expansion. In the future, these facilities would be owned and operated by the Mansfield-Foxborough-Norton (MFN) Regional Wastewater District. Two sites, located in Norton near the WPCF, known as the Reilly Property (Pine Street) and Kok Property (Crane Street) have been procured by Mansfield based on an earlier feasibility study. The objective of this report is to further evaluate and prepare a preliminary design for effluent recharge of 1.0 million gallons per day (mgd) at the Reilly property.

In 2008, CDM Smith completed the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Site Assessments* to evaluate the potential feasibility of these sites for wastewater effluent disposal. Based on the data collected in these initial investigations and resulting analysis, CDM Smith recommended the collection and analysis of additional data at the Crane and Pine Street sites in order to better estimate the effluent loading potential of these sites. In August 2010, the Massachusetts Department of Environmental Protection (MassDEP) sent a letter to the Town accepting the information provided in the 2008 report and approving the recommendation for additional work at the Crane and Pine Street sites, including further data gathering and evaluation of site capacity using groundwater modeling. Specifically, the additional data collection and analyses tasks recommended in the 2008 report and approved by MassDEP in the August 2010 letter include the following:

- Conduct additional hydraulic capacity related field work, including borings in critical data gap areas for further identification and characterization of geologic conditions and geophysical survey to identify bedrock surface.
- Perform a pilot load test for demonstrating actual loading capacities.
- Perform land surface surveying through a combination of aerial and land-based methods to produce more accurate topography for identifying recharge areas and vernal pool elevations.
- Perform surface water quality sampling and evaluate whether the receiving surface water bodies are nitrogen- or phosphorus-limiting.
- Use groundwater model to assess the impact of effluent loading on time-of-travel to the Norton water supply Well #1 and vertical separation between seasonal high groundwater level and ground surface.
- Evaluate ecologic impact to nearby vernal pools as a result of predicted water table rise due to effluent recharge.

The additional site-specific field data collection stated above was conducted at the Pine Street site between August and November 2013. The evaluation of effluent loading impacts using an updated groundwater model was conducted between December 2013 and February 2014. The purpose of this report is to summarize the data collected and the results of the analyses conducted during this most recent evaluation of effluent loading at the Pine Street site and identify feasible loading rates for treated wastewater effluent.

1.2 Description of Pine Street Site

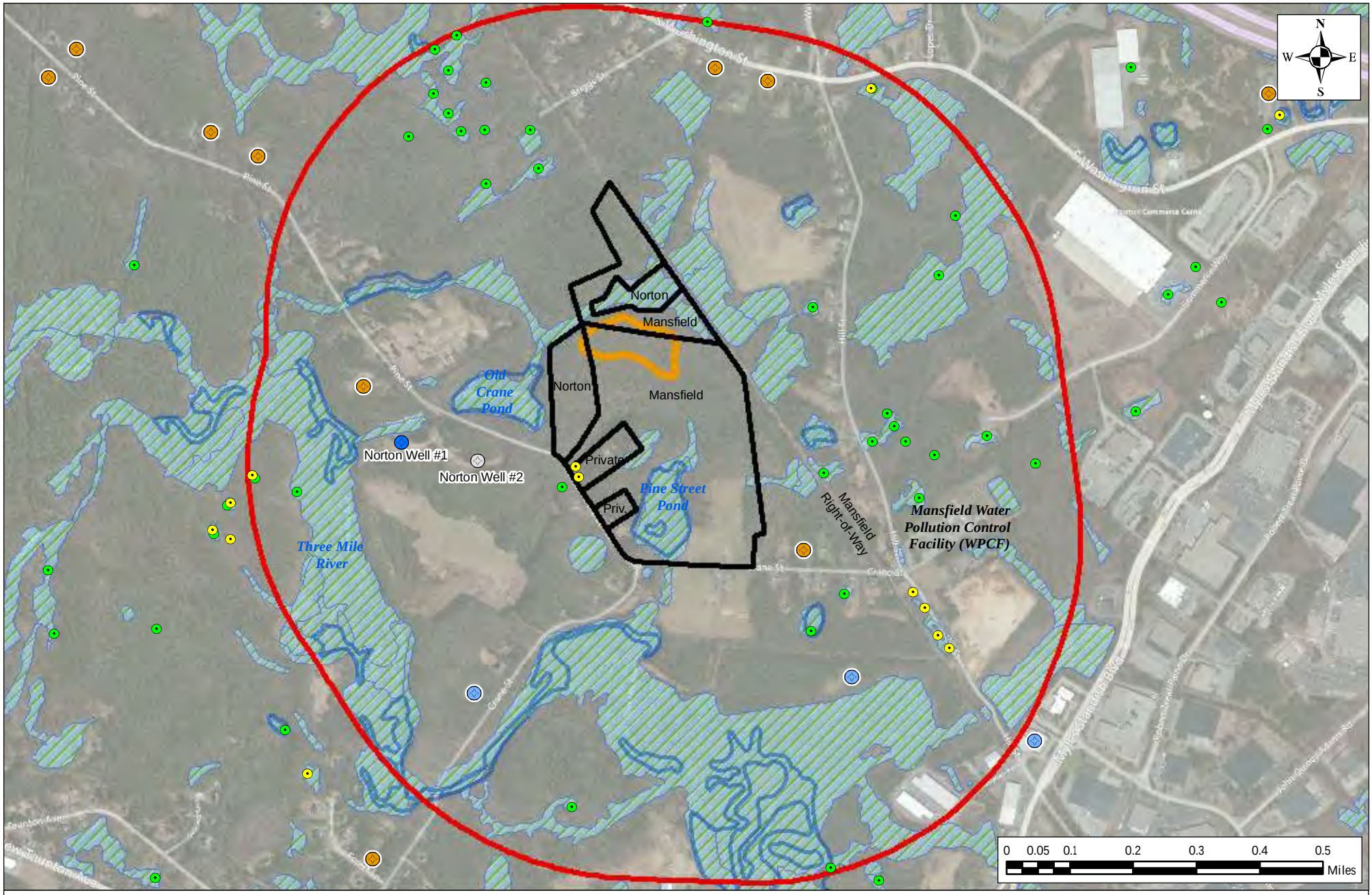
The Pine Street site consists of two Mansfield-owned parcels in Norton, Massachusetts that are currently accessed from the north side of Pine Street. The site encompasses a combined area of approximately 65.6 acres of primarily wooded land and a few unpaved, dirt roads. The main access road to the site and a few other cleared paths wide enough for vehicle access existed at the site prior to the 2013 field data collection effort. The Town improved the conditions of these roads and cleared additional roads to provide safer, easier access to monitoring wells and the pilot test area. The layout of the site, including parcel delineations, the Norton public supply well, private wells within a ½ mile, vernal pools, surface water bodies, and MassDEP delineated wetlands are shown on **Figure 1-1**.

As shown in Figure 1-1, there are two Norton-owned parcels that abut the site to the north and west as well as two privately-owned parcels that abut the southwestern portion of the site. The site has an elevated, flat area in the north central portion of the site which is referred to as the “plateau area” on Figure 1-1. The plateau area is of particular interest since the greater overburden thickness in this area will allow for greater effluent loading capacity.

Encompassing the northern portion of the site is a system of wetlands. These wetlands drain to the west - southwest through Old Crane Pond and other wetlands to the Three Mile River. The Pine Street Pond is in the southern portion of the site, located near the junction of Pine Street and Crane Street. This pond has an outlet tributary that flows generally south/southwest into the Three Mile River. In addition to the ponds and wetlands in this area, there are two vernal pools that have been certified by the Natural Heritage and Endangered Species Program (NHESP). These vernal pools are on the south side of the Pine Street site access road within a privately-owned parcel.

The right of way (ROW) for the wastewater interceptor line to the Mansfield Water Pollution Control Facility (WPCF), which runs along an abandoned railroad line, is at the northeast boundary of the site. The Mansfield WPCF, located at the junction of Hill and Crane Streets in Norton, Massachusetts, is within 0.6 miles from the Pine Street site access road. This close proximity to the WPCF and an existing ROW to the WPCF renders the Pine Street site as a favorable location.

To the west of the site, across Pine Street are two municipal water supply wells (Well #1 and Well #2) for the Town of Norton. Currently, only Well #1 is operated for water supply purposes. According to a January 1996 report on Norton Well #1 Zone II Delineation, Well #2 is no longer in service due to water quality problems (Dufresne-Henry, 1996). Based on guidance from Norton representatives, Well #2 will be abandoned. Both supply wells are shown on Figure 1-1. It should be noted that the Pine Street site is wholly outside the Zone II Area delineated for Well #1.



LEGEND

- Active Well - Norton Public Water Supply Well #1
- Off Line Well - Norton Well #2
- Private Potable Wells
- Private Non-Potable Wells
- NHESP Certified Vernal Pools
- Potential Vernal Pools
- 0.5 Mile Buffer
- Plateau Area
- Surface Water
- DEP Wetlands
- Parcel Boundaries

CDM Smith

Site Map
Pine Street in Norton, MA

Figure
1-1

1.3 Overview of Approach and Report Organization

A work plan describing the hydrogeologic field data collection and data evaluation efforts was provided to MassDEP for review on July 15, 2013 and formal approval was received on February 25, 2014. The tasks completed as part of the hydrogeologic evaluation are described below with the report sections that discuss the outcome of these tasks indicated in parentheses:

- Compile existing data describing the Pine Street site **(Section 2.3)**.
- Collect new site-specific data between August and November 2013 through the following investigations **(Section 2.4)**:
  - Install monitoring wells;
  - Complete geophysical surveying of the plateau area to estimate bedrock surface throughout the site;
  - Complete aquifer property testing;
  - Complete topographic surveying;
  - Measure water levels;
  - Sample surface water and groundwater to monitor quality; and
  - Complete pilot load test to establish a recharge rate.
- Update the numerical groundwater model based on site-specific data **(Section 3)**.
- Assess the feasible loading rates for the treated effluent based on available land area for the loading, the maximum allowable rise of the water table, and potentially limiting factors. Develop a preliminary design layout scenario to infiltrate effluent from the Mansfield WPCF within the confines of site limiting factors **(Section 4)**.
- Summarize the data that was collected and findings of the 2013/2014 investigation and recommend preliminary design loading rates, taking into account impact to vernal pools, time-of-travel to water supply well, water table rise at residences, and clearance to water table below the basins. There are also recommendations focusing on the positioning and layout of the infiltration basins and targeted operational considerations **(Section 5)**.
- Develop a groundwater monitoring plan which identifies sampling locations, and which also specifies baseline monitoring that would occur prior to effluent recharge, and long-term monitoring to be conducted once effluent recharge has commenced **(Section 6)**.

Section 2

Data Collection and Evaluation

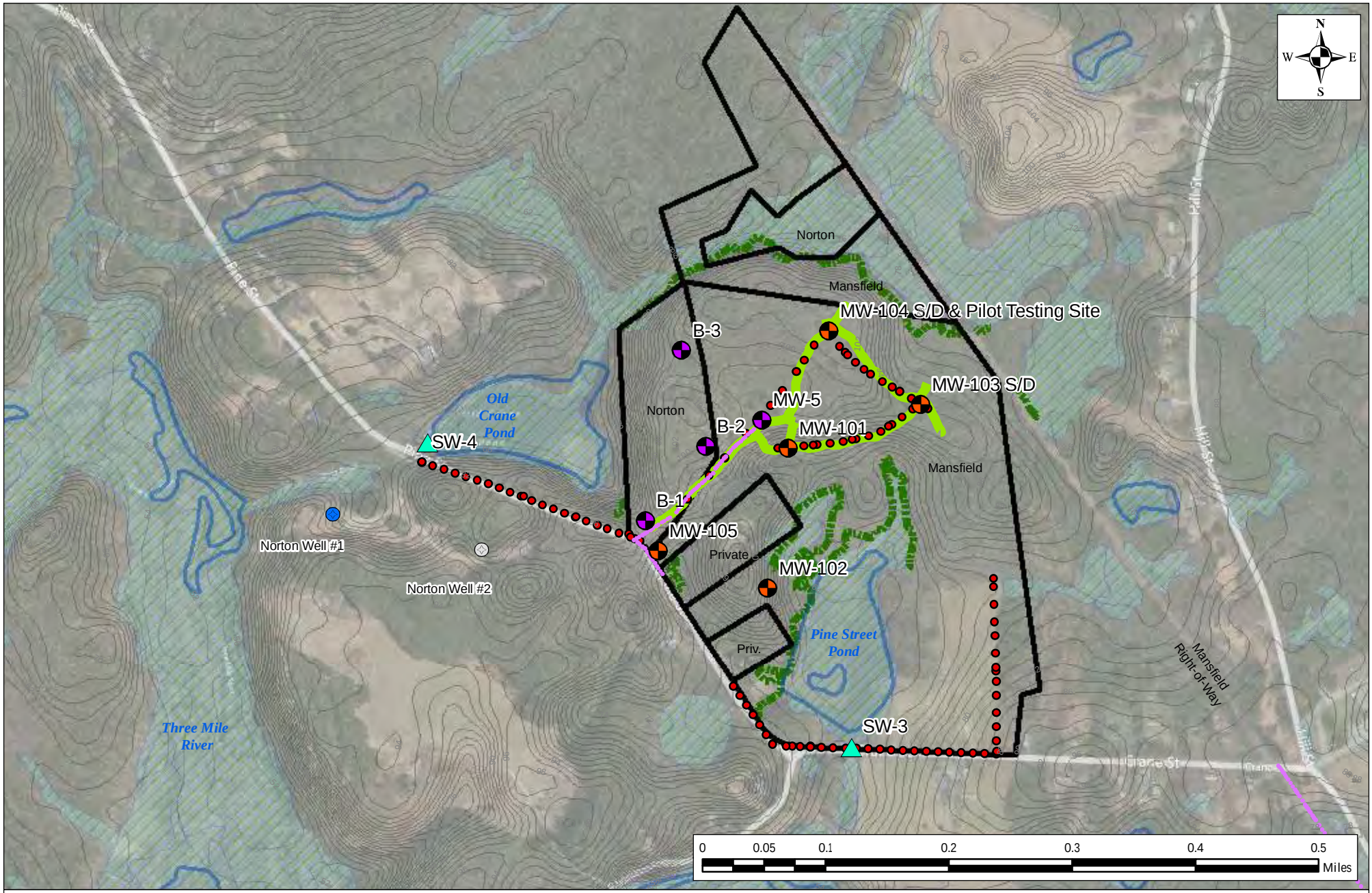
2.1 Overview of Data Collection and Evaluation

This section provides a summary of current and past data collection and evaluation at the Pine Street site. Specifically, Section 2.2 describes the foundational development of a conceptual hydrogeological model, initially developed as part of the CWMP process. Section 2.3 describes the information and data collected during previous efforts and provides a summary of the evaluation efforts, including analytical and numerical modeling. Section 2.4 describes the field tasks conducted in the fall of 2013. This new site-specific data supplemented the prior site-specific data and together were used to update the numerical groundwater model to evaluate the impact of effluent loading rates. The monitoring wells, geophysical survey, and surface water sampling locations established from prior studies and the 2013 field investigation are shown in **Figure 2-1**.

2.2 Conceptual Model Development

A conceptual hydrogeological model that included the Pine Street site was first developed during the 2006 Phase 2 CWMP investigations, primarily based on regional reports and information on the water supply wells from Norton. The conceptual model incorporated an overall understanding of the groundwater flow regime, taking into account geology, hydrogeology and hydraulic properties of the subsurface deposits, anthropogenic stresses to the system, and the water balance. The following list describes each component of the conceptual model and the specific information sources that were used as the basis for developing the model. The model continues to serve as the foundation for the site-specific modeling, including the most recent efforts.

- Topography - Ground surface elevation was initially defined by a Massachusetts Geographic Information System (MassGIS) Digital Terrain Model (DTM) with a National Map Accuracy Standard of + or – 1.5 meters. Ground surface was adjusted based on survey data.
- Surficial and Bedrock Geology - During previous investigations, regional bedrock depths were generalized based on a report by Williams and Wiley published by the United States Geological Survey (USGS) for the Taunton River Watershed (Williams and Wiley, 1973). The bedrock data in this USGS publication were given as a regional mapping of aquifer thickness. This aquifer thickness data was used in conjunction with the ground surface elevation to estimate the regional bedrock surface elevation.
- Hydrology – Based on the USGS and the Massachusetts Water Resources Commission delineation of watersheds using hydrologic unit code with ten digit identification (HUC10), the site is within the Three Mile River Watershed. Old Crane Pond, which is immediately adjacent to the northwest portion of the Pine Street site, is located up-gradient of the Norton water supply Well #1. Wetlands and marshes in the northern section of the site feed a tributary, which drains westward into Old Crane Pond. Old Crane Pond has an outlet that flows southwest towards the Wading River. A second perennial pond, labeled the Pine Street Pond, is located at the junction of Pine and Crane Streets. This pond has an outlet tributary that flows south/southwesterly into the Three Mile River.



2013 New Groundwater Monitoring Well
2013 New Ground Penetrating Radar
2013 Seismic Refraction Transects
Existing Groundwater Observations
Existing Surface Water Observations
Existing Ground Penetrating Radar Transect
Surveyed Wetland Boundary
Elevation Contours (ft)
Active Well - Norton Public Water Supply Well #1
Off Line Well - Norton Well #2
Parcel Boundaries
Surface Water
DEP Wetlands

CDM Smith

Field Observations
Pine Street in Norton, MA

Figure
2-1

2.3 Summary of Previous Site-Specific Investigations

This section summarizes past data collection efforts, which formed the basis of groundwater flow model development and calibration, and subsequent performance of predictive simulations. The modeling efforts provided estimates of feasible loading rates and associated impacts due to simulated effluent infiltration at the Pine Street site.

2.3.1 Initial Phase 2 CWMP Investigations (2004 – 2007)

A significant amount of data was identified and compiled for the initial Phase 2 CWMP investigations. The information that was compiled is related to geologic materials, soils, groundwater levels, ground surface elevations, and groundwater flow patterns. The mapping also provided information for assessing the proximity of the site to wetlands, streams, and ponds that could be impacted by effluent loading.

Information and reports were obtained from the USGS, the Natural Resources Conservation Service (NRCS), the National Climate Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA), MassDEP, MassGIS, and the Massachusetts Department of Transportation (MassDOT). Additional, site-specific data and reports were obtained from Mansfield and Norton.

Information was obtained by contacting personnel from these organizations, visiting their websites, and/or by performing a literature search. The information and data sources are summarized as follows:

- Long-term groundwater levels and trends from certain USGS observation wells were obtained to help define seasonal high water table elevations (USGS, 2005).
- Soil boring information was obtained from reports provided by Norton for its nearby well field and the parcel it owns adjacent to the effluent loading site (Vaidya, 2004). This information was developed in support of Norton's CWMP (Weston & Sampson, 2005), which considered the Pine Street site as one alternative location for treated wastewater disposal.
- Aerial photos were obtained from online sources (MassGIS website).
- Norton provided reports on water supply well rehabilitation work and Zone II studies mapping for the supply wells (Dufresne-Henry, 1996).
- Stream flow data from the USGS for estimating groundwater recharge rates (USGS, 2007).
- Drought index values from NOAA and the Drought Mitigation Center (at the University of Nebraska at Lincoln, funded by NOAA), for evaluating climatic conditions when groundwater levels were measured and helping assess high water table elevations (NOAA, 2005).

During the initial Phase 2 CWMP studies for Norton (Weston & Sampson, 2005) and Mansfield (CDM, 2006 and CDM, 2007), which were aimed at evaluating potential treated effluent loading sites, limited field data collection programs were conducted at the Pine Street site. The fieldwork consisted of the following:

- Advancing borings (B-1, B-2, and B-3) in the locations shown on Figure 2-1 on the municipal land owned by Norton and taking water level measurements at these wells (Vaidya, 2004). This work was also performed in support of Norton's CWMP (Weston & Sampson, 2005).

- Sampling surface water bodies for water quality data at locations in the vicinity of the Pine Street site. The samples were laboratory-tested for nutrients (total phosphorus, total Kjeldahl nitrogen, nitrite, nitrate, ammonia) and chlorophyll *a*. Field parameter measurements were also performed, for temperature, pH, and dissolved oxygen (PEER, 2005).

In addition to these sets of data, CDM Smith (2007) conducted preliminary groundwater flow modeling of the Pine Street site area, for predicting the feasible effluent loading rate at the site, and for estimating the potential time-of-travel from the edge of the loading area to the nearby municipal well field operated by the Town of Norton. This study involved the development and application of a two-dimensional groundwater model that used the hydraulic properties from the well field to represent the entire modeled area. The 2007 assessment indicated a maximum attainable effluent loading rate of 1.9 to 4.2 mgd and a time-of-travel that was longer than the two-year State-specified criterion. The modeling predictions were based on relatively high estimates of hydraulic capacity, and therefore the study recommended obtaining site-specific hydraulic property and geologic layering data, especially due to the presence of a 1-inch and 2-inch layer, or lens, of silt at borings B-1 and B-2, respectively.

2.3.2 Supplemental Phase 2 CWMP Investigations (May 2008 - July 2008)

As part of the *Regional Effluent Disposal Alternative Study for Mansfield, Foxborough, and Norton (MFN): Crane Street and Pine Street Site Assessments* completed by CDM Smith in 2008, the following data was gathered:

- Boring logs along the railroad ROW and the outfall interceptor line (CDM, April 1980);

- Boring logs at the Mansfield WCPF, which were advanced during the upgrade of the facility (CDM, July 1980); and,

- Boring logs for private water supply wells at or near sites of concern (Northeast Water Wells, 2007).

The data from these borings were used to update the conceptual model of the area and to help guide the planning of the detailed field data-collection work plan for the 2008 fieldwork.

In May 2008, a field program was developed and approved by MassDEP, and then initiated at the Pine Street and Crane Street sites. Access to perform on-site field explorations at both privately-owned parcels was granted by each of the owners. The list below summarizes the field investigations that were conducted by CDM Smith.

- Installation of one groundwater monitoring well (MW-5 is shown on **Figure 2-1**) at the Pine Street site and four groundwater monitoring wells at the Crane Street site to collect site-specific information on depth to bedrock, water levels, and subsurface materials;

- A geophysical survey at the Crane and Pine Street sites to map the bedrock surface;

- Aquifer property testing (slug tests) at the five groundwater monitoring wells to serve as aquifer property estimates in the 3-dimensional groundwater flow model;
- Grain size analysis on composite soil samples taken over the screen interval from each boring in order to characterize the soil type associated with each well;
- Water level measurements at the five monitoring wells, four surface water locations, and 1 staff gauge installed in the wetlands in the southern portion of the Crane Street site. The water level data were used to calibrate the 3-dimensional groundwater flow model;
- Double-ring infiltrometer testing and soil evaluations to assess three specific areas within the Pine Street and Crane Street sites to evaluate the effluent loading potential of these sites;
- Hutchins-Trowbridge & Associates Inc. surveyed water level measuring points at each of the newly-installed monitoring well and surface water monitoring locations, as well as the ground surface along the GPR transects.

The 2008 field data collection activities provided the basis for development of a numerical groundwater flow and particle-tracking model covering each of the two sites and surrounding areas. The flow model was calibrated to the measured site-specific groundwater and surface levels, and then used to evaluate the potential impacts of treated wastewater infiltration. Several scenarios were tested via predictive simulations, with each scenario's simulated infiltration area designated for the full extent of higher-elevation portions of each site. Maximum total loading rates were simulated, using State-required depth-to-water as the constraint; particle-tracking simulations were performed for visualizing the fastest travel-times to groundwater discharge locations, including the Norton well field at the Pine Street site; discharge rates to adjacent surface water bodies were simulated for helping evaluate potential surface water quality impacts; and, water table rise at vernal pools and residential properties was also simulated, to help ensure no significant impact to such resources.

The 2008 predictive simulations demonstrated that a target 1.5 mgd would not be achieved by one site alone, and therefore the model was used to simulate both sites running simultaneously. The final predictive simulations indicated that the Pine Street site could accept an effluent loading rate ranging from 0.7 to 0.9 mgd, and the modeling showed that the Crane Street site could support an additional 0.3 to 0.6 mgd. Thus, the modeling predicted that a total effluent loading rate of 1.0 to 1.5 mgd could be supported by the two land recharge sites working together.

The lower estimated effluent loading rates, compared to the results of the 2007 study, are primarily due to the site-specific data at the Pine Street site, which indicated a significantly lower transmissivity in the plateau area than estimated during the 2007 investigation. As a result, assumptions made during prior evaluations of the Pine Street site were adjusted in the 2008 report based on a potentially limiting low-permeability layer. This resulted in the lower effluent loading rate of 0.7 to 0.9 mgd.

2.4 Field Data Collection during Fall 2013

From August through November 2013 the following field tasks were completed:

- Installation of monitoring wells
- Geophysical surveying
- Aquifer property testing – slug tests
- Topographic surveying
- Water level measurements
- Surface water and groundwater quality sampling
- Pilot load test

Sections 2.4.1 through 2.4.7 describe each of the field data-collection tasks in detail. **Figure 2-1** shows the locations field observations including newly installed groundwater monitoring wells, ground penetrating radar transects, seismic refraction transects, existing groundwater and surface water observation locations, surveyed wetland boundaries, and approximate elevation contours.

2.4.1 Installation of Monitoring Wells

During late September and October 2013, five shallow and two deep overburden groundwater monitoring wells were installed and developed by Soil Exploration, Inc., who served as a subcontractor to CDM Smith. CDM Smith conducted oversight of the groundwater monitoring well installations and well development.

In general, the monitoring wells were installed to provide:

- Information on subsurface materials;
- Water table elevation data to estimate groundwater flow direction;
- An estimate of horizontal hydraulic conductivity through aquifer testing methods;
- Groundwater response data during the pilot load test; and
- Existing groundwater quality at the site.

The monitoring well locations, including those installed during previous field investigations, are shown on **Figure 2-1**. Below is a brief description of the purpose for each newly installed monitoring well location:

- MW-101: This well location provides a groundwater monitoring point near the private property closest to the pilot testing site.

- MW-102: This well location provides a groundwater monitor point near the other private property further south, which also abuts the Pine Street site.
- MW-103S/D: This well couplet provides shallow and deep groundwater monitoring points on the eastern side of the site. MW-103D was drilled to bedrock to provide additional data on the bedrock surface and to serve as an extra ground-truthing point for the geophysical survey. This location was also chosen to serve as an alternate site for the pilot load test if the site near MW-104S/D did not successfully show capacity for infiltration.
- MW-104S/D: This well couplet was installed at the top of the plateau area less than 10 feet from the pilot testing site to provide shallow and deep water table aquifer response in the overburden adjacent to the pilot load test. MW-104D was drilled to the bedrock surface.
- MW-105 – This well provides a groundwater monitoring point near the Norton water supply well and vernal pools.

Drilling methods used during borehole advancement included hollow stem auger and drive and wash drilling. At monitoring well locations, MW-103D and MW-104D, the borings were advanced into bedrock using drive and wash drilling methods to confirm depth to bedrock at these locations. At each monitoring well location, split spoon samples of overburden deposits were extracted continuously to 10 feet below the water table and were collected every 5 feet thereafter until refusal was encountered. During borehole advancement at each well location, standard penetration results (i.e. blow counts) were recorded. Split spoon samples were logged and geologic sediment samples were collected from each sample interval.

It should be noted that no low-permeability silt layer was encountered at any of the borings that were advanced to install the new monitoring wells. This indicates that the silt layer, observed at B-1, B-2, and MW-5 during previous investigations, is spatially limited in extent. Based on this finding, this confining layer was removed from the groundwater model for calibration and predictive simulations in the current report. Groundwater model updates based on this finding are discussed in Section 3.3.

The overburden materials encountered during borehole advancement appear to be consistent across the site and are summarized in **Table 2-1**. The shallow overburden consists of a coarse to fine sand ranging from 24 feet thick at MW-105 to 42 feet thick at MW-104S/D. Coarser materials were observed at MW-104S/D and MW-102 when compared to the shallow overburden materials at the other three locations. At all of the new monitoring well locations, except MW-102, finer sand and varying degrees of silt underlie the coarse sand in the middle overburden. This finer sand was logged to the bottom of the three shallow borings (MW-101, MW-102, and MW-105). At the two deep borings, MW-103D and MW-104D, which were advanced to bedrock, till was encountered in the deep overburden, with 7 feet of till at MW-103D and 18 feet of till at MW-104D. The bedrock encountered at the deep borings appeared to be shale.

Table 2-1: Boring Log Summary

	Ground Elevation (ft above MSL)	Total Depth of Boring (ft)	Thickness of Coarse to Fine Sand **Shallow Overburden** (ft)	Thickness of Finer Sand **Middle Overburden** (ft)	Thickness of Till **Deep Overburden** (ft)	Bedrock Depth (ft)	Bedrock Elevation (ft above MSL)
MW-101	87.8	41	30	11	NE	NE	NE
MW-102	76.4	35	35	NE	NE	NE	NE
MW-103D	88.0	53	34	12	7	53	35.0
MW-104D	100.7	90	42	28	18	88	12.7
MW-105	78.6	41	24	17	NE	NE	NE
MW-5*	98.5	100	94	NE	NE	94	4.5

*MW-5 is an existing boring drilled in 2008.

NE - Not encountered at this boring location

Bedrock elevations at wells MW-103D (35.0 ft MSL), MW-104D (12.7 ft MSL), and MW-5 (4.5 ft MSL) indicate that the bedrock is tipping to the west. This is consistent with the findings of the geophysical survey which is discussed in the next section.

Monitoring wells MW-101, MW-103S, MW-104S, and MW-105 were installed in the shallow overburden, screened directly below the water table in the coarse to fine sand unit. Monitoring well MW-104D was screened in the deep till formation and monitoring well MW-103D was screened above the till formation in the fine sand and silt unit. All wells were constructed with a 2-inch diameter schedule 40 PVC riser and a 5 to 10-foot long, 0.01" slot schedule 40 PVC well screen. The annular space around each overburden well screen was backfilled with sand two feet above the screen, two feet of bentonite above the sand, native backfill to 2 feet below ground surface, and sealed with concrete from 2 feet below ground surface to the surface. Each well is protected with a locking 4-inch protective steel casing that sticks up 2 to3 feet above the ground surface. **Appendix A** provides a table summarizing the well construction information and soil boring characteristics. The appendix also contains monitoring well construction logs.

2.4.2 Geophysical Surveying

On November 4 through 11, 2013 Hager Geosciences, Inc. (HGI) performed a geophysical survey of the study area to primarily estimate bedrock surface and potentially locate water table depths as well as the presence of a potentially confining layers. HGI submitted the final report to CDM Smith in December 2013, which is included in **Appendix B**. The report discusses the seismic refraction and ground penetrating radar (GPR) methods used to obtain the data and the limitations of these geophysical methods. Plate 1 in **Appendix B** shows the seismic and GRP survey lines. Seismic refraction data was collected along six lines (Line 100 – Line 600) on the Pine Street site, with two of the lines located directly within the Pine Street ROW. GPR data were collected along two sections of Pine Street with overlap on seismic lines L200 and L300.

The results of the geophysical surveying and interpretative modeling showed that bedrock elevations range between approximately 60 and -45 feet referenced to the National Vertical Datum of 1988 (NAVD88). The highest bedrock elevation occurs in area of the open field in the southeastern portion of the site, where bedrock is estimated to be approximately 25 feet below ground surface. The bedrock trend shows an apparent increase in elevation towards the east and a decrease in elevation towards the west. The lowest bedrock elevation was estimated to be near surface water location, SW-4 (shown on **Figure 2-1**), by Old Crane Pond along Pine Street where bedrock is estimated to be approximately 110 feet below ground surface. This indicates that the bedrock dips to a lower elevation in the area of the Norton water supply well. The seismic and GPR methods indicate a high degree of bedrock weathering throughout the site and neither of these two methods indicates the presence of a subsurface clay/silt layer. The geophysical data confirmed that the bedrock in the existing 3-dimensional groundwater flow model is accurately depicted.

2.4.3 Aquifer Property Testing – Slug Testing

On October 10, 2013, CDM Smith conducted slug testing at newly installed monitoring wells MW-101, MW-102, MW-103S, MW-103D, MW-104S, MW-104D, and MW-105. The slug testing was conducted to estimate horizontal hydraulic conductivity in the surrounding formation adjacent to each of those monitoring wells. The slug testing results were primarily used as guidelines for establishing hydraulic conductivity values for aquifer materials in the groundwater model.

Horizontal hydraulic conductivity of the overburden material may be measured through falling head and rising head slug tests performed in groundwater monitoring wells. In the falling head test, a large PVC slug is dropped into a well to temporarily elevate the water level; over time, the water level falls back to the initial static level. Measuring these changes in water level over time allows an estimate of flow velocity through the well screen. The rising head test uses a similar procedure to evaluate flow velocity, except that the slug is instead quickly removed from the well, causing the water level to drop suddenly below the initial static level. Measuring the rate at which the water level rises or falls is used to estimate the horizontal hydraulic conductivity. The data was analyzed using a software package for aquifer test data plotting and evaluation, AQTESOLV™, which applies the Bouwer and Rice method to calculate horizontal hydraulic conductivity.

The horizontal hydraulic conductivity values estimated from falling and rising head tests of the shallow overburden wells MW-102 and MW-104S ranged from 70 to 100 feet per day, which is consistent with representative values of hydraulic conductivity of coarse to medium sand deposits. When compared to the initial 2008 hydraulic estimates, this higher hydraulic conductivity, estimated based on the 2013 slug testing, was the basis for increasing the horizontal hydraulic conductivity in the groundwater model. This update to the model will be discussed in Section 3.

The horizontal hydraulic conductivity values from falling and rising head tests of the remaining shallow overburden wells MW-101, MW-103S, and MW-105 ranged from 5 to 20 feet per day, which is consistent with medium to fine sand deposits. The horizontal hydraulic conductivity values from the falling and rising head tests at deep overburden well MW-103D ranged from 1 to 3 feet per day, which is consistent with representative values of hydraulic conductivity of fine sand-silt deposits. The horizontal hydraulic conductivity values from the falling and rising head tests at deep overburden well MW-104D ranged from 0.1 to 0.3 feet per day, which is consistent with representative values of hydraulic conductivity for till deposits.

The measured data downloaded from the In-Situ Troll data logger, AQTESOLV analytical screens, and calculations of hydraulic conductivity from rising and falling head tests are provided in **Appendix C**.

2.4.4 Topographic Surveying

Surveying and Mapping Consultants, Inc. (SMC) was subcontracted by the Town to coordinate and compile topographic data collected through photogrammetric mapping and land surveying. The topographic data were provided as digital data files that were compatible with AutoCAD Land Development Desktop - compatible files that cover approximately 50 acres at a scale of 1-inch to 40-feet with a 1-foot contour interval.

As part of this surveying effort, a topographic and monitoring well location survey was conducted to provide an accurate ground surface for:

- Water level readings used for the calibration of the groundwater model;
- Defining slopes and depressions in potential recharge areas that are used for evaluating effluent recharge scenarios; and
- Use by HGI in performing modeling of the geophysical survey data, for estimating elevations of changes in stratigraphic characteristics.

SMC surveyed water level measuring points at each of the newly-installed monitoring well and surface water monitoring locations, as well as the ground surface along the GPR and seismic transects in November 2013. Surveys were performed in a relative coordinate system before being converted to a horizontal datum of North American Datum (NAD) 1983 State Plane Massachusetts Mainland (feet) and a vertical datum of NAVD88 (feet).

2.4.5 Water Level Measurements

Water level was measured at groundwater monitoring well locations using manual and automated methods. The measurements were used to monitor the influence of the pilot load test on the water table, provide background groundwater elevation data for helping define static, pre-test and uninfluenced groundwater level and flow patterns, and for serving as target water levels for groundwater flow model steady-state calibration. Surface water levels were measured manually at pond outlet structures to provide fixed head elevations at the ponds for the groundwater model. Details regarding the model development and calibration are discussed in Section 3**.**

On October 10, 2013, pressure transducers were installed in the seven newly installed monitoring wells (MW-101 through MW-105) and one existing monitoring well (MW-5) that was installed in 2008 to record water level measurements every 30 minutes to provide background groundwater elevation conditions prior to the pilot load test started on October 21, 2013. Prior to the start of the pilot load test, on October 21, 2013, the pressure transducers in the wells were re-programmed to record water level measurements every 5 minutes to provide groundwater response data during the pilot load test. These automated water level measurements were used to calibrate the transient groundwater model simulations.

Manual water level measurements were taken between October 10 and November 8, 2013 at the seven newly installed wells, one existing well, and two surface water locations (SW-3 and SW-4). The water level measurements taken on November 8, 2013 also included the B-series wells which were installed in 2004 as part of a CWMP study for the Town of Norton.

Monitoring well and surface water measuring points are shown on **Figure 2-1.** The water level data, measured using a pressure transducer and downloaded from the In-Situ Troll data logger, are shown in **Appendix D**. The manually measured water level readings at groundwater and surface water locations are shown in **Table 2-2.**

Table 2-2 Groundwater and Surface Water Elevation Measurements in 2013 (NAVD 88)

Monitoring Point	October 8, 2013	October 9, 2013	October 10, 2013	October 21, 2013	October 22, 2013	October 23, 2013	October 29, 2013	November 8, 2013
MW-101	NM	67.4	67.4	67.3	67.3	67.3	NM	67.2
MW-102	NM	63.8	63.8	63.7	NM	63.7	NM	63.6
MW-103S	NM	69.9	69.9	69.8	69.8	69.8	NM	69.7
MW-103D	70.1	NM	69.9	69.9	69.9	69.9	NM	69.8
MW-104S	68.6	NM	68.6	68.6	68.7	68.6	68.9	68.5
MW-104D	NM	NM	68.6	68.7	68.7	68.7	68.9	68.6
MW-105	NM	63.6	63.6	63.4	NM	63.4	NM	63.3
B-1	NM	NM	NM	NM	NM	NM	NM	63.6
B-2	NM	NM	NM	NM	NM	NM	NM	66.4
B-3	NM	NM	NM	NM	NM	NM	NM	67.0
MW-5	NM	NM	67.4	67.5	67.5	67.5	NM	67.5
SW-3	NM	NM	NM	NM	NM	61.6	61.6	NM
SW-4	NM	NM	NM	NM	NM	64.6	64.6	NM

NAVD88: North American Vertical Datum of 1988
NM: not measured
MW: monitoring well
S: shallow
D: deep
SW: surface water

2.4.6 Surface Water and Groundwater Quality Sampling

Surface water quality sampling was conducted by CDM Smith at Old Crane Pond and Pine Street Pond on a monthly basis from August through October 2013 to establish background water quality conditions and assess nitrogen or phosphate-limiting conditions of these ponds that are down-gradient of the potential infiltration site. Groundwater quality sampling was conducted by CDM Smith at the seven newly installed monitoring wells in October 2013 to establish background groundwater quality conditions.

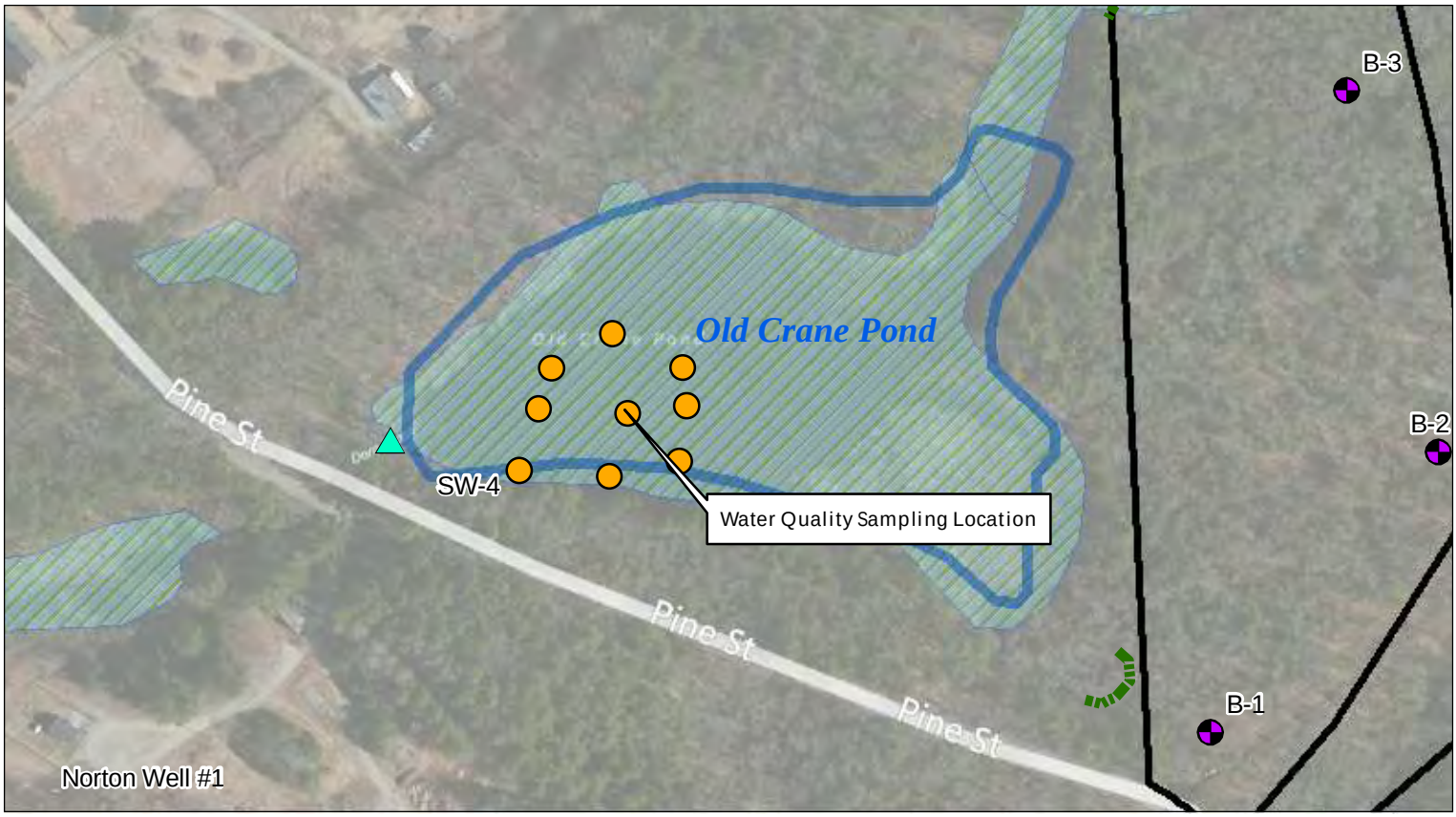
On August 29, 2013 during the first surface water sampling round, CDM Smith conducted traverses of Old Crane Pond and Pine Street Pond with a canoe and water level meter to measure pond depths and to identify the location with the maximum measured depth in each pond. The water quality samples were taken at the deepest location in each pond at various elevations so a shallow and deep sample could be collected to discern if the pond is stratified. Once these locations were identified during the first round in August 2013, a GPS unit was used so samples could be taken from the same location each subsequent round.

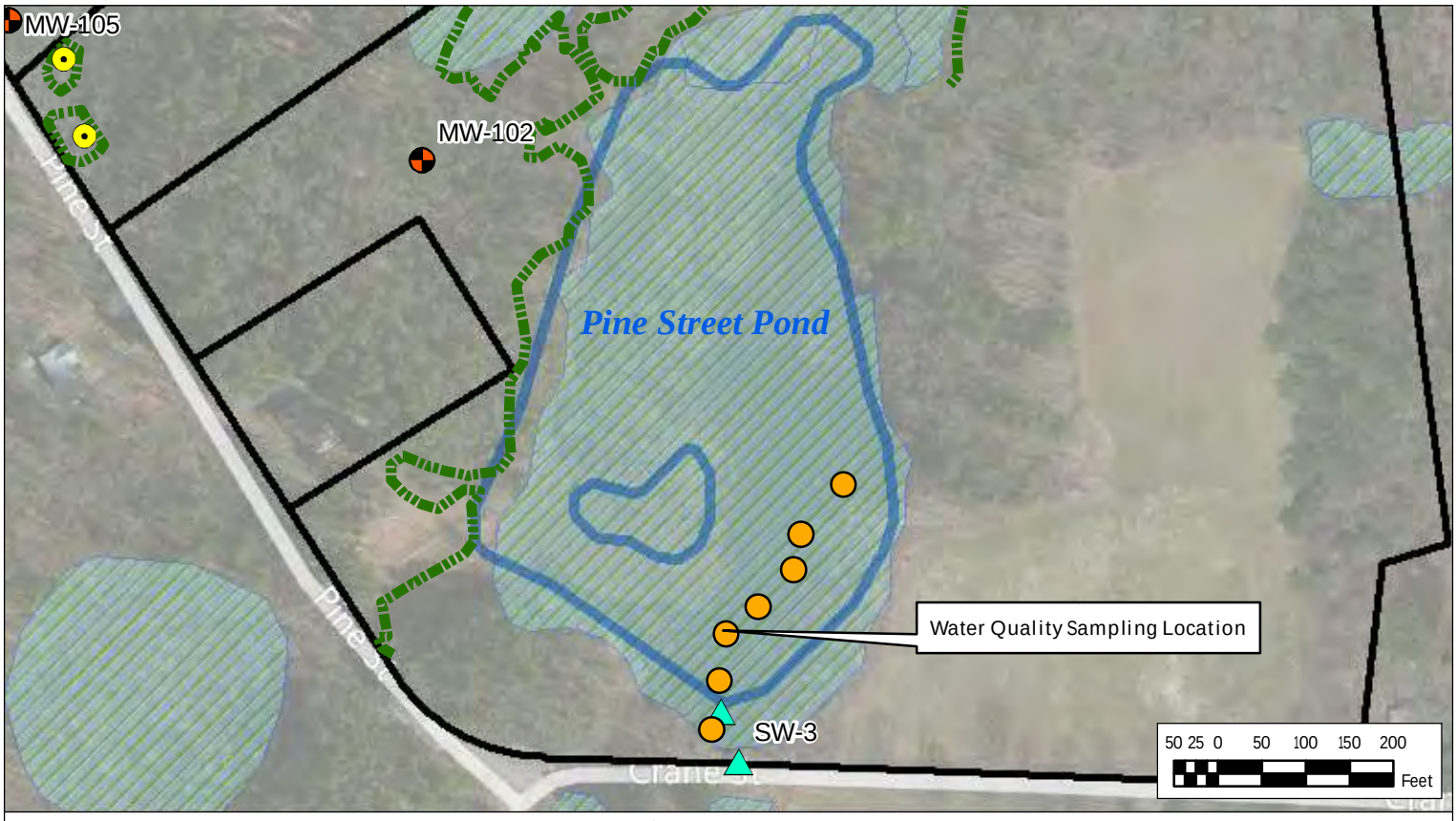
Heavy vegetation growth at Old Crane Pond was mostly around the outer edge of the pond. Field personnel were able to conduct three traverses and collect pond depth measurements at ten locations throughout the pond. The three monthly surface water quality samples were collected from the maximum pond depth location, which measured 4.57 feet below pond surface (BPS). At the Pine Street Pond, bottom of pond depths were determined at five locations across one traverse. Due to the shallow pond depth and vegetation growing throughout Pine Street Pond, only one traverse was completed. The three monthly surface water quality samples were collected from the maximum pond depth location, which measured 3.5 feet BPS.

A shallow and deep sample was collected monthly from each pond using a Van–Dorn surface water sampler. The shallow sample was collected 2 feet BPS and the deep sample was taken approximately one half-foot above the bottom of the pond at the deepest location identified during the pond traverses. At Old Crane Pond, potential sampling locations were limited to the southwestern portion of the pond due to shallow depth heavy vegetative growth in the rest of the pond. For the same reason, , potential sampling locations at Pine Street Pond were limited to the southeastern portion of the pond. **Figure 2-2** shows locations along traverses where pond depth readings were taken and the two surface water sampling locations where a shallow and deep sample was taken.

The samples were submitted to the University of Massachusetts-Dartmouth School of Marine Science and Technology (SMAST) laboratory in New Bedford, Massachusetts, which analyzed the samples for chlorophyll-A, nutrients, and boron.

Dissolved parameters were collected with a 0.45 micron filter. In addition to the parameters above, temperature, specific conductivity, conductivity, salinity, dissolved oxygen, pH, and, oxygen reduction potential were measured at the time of the shallow and deep sample collection by slowly lowering a multi-parameter probe into the pond. Surface water clarity observations were also measured and recorded via Secchi disk and visual description. Surface water quality results from the SMAST lab and measurements taken in the field are presented in **Appendix E. Table 2-3** summarizes the surface water and groundwater quality results received from the lab.





LEGEND

- Pond Depth Measurement Locations
- 2013 New Groundwater Monitoring Well
- Existing Groundwater Observations
- Existing Surface Water Observations
- NHESP Certified Vernal Pools
- Potential Vernal Pools
- Surveyed Wetland Boundary
- DEP Wetlands
- Parcel Boundary

CDM Smith

Surface Water Sampling Locations
Pine Street in Norton, MA

Figure
2-2

Table 2-3 - Summary of Surface Water and Groundwater Data

SAMPLE ID	DEPTH	DATE	PO4 (mg/L)	TP (mg/L)	DIN (mg/L)	TON (mg/L)	TN (mg/L)	CHl-a (ug/L)	Phaeo (ug/L)	TN : TP
Pine Street Pond	Shallow	08/29/2013	0.003	0.113	0.045	0.999	1.049	59.14	7.99	9.284
		09/19/2013	0.002	0.025	0.015	0.514	0.529	2.65	1.59	21.166
		10/29/2013	0.005	0.018	0.22	0.57	0.79	1.65	2.38	42.739
Pine Street Pond	Deep	08/29/2013	0.006	0.042	0.031	0.875	0.910	29.46	12.07	21.479
		09/19/2013	0.002	0.184	0.023	0.969	0.991	9.97	12.94	5.396
		10/29/2013	0.004	0.054	0.12	0.68	0.80	2.39	2.60	14.707
Old Crane Pond	Shallow	08/29/2013	0.002	0.024	0.014	0.766	0.784	16.81	0.00	32.445
		09/19/2013	0.006	0.037	0.069	0.656	0.725	7.36	1.53	19.446
		10/29/2013	0.004	0.027	0.40	0.47	0.87	2.61	0.70	32.326
Old Crane Pond	Deep	08/29/2013	0.002	0.020	0.015	0.669	0.687	12.60	0.90	33.540
		09/19/2013	0.002	0.081	0.055	0.946	1.002	12.46	7.05	12.440
		10/29/2013	0.005	0.028	0.22	0.58	0.80	5.74	6.55	28.627

GROUNDWATER RESULTS

SAMPLE ID	DATE	PO4 (mg/L)	TP (mg/L)	DIN (mg/L)	TON (mg/L)	TN (mg/L)	CHl-a (ug/L)	BORON (mg/L)
MW101	10/10/13	0.011	0.093	0.03	0.11	0.15	0.28	0.0078
MW102	10/10/13	0.009	0.078	0.67	0.20	0.87	0.04	0.011
MW-103S	10/10/13	0.001	0.019	0.53	0.12	0.65	0.09	0.012
MW-103D	10/10/13	0.024	0.313	0.02	0.11	0.13	0.22	0.0071
MW-104S	10/10/13	0.002	0.052	0.48	0.15	0.63	0.12	0.024
MW-104D	10/10/13	0.022	0.054	0.01	0.10	0.11	0.25	0.0087
MW105	10/10/13	0.000	0.019	0.01	0.08	0.09	0.14	0.0066

BELOW REPORTING LIMIT, BUT HIGHER THAN DETECTION LIMIT

P04- Orthophosphate

TP- total phosphorous

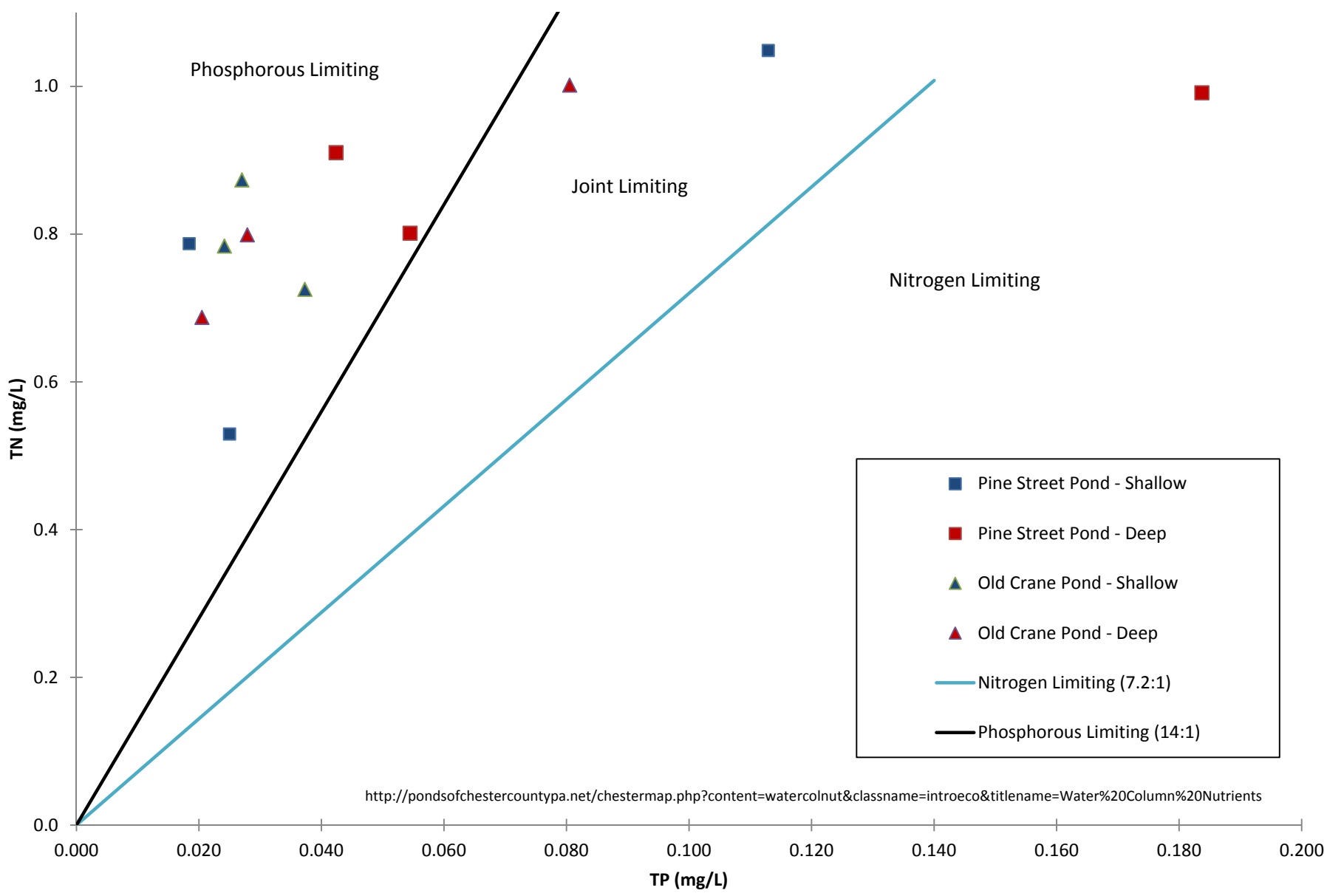
DIN- dissolved inorganic nitrogen

TON- total organic nitrogen

TN- total nitrogen

CHI-a - Chlorophyll A

Figure 2-3 Ratio of Total Nitrogen : Total Phosphorous for Pine Street and Old Crane Ponds



The evaluation of the surface water quality data focused on which nutrient, nitrogen or phosphorus, is likely to control undesirable biological growth in the ponds down-gradient of the potential infiltration site. Both nitrogen and phosphorus are essential for growth but unless the ratio of these nutrients to each other is within a certain range, algae growth is usually limited by one or the other nutrient. Thus, although the nutrient ratio depends somewhat on the type of algae that exists in the ponds, for the situation at these ponds in Norton it is appropriate to use total nitrogen to total phosphorus (TN:TP) ratios computed from the monitoring data (as guided by Redfield (1958) and Downing and McCauley (1992)). Those authors indicated that when the ratio is less than 7.2, the pond is nitrogen-limited (Redfield, 1958). When it is between 7.2 and 14, the pond is jointly-limiting. And, a ratio greater than 14 indicates a phosphorus-limited system (Downing and McCauley, 1992). **Figure 2-3** (below **Table 2-3**) shows the measured TN:TP values with TN on the y-axis and TP on the x-axis. The 7.2:1 ratio and 14:1 ratio lines are shown on **Figure 2-3** so as to illustrate the samples that are phosphorus-limited, nitrogen-limited, or jointly-limited. Based on this evaluation of the water quality data, both ponds are phosphorus-limited.

It should be noted that both ponds, especially the Pine Street Pond, are densely vegetated during the growth season (late spring to early fall). This is further evidenced by the chlorophyll A concentrations that were very high during the August round and drop off significantly as growth slows down in September and October. Based on this observation and chlorophyll A concentrations, these ponds have been impacted by nutrients under existing conditions.

Groundwater quality sampling at the seven newly installed monitoring wells was conducted to establish baseline levels for the analyzed parameters. The samples were collected using low flow sampling techniques via peristaltic and submersible pumps. Prior to purging and sampling, groundwater levels were gauged with a water level meter. While purging, groundwater field parameters including temperature, specific conductance, dissolved oxygen, pH, and oxidation-reduction potential were monitored and recorded using a multi-parameter probe and flow-through cell. Groundwater samples were collected after field parameters stabilized as indicated by a change of less than 10 percent between readings for all field parameters. Dissolved samples were field filtered using 0.45-micron in-line filters. The groundwater samples were also submitted to the SMAST laboratory for chlorophyll-A, nutrients, and boron, the same parameters tested in the surface water quality samples. Groundwater quality results from the lab and measurements taken in the field are included in **Appendix E.** The concentrations were indicative of typical unimpacted conditions in southeastern Massachusetts.

As a specific initial step in assuring acceptable impact, the surface water and groundwater quality samples were analyzed for boron to establish a baseline level that would serve as a way of identifying a change in water quality as a result of treated effluent recharging at the site. Boron was selected because it is widely used in detergents, and it is generally not fully removed during wastewater treatment; in addition, it can migrate without significant attenuation in sand aquifers such as at the Pine Street site, thus serving as in indicator of affected groundwater. Uncontaminated groundwater generally contains less than 0.05 mg/L boron (LeBlanc, 1984). The 2013 sampling results showed that boron concentrations at the monitoring wells were indicative of unimpacted conditions. Boron concentrations at the ponds were also very low, especially at the Pine Street Pond where boron was only detected during the October round at the shallow location. Boron was detected at very low levels at the Old Crane Street Pond at each of the three rounds and at both shallow and deep locations.

2.4.7 Pilot Load Test

An infiltration basin pilot load test was conducted between October 18 and November 4, 2013. Approximately 293,000 gallons of water was discharged to a pilot basin during this 17-day pilot load test. The purpose of this pilot test was to evaluate the loading capacity of the overburden aquifer at the Pine Street site. Data collected during the pilot test was used to estimate an infiltration loading rate that was subsequently used to identify the infiltration basin area needed to infiltrate the proposed target of 1.0 mgd of treated effluent.

The primary objective, with regard to pilot test loading, was to apply as much water as possible to the test basin to induce response from the water table. The pilot test loading aids in updating the estimated, site-specific aquifer transmissivity and associated predictive modeling for establishing total site capacity from the 2008 study and provides a larger-scale basis for estimating an applicable design loading rate. During the pilot load test, there were two modes of water-recharge. The predominant mode was to set a near-steady flow rate just low enough to avoid rising water in the test pit, so that the impact of maximum sustained infiltration could be evaluated. For the second mode of operation, rising and falling head tests were conducted in the basin to estimate infiltration rates, similar to the procedures used in smaller-scale, double-ring infiltrometer testing performed as part of the 2008 study. Rising head tests were conducted by filling the trench at a constant loading rate and measuring the water level in the basin as it increased with time. Falling head tests were conducted by filling the trench and allowing it to fully drain with no influent discharge and measuring the water level decrease in the basin over time.

During the pilot load test the following parameters were monitored to characterize conditions before, during, and after the application of infiltration water:

- Pressure transducers collected water level data in the seven newly installed wells and one existing well;
- Manual water level measurements were taken at the eight groundwater wells and two surface water gauging stations;
- Visual water level measurements were recorded in the basin during infiltration;
- Totalizer readings taken at an in-line flow meter at the fire hydrant were manually recorded; and
- Totalizer readings taken at an in-line flow meter at the outlet of the frac tank were manually recorded and used to calculate flow into the infiltration basin.

Figure 2-4 shows the set-up of the pilot testing site. The following sequence of events took place prior to, during, and after the pilot load test:

October 1, 2013: The infiltration basin was excavated by the Town of Mansfield's Department of Public Works (DPW) near monitoring well, MW-104S/D, in the plateau area. The dimensions of the infiltration basin upon excavation were 10 x 12 feet defining the total "footprint" laterally, and 1.5 feet deep with steep side-walls.

Figure 2-4 - Photo of the Pilot Testing Site Set-Up

October 10, 2013: Pressure transducers were installed in the seven newly installed monitoring wells and set to take background readings every 30 minutes. A round of manual water level readings was also taken at the monitoring wells.

October 18, 2013: A 21,000 gallon frac tank was installed at the site approximately 30 feet from the infiltration basin. In order to provide a continuous water source for the pilot test, Mansfield DPW coordinated the installation of a 2-inch plastic hose from the fire hydrant on Pine Street adjacent to the Norton well field to the frac tank at the Pine Street site. Prior to filling the frac tank, in-line flow meters were connected to the discharge piping at the hydrant and the discharge piping from the frac tank to keep track of the amount of water flowing into the frac tank and infiltration basin. A splash board was also installed in the infiltration trench to prevent erosion of the basin. CDM Smith started discharging water to the trench at 5-7 gallons per minute (gpm) to saturate the soil column down to the water table. This flow was maintained through the weekend of October 20 and 21, 2013.

October 21 to November 4, 2013: Pressure transducers were re-programmed to record water levels every five minutes through the duration of the pilot test. **Appendix F** summarizes the flow-related measurements and estimates, including totalizer meter readings and estimated rates based totalizer readings and the time that lapsed between readings. The table also includes observations of conditions in the test basin, such as ponded depth of water, and activities associated with flow-rate adjustments as well as raking of the basin to remove leaf-litter and fine-sand blockage. The following is a summary of the infiltration rates measured on each of the days during the pilot test:

- From October 21 through 24, the loading rate into the infiltration basin ranged from 5-10 gpm.
- On October 22 and October 24, falling head tests were conducted in the basin. The infiltration rates during these tests were 4.5 to 5 gpm.
- On October 25, CDM Smith raked the bottom of the trench with a steel rake to remove fines and leaf litter. This is consistent with standard maintenance that would occur at an infiltration basin.
- From October 25, after the trench was raked, through October 29, the loading rate into the infiltration basin ranged from 15-20 gpm.
- On October 27 and October 29, falling head tests were conducted in the basin. The infiltration rate during these tests was 15 gpm.
- On October 29, after the falling head test was conducted, the trench was raked again by CDM Smith. From October 29, after the basin was raked, through October 31, the loading rate ranged from 25-29 gpm.
- Upon arriving on site on October 31, the basin was completely full at ~1.50 feet. On October 31, the basin was allowed to drain until the water level in the test pit was about 0.6 feet and a steady loading rate of 12 gpm was sustained for the weekend of November 2 and 3, 2013.

- November 4: Water from the fire hydrant was turned off. Flow to the infiltration basin was increased to 38 gpm until the basin was full. Water from the frac tank to the basin was then turned off. Remaining water in the frac tank (approximately 6,000 gallons) was allowed to drain into the woods near the frac tank. The test basin was allowed to drain completely. Piping for water, frac tank, and in-line meters was disassembled and removed from the site. The test basin was filled in and the site was secured.

The groundwater level measurements from the pressure transducers were converted to groundwater elevations and were plotted to quantify and evaluate groundwater impacts from the pilot load test. Monitoring well MW-104S, located directly next to the infiltration basin and screened just below the water table, showed the most response from loading, with a 0.45 foot water table elevation increase during the loading test. Monitoring well MW-104D, also located directly next to the infiltration basin but screened in the deep till formation just above the bedrock, showed a very similar response of 0.32 foot increase. The six remaining pilot test monitoring wells showed slight groundwater elevation increases from October 27 through November 1, but this appears to represent ambient groundwater conditions as some measurable precipitation was observed during this period.

It is important to note that the infiltration rate increased substantially after the infiltration basin was raked on October 25 and October 31. As a result of raking the infiltration basin and removing fines that had settled, the infiltration rate increased from 5-10 gpm to 15-29 gpm. The higher rate resulted in filling the basin and triggered the need to return to a rate of 12 gpm to ensure adequate, steady infiltration without ponding. Therefore, an average infiltration rate of 12 gpm represents an adequately conservative estimate of the design loading rate; this rate was thus used to calculate an areal extent for full-scale infiltration basin design in the predictive simulations.

A rate of 12 gpm was applied to the 10 feet x 12 feet test basin with a 120 square feet (ft^2) area. This equates to a loading rate of 144 gallons per day (gpd) per ft^2. To be further conservative with the loading rate estimate, 10 percent of this loading rate (14 gpd/ft^2) was used to calculate the necessary infiltration area. At the rate of 14 gpd/ ft^2, the infiltration area needed to apply 1.0 mgd was calculated to be approximately 1.6 acres. See Section 4 for details regarding the predictive simulations conducted to determine the impact of applying 1.0 mgd to the estimated recharge area.

Section 3

Numerical Groundwater Modeling Update

3.1 Overview of Numerical Modeling and Update Process

A fully three-dimensional, numerical groundwater flow and particle-tracking model was developed as part of the 2008 effort to evaluate effluent loading at the Pine Street and Crane Street sites. The model was used to estimate impact to offsite areas such as wetlands, ponds, vernal pools and the Town of Norton's municipal well field. This section discusses details of the numerical groundwater flow model, updates that were made as a result of the 2013 field investigation (described in Section 2) in the area of the Pine Street site, and subsequent model calibration and validation based on the new site-specific data.

Initial model calibration updating was conducted in steady-state mode to simulate the ambient groundwater table reflective of the 2013 monitoring period. This approach is based on assuming that the groundwater flow system was essentially at equilibrium, as indicated by evaluation of long-term hydrographs from USGS monitoring wells. This same assumption was used during the first round of 3D modeling of the site area during an earlier project phase, facilitating comparison of 2008 and 2013 ambient groundwater conditions at the site and thereby helping confirm the model calibration updates.

Further model validation was achieved by simulating the pilot load test in transient mode, using the groundwater level hydrographs collected during the pilot load test as the basis of model-confirmation. The transient mode allows for the simulation of the pilot load test at incremental time steps, more accurately reflecting the dynamics of the test period.

Details regarding these two groundwater modeling modes are provided in Section 3.5 Model Calibration.

3.1.1 DYNSYSTEM Simulation Codes

The DYNSYSTEM groundwater modeling software was used in this study and includes DYNFLOW (single-phase groundwater flow) and DYNTRACK (solute transport). DYNFLOW is a fully three-dimensional, finite element groundwater flow model. This model has been developed over the past 25 years by CDM Smith water resources engineering staff, and is in general use for large scale basin modeling projects, site-specific remedial design investigations, and water resources management applications. It has been applied to over 200 groundwater modeling studies in the United States and has been reviewed and tested by the International Groundwater Modeling Center (IGWMC) (van der Heijde 1985, 2000). The code has been extensively tested and documented by CDM Smith (CDM, 1997).

DYNTRACK is a fully 3-dimensional particle tracking and solute transport code and a companion code to DYNFLOW. In simple particle-tracking mode, DYNTRACK simulates the mean advective flow path of dissolved solutes using three-dimensional flow fields developed by DYNFLOW. This particle-tracking

feature was used to estimate time-of-travel from the Pine Street site to the Town of Norton well field (Section 4.3.3).

3.1.2 Summary of Prior Modeling

The previous modeling effort in 2008 indicated that 0.7 to 0.9 mgd could be applied at the Pine Street site with an acceptable amount of water table mounding at the site, and the additional side-slope break-out along the lateral edges of the plateau area was sufficiently confined within the site's limits. The range in recharge rate was based on two different versions of the groundwater model used to simulate the recharge loading rates. One provided for a "conservative" estimate of effluent loading while the other version of the model provided a "high range" estimate.

At the Pine Street site, the "conservative" version of the model was developed due to limited data on bedrock depth. A USGS overburden thickness map (Williams and Willey, 1973) indicated 75 feet of overburden in the plateau area. The boring at MW-5 was drilled to 100 feet before encountering bedrock. A "conservative" version of the model was developed where the overburden thickness was adjusted to 75 feet in the plateau area and a "high range" version of the model having 100 feet of overburden thickness.

3.1.3 Current Focus on Pilot Load Test and Preliminary Design

Both DYNSYSTEM and DYNTRACK were used as part of the recent 2013/2014 modeling effort. The model developed in 2008 was validated or updated based on the data collected in the field in the fall of 2013. The areal extent of the infiltration basin was estimated based on the pilot load test. A steady-state version of the updated model was then calibrated using the water level measurements taken at the existing and newly installed monitoring wells. The calibrated model was used to simulate the loading capacity of the Pine Street site.

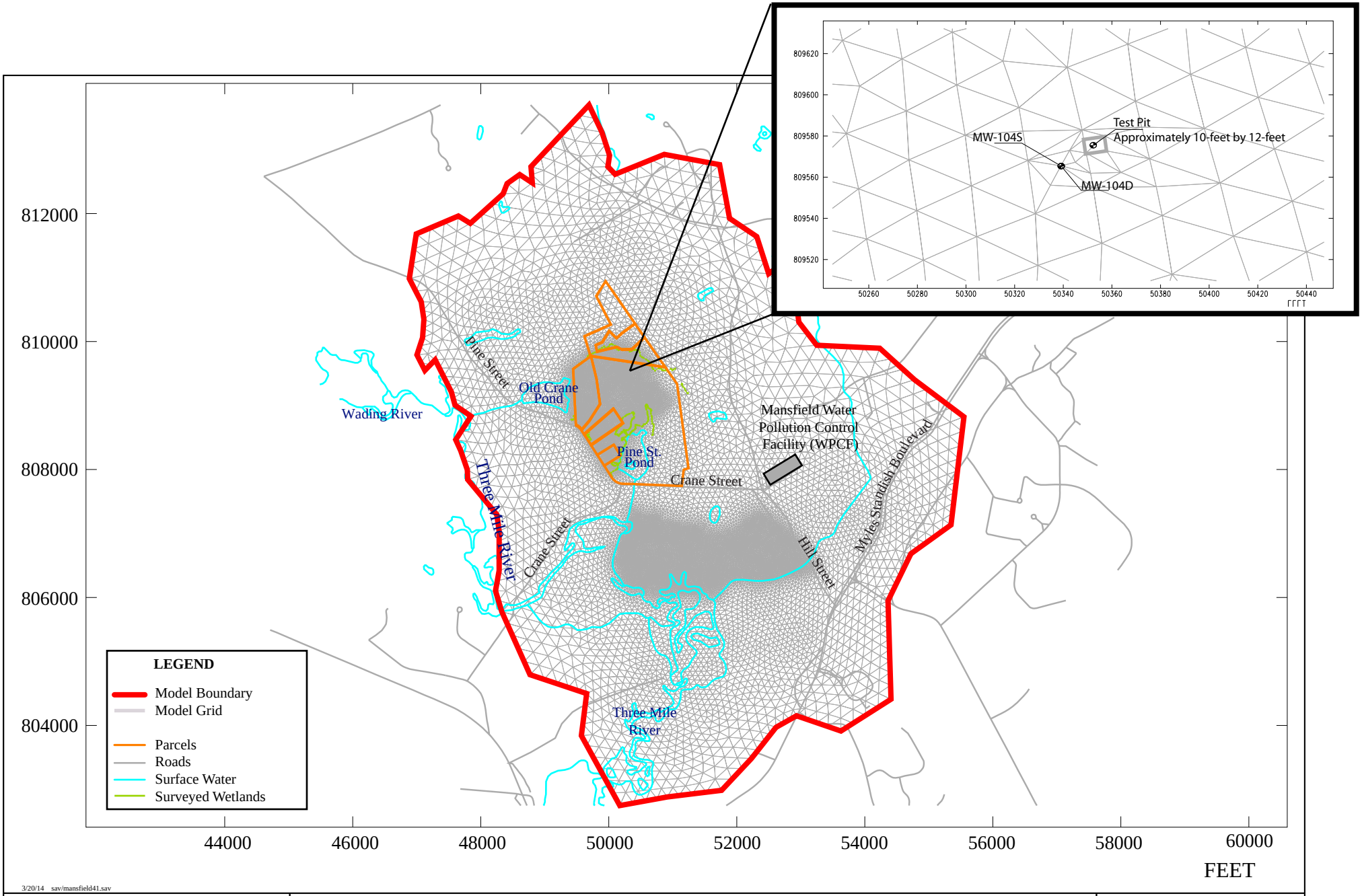
The following sections describe the various components of the numeric groundwater flow model and the updates that were made based on site-specific data that was obtained during the October to November 2013 field effort.

3.2 Numerical Model Grid

As part of the 2008 modeling effort, a numerical model grid was developed for the study area. The full model domain and the finite-element grid is depicted in **Figure 3-1**, which also shows key surface water features, the Town of Norton well field, and roads. The extent of the model domain was mapped based on surface water hydrologic features, specifically the wetlands to the north and east, and the Three Mile River and its tributaries to the west and south.

The 2013 model grid covers an area of approximately 1,300 acres and consists of 13,063 nodes and 25,944 elements in plan-view. The node spacing ranges from 200 feet at the edge of the model to approximately 25 feet at the effluent loading sites and immediate surroundings, including the Town of Norton well field that is adjacent to the Pine Street site.

In the area where effluent loads are applied, increased detail is necessary to evaluate the pilot load test infiltration impacts on the water table and to simulate effluent pathways with sufficient accuracy. Therefore, as part of the current modeling effort, additional discretization was added in the area of



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Numerical Groundwater Model Grid

Pine Street Site, Norton, MA

FIGURE 3-1

the pilot testing site allowing for node spacing of approximately 12 feet in the immediate area of the pilot testing site. The revised area is shown as an inset in **Figure 3-1**.

3.3 Stratigraphy and Model Properties

Model stratigraphy and properties were developed based on regional and site-specific data. The model has a total of seven layers, with one layer for simulating bedrock and the remaining six layers for the overburden, consisting of a variety of unconsolidated glacial and alluvial deposits. Several overburden layers were included to provide sufficient detail for simulating vertically varying flow pathways, variations in hydraulic properties, and different screened intervals in observation and pumping wells.

The bottom layer represents the relatively low hydraulic conductivity bedrock that underlies glacial overburden. The top of the bedrock was regionally defined using a USGS overburden thickness map (Williams and Willey, 1973). In 2008, the bedrock-overburden contact elevations were adjusted in areas where seismic and GPR data was available. The bedrock was further adjusted based on depth to bedrock encountered at the boring advanced during the May through July 2008 field effort.

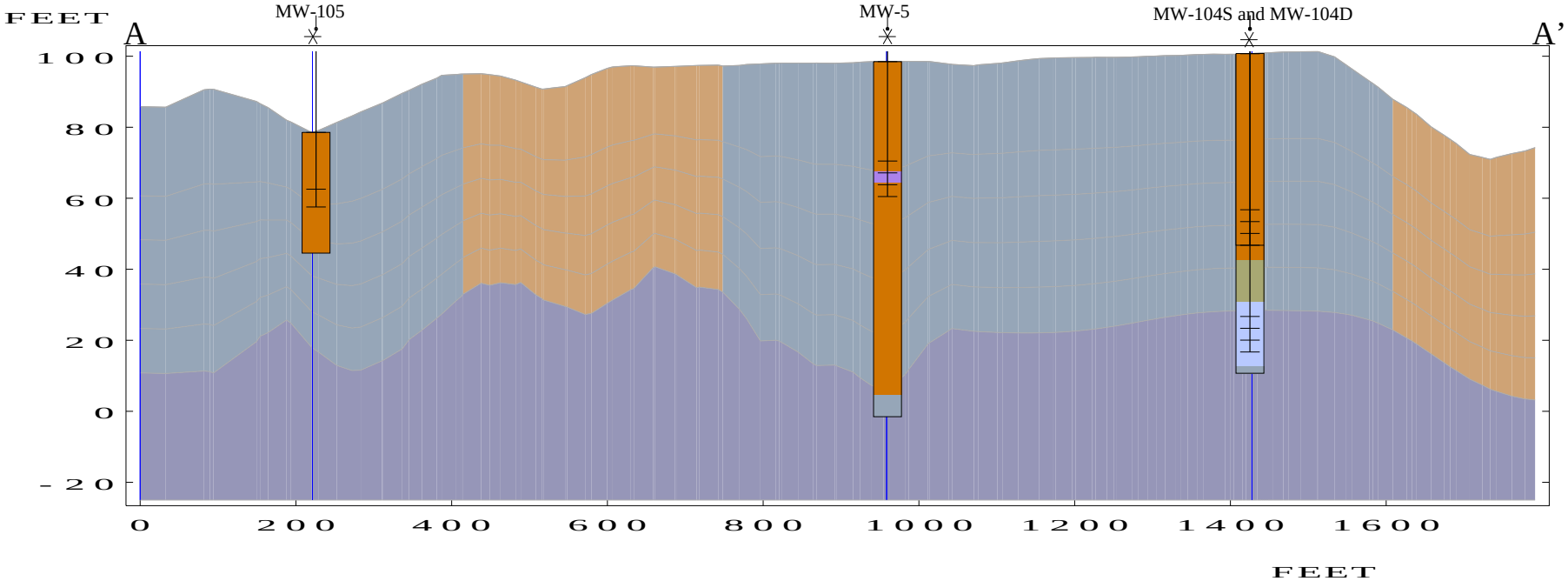
Overburden layers are generally the sand/sand silt deposits in which all of the monitoring wells are screened. Based on the borings advanced during the 2013 field effort, it was observed that, although the overburden deposits varied from location to location, the overburden showed little evidence of having significant, laterally-extensive layering. Thus, aquifer properties were varied laterally, but were simulated as being homogeneous over the thickness of the aquifer. Although there is generally only bedrock and a single overburden property defined at each location, the additional layers provide the discretization necessary for predictive simulations to track vertically varying flow pathways. In addition, there was little to no evidence of a low permeability silt layer logged at any of the new boring locations. The silt lens that was encountered at MW-5 is thus assumed to be a localized lens that will not have an adverse impact on the effluent loading in the plateau area.

The top model level is assigned ground surface elevations, which were initially defined by a MassGIS DTM with a National Map Accuracy Standard of + or - 1.5 meters (MassGIS, 2003). Ground surface was adjusted based on the topographic survey conducted throughout the site during fall 2013. The survey produced 1-foot contour intervals allowing for greater accuracy of the ground surface in the model.

Figure 3-2 is a southwest to northeast cross-section through the Pine Street site. The boring logs in the figure indicate locations where there are control points for establishing stratigraphy. Discrepancies in bedrock stratigraphy are generally due to projection distances.

Hydraulic properties are assigned to the overburden model layers to represent the hydraulic characteristics of the unconsolidated glacial and alluvial deposits in different areas. The various hydraulic characteristics are defined as “material types” in the terminology of the simulation software, representing a wide range of sediment types, ranging from low-permeability till and lacustrine, clay-type deposits to very high-permeability sands and gravels. **Figure 3-3** shows the delineation of the various material types in the model.

The hydraulic properties that are specified for each material type defined in the groundwater flow model are horizontal and vertical hydraulic conductivity. (Storage coefficients are not needed for the



MATERIALS CROSS-SECTION AA

- Bedrock Valley Medium to Fine Sand
- Unconsolidated Glacial Drift High K Deposit
- Bedrock

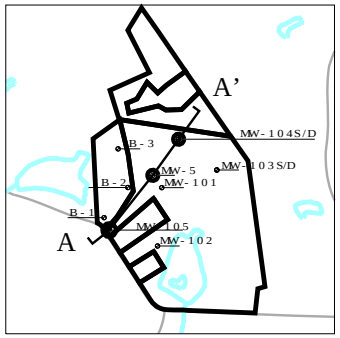
WELL LOG LEGEND

- Till
- Sand & Silt
- Sand
- Silt
- Bedrock

- MONITORING WELL
- GROUND SURFACE
- TOP OF SCREEN
- BOTTOM OF SCREEN

PROJECTED 100 FT

CROSS SECTION AA



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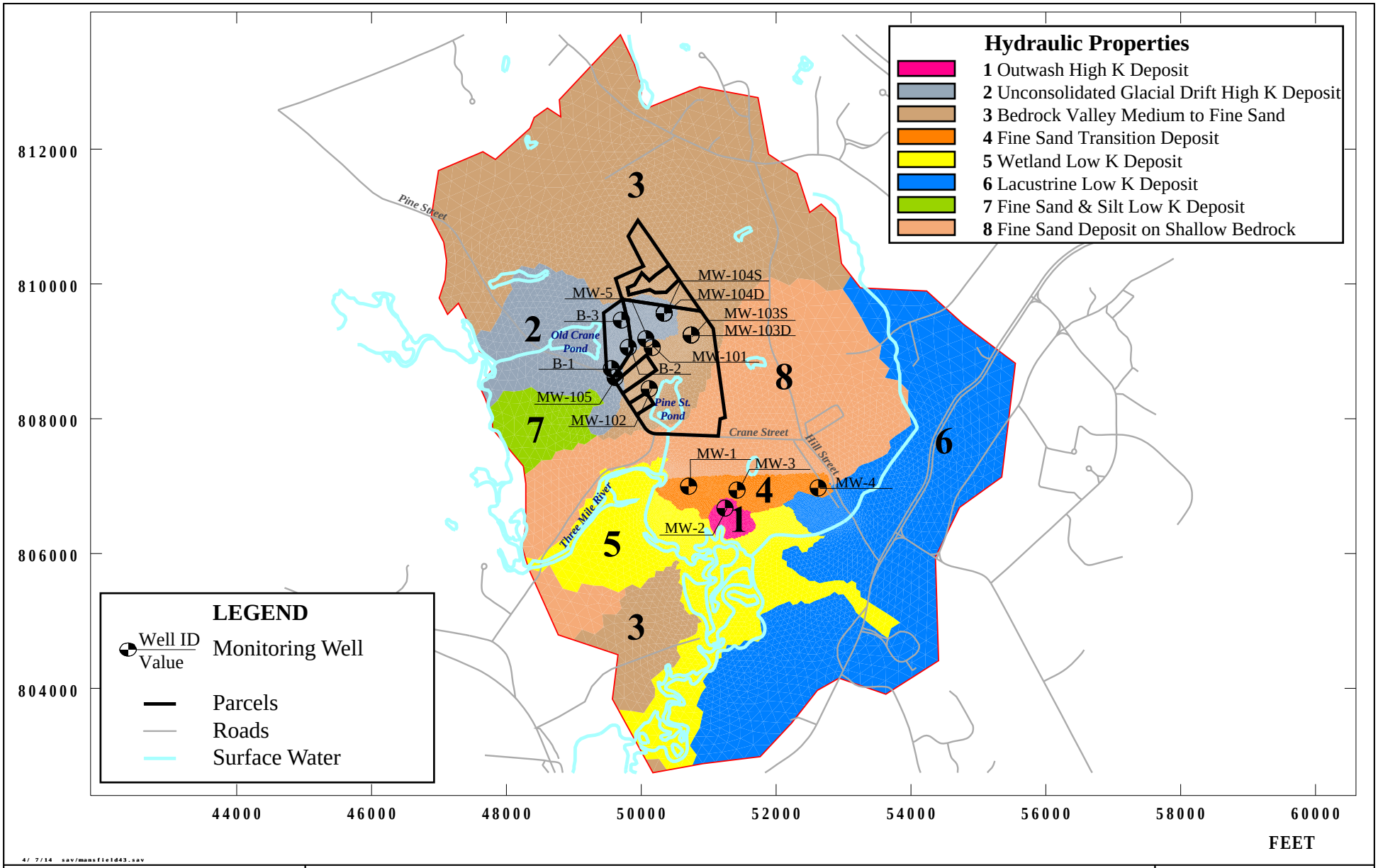
CDM Smith

Southwest to Northeast Cross-Section

Pine Street Site, Norton, MA

FIGURE 3-2



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Variation of Hydraulic Properties of Overburden Sediments in Simulation Model

Pine Street Site, Norton, MA

FIGURE 3-3

steady-state simulations that were performed in this study; transient simulations, which would require the use of storage coefficients, were not performed with the flow model.) For the particle-tracking and effluent discharge-to-surface water simulations that were conducted for the predictive simulations, additional hydrodynamic properties (effective porosity and dispersivity) were specified based on prior modeling of sites in similar hydrogeological settings (see Section 4).

For each material type, an initial set of hydraulic properties was selected based on slug test results, the Zone II report in the Norton well field area, and geologic sediment types described in boring logs. These estimates were used as the starting point for calibration of the hydraulic property assignments in the three-dimensional groundwater flow model.

During calibration, aquifer properties were adjusted to achieve acceptable comparison between measured and simulated heads. The aquifer properties established after calibrating to measured water levels are presented in Section 3.5.1.

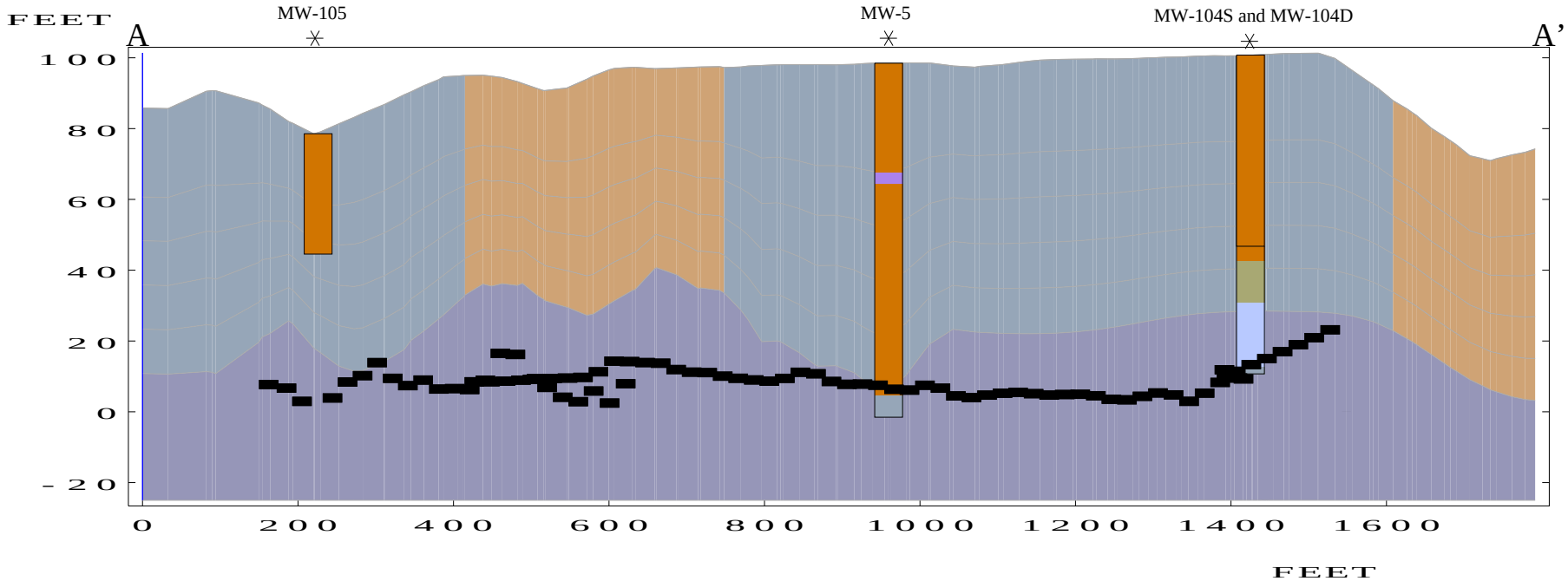
Figure 3-4 shows a cross-section through two bedrock monitoring locations MW-5 and MW-104S/D, the existing bedrock surface in the groundwater model, and the bedrock surface as identified by the field geophysical survey. Near MW-104S/D, the bedrock in the model is higher in elevation than the bedrock depth identified in the boring log. This did not warrant a change to the bedrock surface in the model in this area since till was identified at the depth that bedrock exists. At MW-5, the bedrock in the boring log aligns with the current model configuration. Although the field bedrock observations are shown to be lower in elevation, the bedrock was not adjusted in the model since lower permeability, fine sand deposits exists to the southeast of the site (shown in the material types on **Figure 3-3**) indicate that there may be reduced transmissivity to the southeast. Thus, this local adjustment of bedrock was not necessary since the lateral distribution of transmissivity is accurately distributed so that recharge at the plateau area flows preferentially to the wetlands to the north of the site.

3.4 Boundary Conditions

The boundary conditions of the groundwater flow model are discussed below. There are two basic types of flow model boundary conditions: specified flux and specified water level. At locations where the groundwater level is specified (or held “fixed”), the model computes the flux into or out of the model, and vice versa. Unless otherwise indicated, a no-net-flow condition is assumed by the simulation model, which means that the model computes the groundwater head. Typically, surface water features connected hydraulically to the groundwater flow system are represented as specified water levels; and, natural and artificial flows affecting the groundwater system, such as precipitation-recharge and pumping are simulated as specified fluxes. **Figure 3-5** shows where specified fixed head boundary conditions were established within the interior portions of the model. The figure also shows the value at which the head was fixed at each such point in the model.

3.4.1 Lateral and Bottom Edges

The bottom edge of the model was set at -25 feet MSL throughout the entire modeled area, and it was simulated as a no-flow boundary. A no-flow boundary condition was applied at the lateral edges of the model also. Generally, the side edges follow watershed divides or flow lines. In either situation, the no-flow boundary condition is an appropriate setting. No changes were made to the bottom or lateral edges of the 2008 model during this 2013 - 2014 round of updates.



MATERIALS CROSS-SECTION AA

- Bedrock Valley Medium to Fine Sand
- Unconsolidated Glacial Drift High K Deposit
- Bedrock

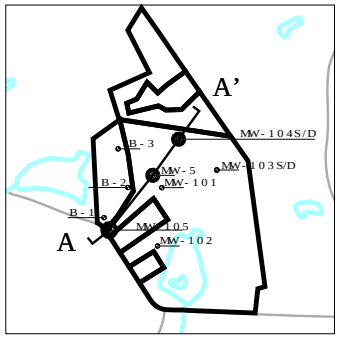
WELL LOG LEGEND

- Till
- Sand & Silt
- Sand
- Silt
- Bedrock

- MONITORING WELL
- GROUND SURFACE
- TOP OF SCREEN
- BOTTOM OF SCREEN
- FIELD BEDROCK OBSERVATIONS

PROJECTED 100 FT

CROSS SECTION AA



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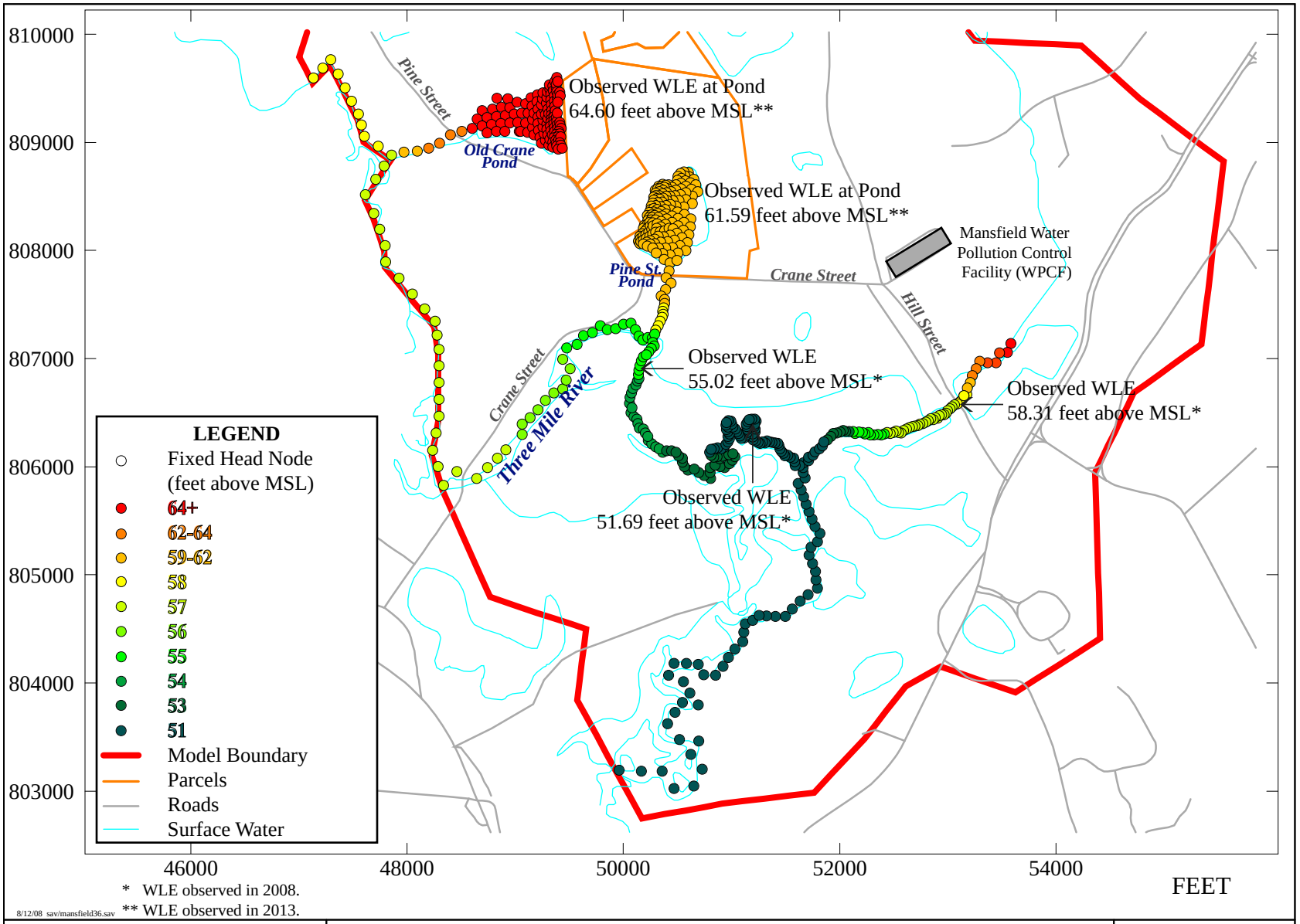
Comparison of Modeled vs. Field Derived Bedrock Surface Elevation

Pine Street Site, Norton, MA

FIGURE 3-4



* WLE observed in 2008.
** WLE observed in 2013.

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CDM Smith

Observed Water Level Elevations
Norton, MA

Regional Effluent Disposal Alternative Study for MFN

FIGURE 3-5

3.4.2 Natural Recharge

The net recharge rate in the model is the amount of precipitation that ultimately seeps through the ground and enters the groundwater flow system. In Massachusetts, the average annual precipitation is 45 inches. Precipitation that is "rejected" from the groundwater system includes evapotranspiration (ET) and surface water runoff. The "net effective" recharge to the groundwater system was estimated to be between 20 and 21 inches per year based on published values in a USGS report (Williams and Wiley, 1973) and the Zone II study conducted on the Town of Norton's well field, respectively. Twenty inches per year natural recharge was applied uniformly to the water table in the numerical model. No changes were made to the natural recharge during the 2013-2014 round of model updates.

3.4.3 Water Supply Wells

The Town of Norton's water supply pumping well, Well #1, was the only active pumping well represented in the groundwater model. Well #1 was represented as a specified flux at a node that corresponds to the horizontal and vertical coordinates of the well screen. Since the simulation was run at a steady-state, the specified flux at Well #1 was set to the average pumping rate of 200 gpm. No changes were made to the water supply well configuration in the model during the 2013-2014 round of updates. The Town of Norton owns a second water supply pumping well, Well #2, that is situated in close proximity to Well #1. Based on information from Norton, this well will not be used for water supply purposes.

3.4.4 Surface Water Features, Wetlands, and Vernal Pools

The two perennial ponds within the model were simulated as specified head boundaries, fixed at water level elevations based on water level measurements taken in October 2013 at outlet structures at SW-3 (Pine Street Pond) and SW-4 (Old Crane Pond). These pond elevations were applied as fixed heads across each pond's surface area. In the 2008 simulation, Old Crane Pond was fixed at 64.1 feet and Pine Street Pond was at 63.9 feet. During this round, water levels were fixed at 64.6 feet at Old Crane Pond and 61.6 feet at the Pine Street Pond.

No updates were made to the specified head boundaries that simulate the Three Mile River, but minor updates were made to the tributaries that flow to it. The smaller, outlet tributaries from the Pine Street Pond and Old Crane Pond were adjusted to the updated fixed head water levels. This approach is assumed to be adequate because the simulated streams are relatively distant from the Pine Street site, with the two relatively large ponds in between the site and the streams; thus, the two ponds represent the dominant surface water features.

All of the other ground surface locations were simulated using the "rising water" feature in DYNFLOW, where the model simulates water table conditions unless the water level rises to the ground surface triggering computation of the amount of groundwater discharge to the ground surface. These "rising water" areas, which usually occur at wetlands or vernal pools, were watched closely during the predictive simulations.

3.5 Groundwater Flow Model Calibration Update

3.5.1 Steady-State Simulation of Fall 2013 Conditions

Steady-state simulations representative of conditions observed in October to November 2013 were conducted for the assessment of the land recharge sites. Water level measurements taken at monitoring well locations provided target water level elevations for the model calibration. These observed water level measurements were shown in **Table 2-2**. Model parameters including horizontal and vertical hydraulic conductivity were adjusted in order to match observed water levels at the wells.

Water levels in the Norton well field area were not included explicitly as calibration targets since the well field observation and pumping wells were not measured during this study. However, the measured water levels, as reported by previous studies, were used to qualitatively check the simulated water table in the Norton well field area. **Table 3-1** summarizes the comparison between the simulated and observed water level readings and the associated calibration statistics. **Figure 3-6** shows the model agreement to observed readings to achieve the metrics established by ASTM D5718-13 and D5981-96 standard guides for groundwater flow modeling. The sufficiency of the calibration is based on criteria also suggested by Anderson and Woessner (1992) who recommend that the mean difference and standard deviation should be less than 10 to 20 percent of the head or water table difference across the simulated area(s) of interest.

Table 3-2 shows the aquifer properties that were established for each of the material types in the calibrated, average-condition model. Aquifer properties were estimated based on previous and current field infiltration tests in addition to considering general conductivity ranges of aquifer properties. The calibrated model was used as the basis for simulating predictive scenarios of various effluent loading at the Pine Street site, as described in Section 4.

3.5.2 Transient Simulation of Pilot Load Test

The calibrated groundwater flow model was run in transient mode to simulate the time-varying loading rates that were applied in the field during the pilot test. The pilot load test is discussed in Section 2.4.7 and an annotated record of the loading rates is documented in **Appendix F**. The observed water level data collected with the pressure transducers in the MW-104S/D couplet was used as the primary basis for validating the model calibration. The MW-104 series were the only instrumented wells that demonstrated an observed, measurable water table rise of approximately 0.46 feet. In addition, the filling of the test basin, when loaded with higher-range flow rates, was used as a possible upper bound for water table rise.

The transient simulation efforts included representation of the time-varying flow rates at a sufficient level of temporal detail for the model to replicate the timing of responses at MW-104 couplet. **Figure 3-7** shows the observed and simulated hydrographs at MW-104S (top) and MW-104D (bottom) during the pilot load test. Note that the y-axis is trimmed to only show the range of water table fluctuations at both wells. A rise in water table is shown when the application begins on October 21, 2013. Comparing the hydrographs from MW-104S and MW-104D, the simulated water levels from the transient simulation validate the model's capacity to simulate the variable loading rates that occurred. Although the rapid rise-and-fall of the water table elevation is evident in the observed data, the simulated response demonstrates that the model can adequately simulate the impacts of infiltration. More importantly, the pilot-test transient modeling results, in regard to water table rise, confirm that the steady-state calibration efforts produced a model that simulates loading-induced responses with adequate absolute-value accuracy. Thus, the steady state model was used for the predictive simulations discussed in Section 4.

Table 3-1 - Summary of Calibration

Monitoring Point	Simulated Head or Water Table Elevation (ft NAVD88)	Observed Head or Water Table Elevation (ft NAVD88)	Date of Field Observation	Difference (Sim-Obs, ft)	Absolute Difference (ft)
MW-101	66.31	67.38	10/10/13	-1.08	1.08
MW-102	63.09	63.83	10/10/13	-0.74	0.74
MW-103D	68.75	69.90	10/10/13	-1.15	1.15
MW-103S	68.78	69.92	10/10/13	-1.14	1.14
MW-104D	69.18	68.64	10/10/13	0.53	0.53
MW-104S	69.20	68.57	10/10/13	0.62	0.62
MW-105	64.49	63.65	10/10/13	0.83	0.83
MW-5	66.77	67.37	10/10/13	-0.60	0.60
B-1	64.64	63.57	11/08/13	1.07	1.07
B-2	65.77	66.39	11/08/13	-0.62	0.62
B-3	66.58	66.96	11/08/13	-0.37	0.37

Figure 3-6 Calibration Results

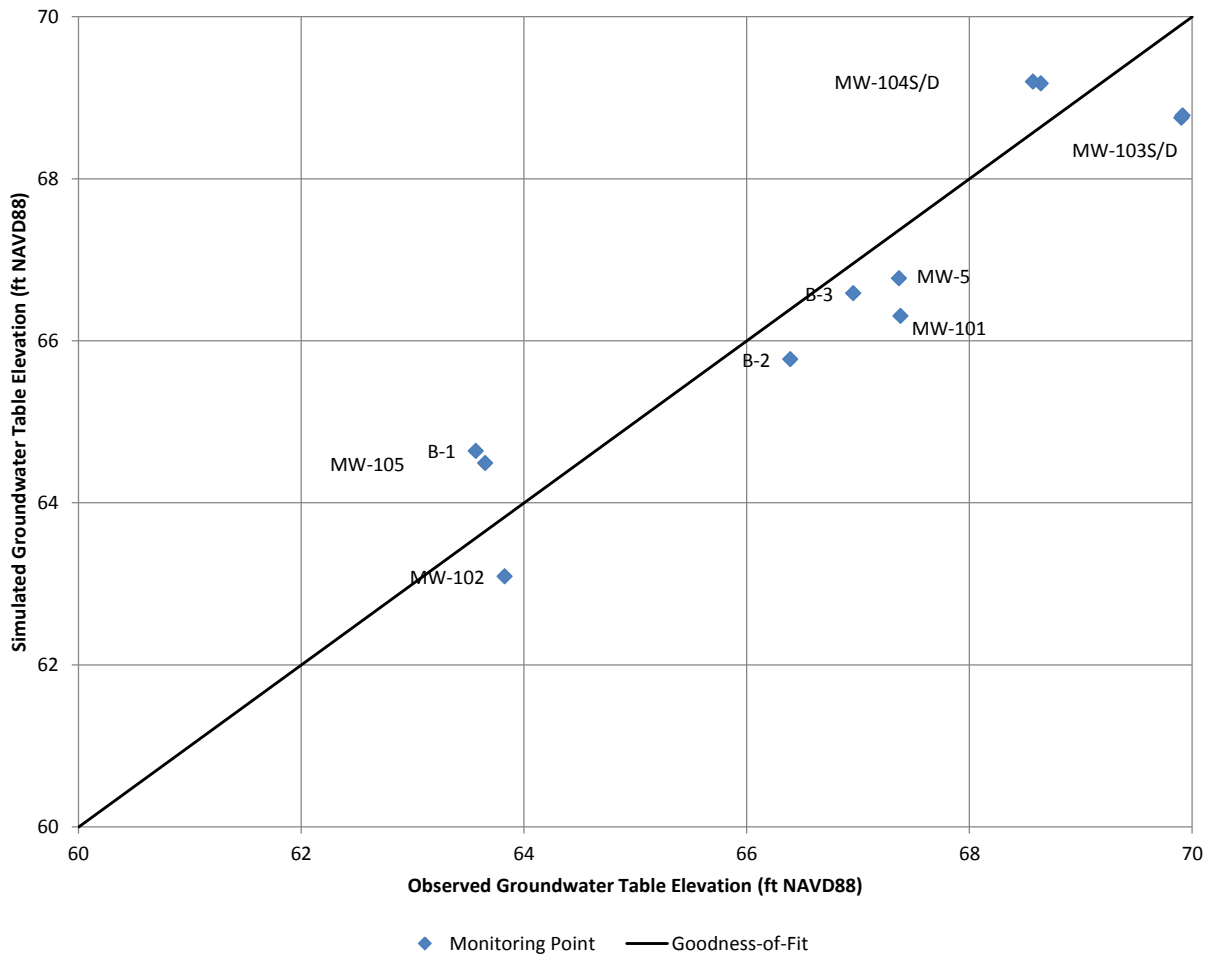
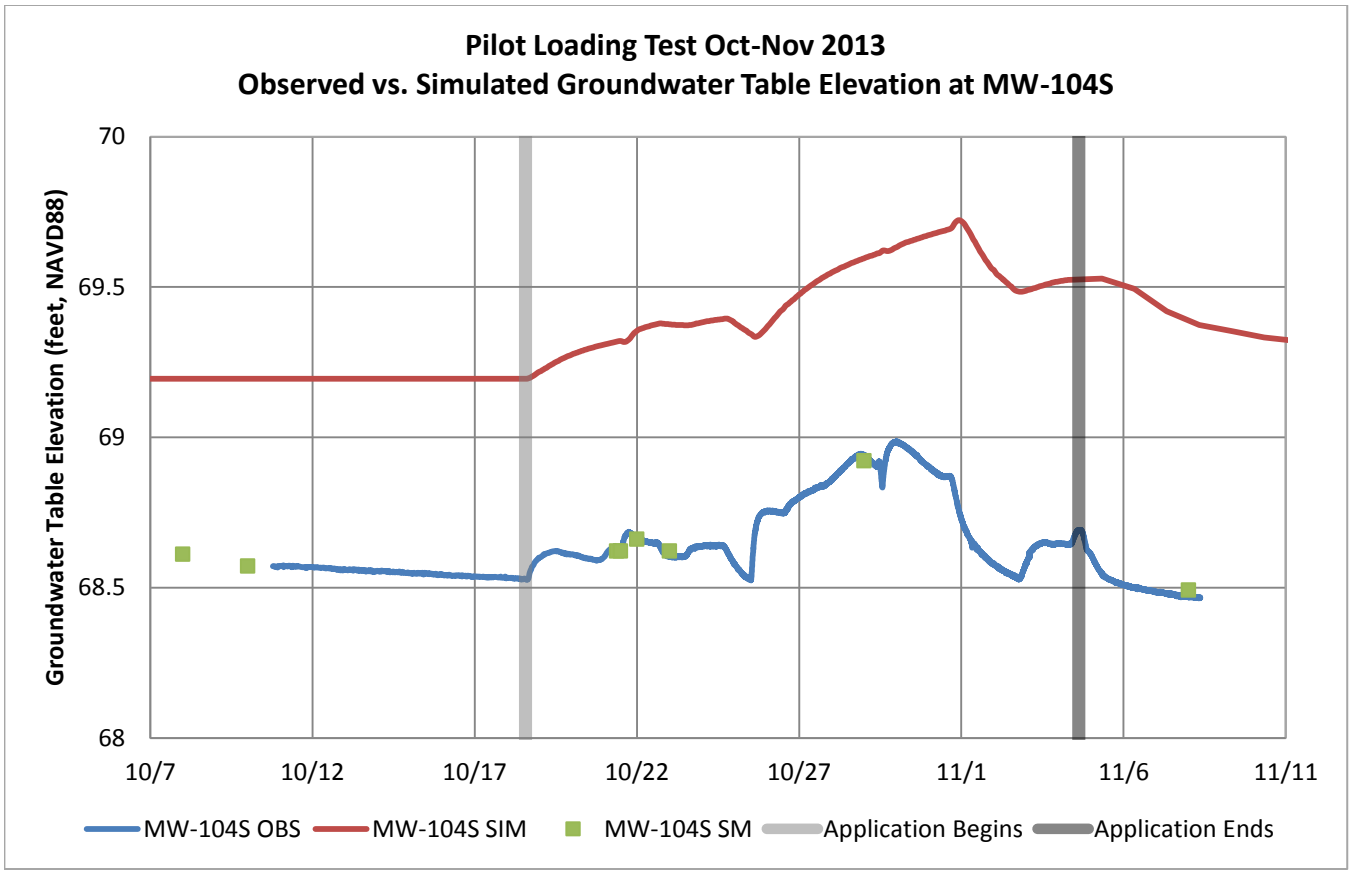


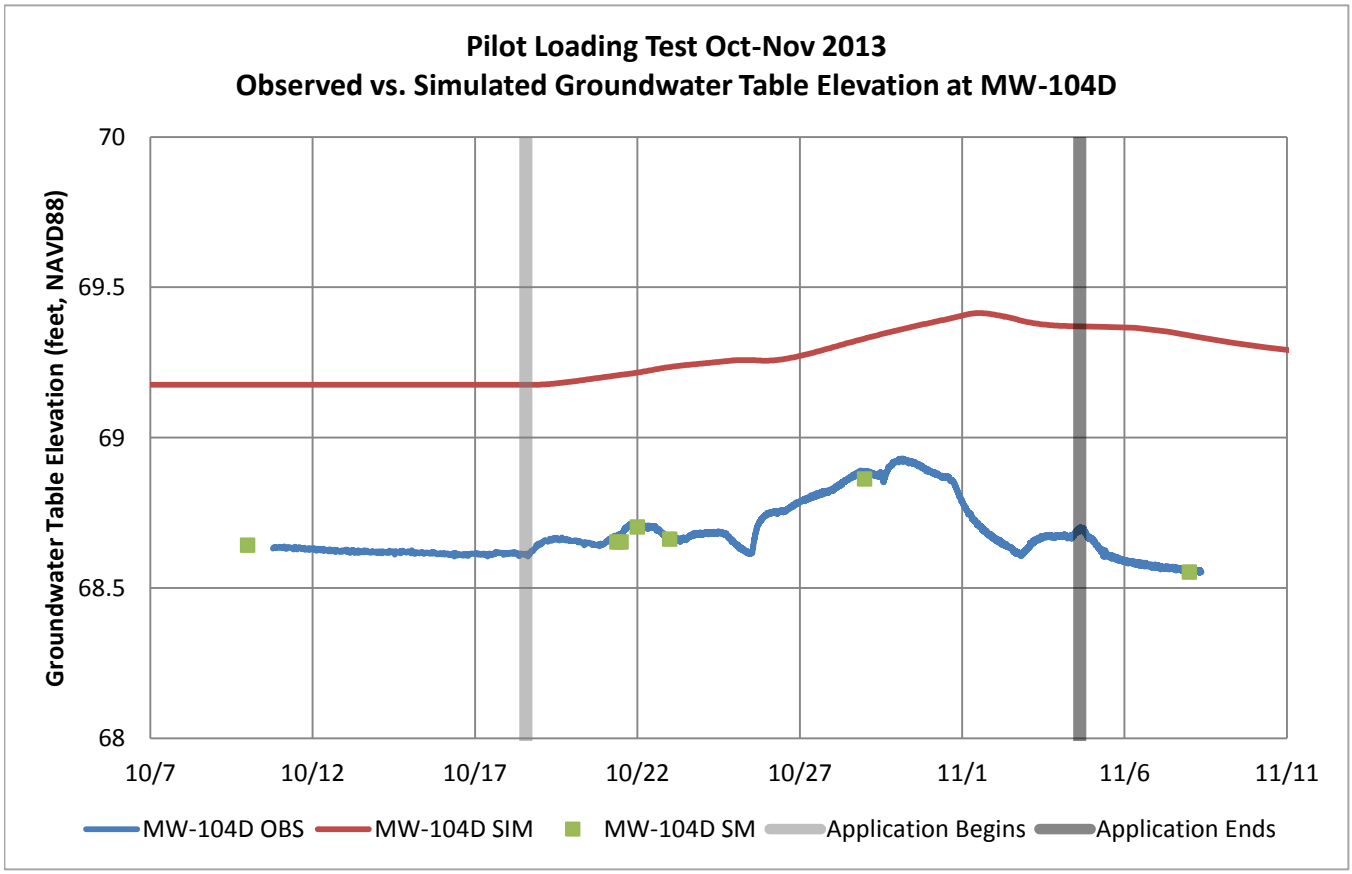
Table 3-2 Hydraulic Properties of Overburden Sediments

Flow Model Material Type*	Deposit	Horizontal Hydraulic Conductivity (ft/day)	Vertical Hydraulic Conductivity (ft/day)
1	Outwash High K Deposit	75	7.5
2	Unconsolidated Glacial Drift High K Deposit	50	5
3	Bedrock Valley Medium Sand	30	3
4	Fine Sand Transition Deposit	8	0.8
5	Wetland Low K Deposit	7	0.7
6	Lacustrine Low K Deposit	3	0.03
7	Fine Sand & Silt Low K Deposit	2	0.1
8	Fine Sand Deposit on Shallow Bedrock	1	0.1

*See Figure 3-3 for a map of the material types
K: hydraulic conductivity

Figure 3-7 Transient Calibration Comparison at MW-104S/D





OBS = Observed from Data Logger, SM = Observed Synoptic Measurement, SIM = Simulated

Section 4

Predictive Simulations

4.1 Overview of Predictive Simulation Process

The locally-detailed and updated groundwater flow model was used to evaluate the potential impacts of proposed infiltration basins under the groundwater conditions that existed during the calibration period as well as evaluating effluent loading accounting for seasonal high groundwater conditions. The 2008 study used two groundwater flow model representations resulting in a conservative and a high range recharge rate estimate. Based on findings from the recent field investigation, pilot load test, and updated model calibration, only one groundwater flow model, with reasonably conservative assumptions, was used for predictive simulations.

In addition to the use of the flow model (DYNFLOW), its companion mass transport simulator (DYNTRACK) was also implemented, for performing time-of-travel and discharge-to-surface water (and other adjacent features) simulations. These additional predictive simulations were conducted to help in assessing potential limiting factors (Section 4.2) and thereby provide assurance of reasonable estimates of site loading capacity and anticipated basin layout design (Section 4.3).

4.2 Potential Limiting Factors

There are several limiting factors which were investigated because they could potentially limit effluent loading at the site. Sections 4.2.1 through 4.2.6 discuss these factors.

4.2.1 Separation Distance

Water table mounding was evaluated by plotting the “separation distance”, or depth-to-water, defined as the vertical distance between the simulated water table with effluent loading and the ground surface. Separation distances below the footprint of the infiltration basins were calculated assuming the basin bottoms would be at the existing ground surface elevation of approximately 100 feet NAVD88.

Simulated separation distances were also used to indicate the potential for side-slope break-out. In locations where the slope of the land is high, seepage may already be occurring. With the addition of effluent loading, the groundwater table would rise and thus additional side-slope break-out could occur.

The primary criterion applied during the predictive simulation process involved the maintenance of a minimum separation distance of four feet at all locations within the effluent application zone (i.e. “footprint”). This criterion served as a goal based on applicable regulatory guidance for subsurface wastewater effluent disposal. This was confirmed in the August 2010 letter from MassDEP in response to the 2008 study. The letter stated, “The Department would like to clarify the position that the 4 foot vertical separation between the simulated groundwater mound, which includes the seasonal high groundwater level adjustment, with the ground surface must be maintained.” Effluent loading zones and rates were adjusted until an acceptable depth-to-water was achieved. Section 4.3 describes the

different scenarios that were simulated and adjusted to maintain the vertical separation distance. Section 4.2.4 provides information on the seasonal high water table considerations used in evaluating the modeling results.

4.2.2 Predicted Time-of-Travel to Water Supply Wells

The potential for effluent application to enter the Town of Norton's water supply well was examined by simulating the migration of infiltrated effluent from the west-southwestern edge of the infiltration area. The particle-tracking simulation method was used for this evaluation. The current Code of Massachusetts Regulations for the Ground Water Discharge Permit Program (314 CMR 5.00) allows for different effluent discharge limits of certain parameters based on whether the time-of-travel from the proposed site to a permitted water supply well is greater than two years.

Therefore, the predictive simulation results were estimated to provide a minimum two-year time-of-travel from any point within the simulated basin footprint to the nearest public water supply well identified as likely to be in operation in the future. Simulated time-of-travel under the effluent recharge scenarios is discussed in Section 4.3.3.

It is assumed that the time-of-travel regulatory constraint applies to groundwater pathways and not to groundwater that discharges to surface waters and that is induced to flow back into the groundwater by a public water supply well. Although such multiple pathways may exist downgradient and downstream of the infiltration site (via Old Crane Pond to the north/northwest to the stream flowing past the Norton well field), it is likely that significant dilution and attenuation of water quality constituents will occur along such a pathway.

4.2.3 Lower Permeability Sediment Layering

In the 2008 investigation, a three-foot thick interval of silty sand, notably finer than the sands above and below it, was encountered below the water table at the boring for the installed well, MW-5. Because an areally-extensive layer of silty sand like this could significantly limit the total infiltration capacity, the 2013 hydrogeological investigation included specific activities to characterize the geologic layering, including newly drilled wells to bedrock, the geophysical surveying, and the pilot load test. Based on these field data collection efforts and subsequent interpretation and modeling, it was determined that the previously defined silty interval at MW-5 does not represent a layer of site-wide areal extent, and its possible lateral extent is not substantial enough to warrant a significant loading rate limitation.

4.2.4 Seasonal High Water Levels

Data and interpretive evaluations from the USGS and NOAA/Climate Visualization Center for the November 2013 data were used to assess the water table conditions during the field work period. The information from the USGS and NOAA appear in **Appendix G**, including 119 years of the Palmer Drought Severity Index (PDSI) and over five decades of long-term monitoring well data from selected sites in Southern Massachusetts.

USGS long-term observation well records provided one set of data for determining climatic/seasonal conditions during the field work period. One well, located in Norton, was used to perform this assessment. Statistical analyses of the long-term records from this well, the hydrogeologic settings, and the October 2013 departure-from-average conditions are presented in Appendix G. This

information showed that the field data collection activities were conducted when water levels were below average. The PDSI provided the same indication.

A correlation-comparison approach, based on a methodology documented by the USGS (Frimpter, 1981), was applied to produce estimated increases from average levels to seasonal high water table elevations. The USGS correlation method utilizes USGS long-term observation well records (Appendix G) to provide an indication of climatic/seasonal conditions. The method specifies that a long-term observation well be identified that is located in a similar hydrogeologic setting. Once an appropriate USGS well is identified, the current period data and trends in the record for the long-term well are compared to the data from the site-specific monitoring well.

The difference between current water level and the average seasonal high water table at the long-term well is then used to define the same difference at the site-specific location. For the Pine Street site, this assessment was based on records from a long-term well in Norton (USGS site 415812071111101), which was installed in terraced geologic sediments in an "upland" location. This is a similar hydrogeologic setting to the site. A reading was taken on November 1, 2013 at the Norton USGS well at a water level below ground surface (bgs) of 9.41 feet to represent October groundwater conditions. The median (50th percentile) water level for October was 8.25 feet bgs. This indicates that the November 1, 2013 water level reading is below average.

Therefore, water levels at the site measured during October through November 2013 represent below average water table elevations. This indicates that groundwater flow modeling based on the measured levels would represent below average water table conditions. To accommodate for this representation, seasonal high water level conditions were evaluated. This was performed to estimate the potential impact on the estimated maximum effluent loading rates predicted by the modeling. The increases were then added to the predicted water table elevations under future conditions with maximum loading rates being applied, as presented in Section 4.3.

In order to estimate how much higher the seasonal high water level would be at the site, the difference between the median water level in October and the median seasonal high water level was computed using the USGS observation well's data. The median seasonal high water level was determined to be in March when water levels in Massachusetts are typically at their highest during the year. In March, the median seasonal high water level at the Norton USGS well is reported as 5.48 feet bgs. The difference of 3.93 feet indicates how much higher the median seasonal high water level would be than the conditions to which the model was calibrated at the site.

The site's water table simulation was examined to evaluate what impact a general rise of 3.93 feet would have on the infiltration area for the simulated scenarios. This evaluation was performed in addition to maintaining at least a 4-foot separation distance between the ground and the top of the groundwater mound for a total of 7.93 feet, or approximately 8 feet.

4.2.5 Water Table Rise in Adjacent Areas

The modeling-based analysis of higher water table elevations caused by simulated infiltration at the site included evaluation of potential impacts on adjacent areas, which include wetlands and existing seepage face zones, certified vernal pools, and residential properties.

A vernal pool is a contained basin depression lacking a permanent above ground outlet. In the Northeastern United States, vernal pools fill with water due to the rising water table of fall and winter and runoff from melting snow and rainstorms. Many vernal pools in the Northeast are covered with ice in the winter months. They contain water for a few months in the spring and early summer. By late summer, a vernal pool is generally, but not always dry. There are certain flora and fauna species that rely on this cycle. The Massachusetts Wetlands Protection Act regulations protect certified vernal pools, by including stipulations of maintaining a 150-foot restricted construction buffer area beyond the boundary of each certified vernal pool. There are two certified vernal pools relatively close to the "plateau area" where effluent application was simulated, as shown in **Figure 1-1**. These vernal pools could limit the capacity of the site if the water rise caused by application rises too much, causing persistent ponding within them.

4.2.6 Surface Water Quality

As indicated in Section 2.4.6, the evaluation of surface water quality data collected during the 2013 field program indicated that the two ponds adjacent to the site are phosphorus-limited. Based on a conceptual modeling premise that phosphorus would not migrate in groundwater, and therefore not discharge into the ponds, the concern focuses on potential nitrogen transport and discharge. Therefore, predictive groundwater modeling of potential infiltrated effluent migration and discharge was performed, and then examined in conjunction with the field data based evaluation, for helping develop recommendations regarding infiltration basin layout.

4.3 Effluent Load Application Scenarios and Preliminary Design Layout

Effluent loading simulations focused on the ability of the aquifer to conduct the infiltrated water away from the recharge area, without significant impacts in terms of water table mounding . The initial areal extent was determined based on maintaining a maximum infiltration rate of 14 gpd/ft^2,as calculated from the pilot load test. With consideration of potential limiting factors as described in Section 4.2, the primary, steady-state effluent loading scenario simulated was:

- 1.0 mgd infiltration on 2.4 acres of upland area of the site

Sensitivity analyses and supporting model simulations were performed to supplement the findings from the primary model scenario. The sensitivity model simulations were:

- 1.5 mgd infiltration on 4.0 acres of upland area of the site
- Spatially-targeted, variable infiltration rate if applied to 4.0 acres of upland area of the site

Prior to commencing the predictive simulations, the existing conditions were reviewed, based on the updated calibrated groundwater flow modeling results. Water table mounding was evaluated by plotting the "separation distance", or "depth-to-water" between the simulated water level with effluent loading and the ground surface.

Based on the results of the primary loading scenario and sensitivity analyses, an infiltration basin preliminary design was developed.

4.3.1 Preliminary Design Layout of Infiltration Basins

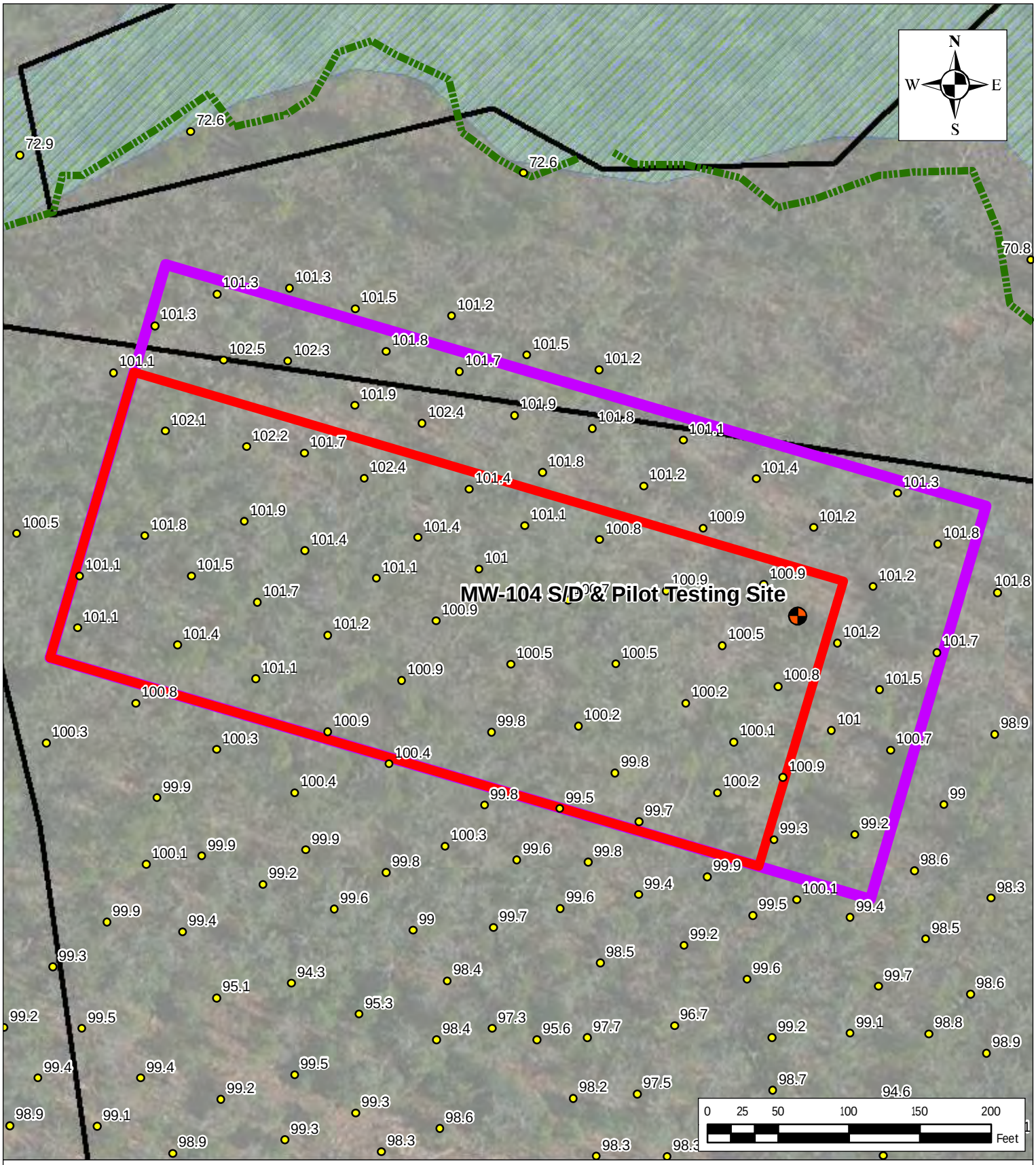
Figure 4-1 shows the location of the simulated infiltration basin areas with spot topographic measurements. The smaller, 2.4 acre area was used to simulate the 1.0 mgd infiltration rate. For sensitivity analyses, the 4.0 acre area was used to simulate the 1.5 mgd infiltration rate and the spatially-targeted variable rate. This larger extent is based on potential expansion to areas with a ground surface elevation of approximately 100 feet NAVD88.

Figure 4-2 shows the simulated water table elevation under non-loading, existing conditions. **Figure 4-3** shows the simulated separation distance between the water table and ground surface (depth-to-water) similarly without effluent loading. As previously mentioned, the effluent application zone was situated entirely within the plateau area in the upland area of the site. The rectangular shape was used to represent a general footprint of the infiltration basin setup. Greater detail is considered as part of the preliminary design. The placement of the infiltration basin area is an attempt to balance the following:

- A location on the plateau, where the largest separation distance exists between the ground surface and the water table, nearby surface water features and wetland;
- A distance furthest away from any potential abutters; and
- A location within relative close vicinity to the Mansfield WPCF.

4.3.2 Targeted Design Loading Rates

The predictive simulation results were used to estimate the overall design loading rates for each basin layout simulated, representing the average flow rate that is needed to sustain the proposed infiltration rate in total. Infiltration rates per square foot were calculated. For conducting estimates of infiltration rates, the simulated maximum allowable effluent loading flow rate was divided by the land area of the effluent recharge zones as shown in **Figure 4-1**.



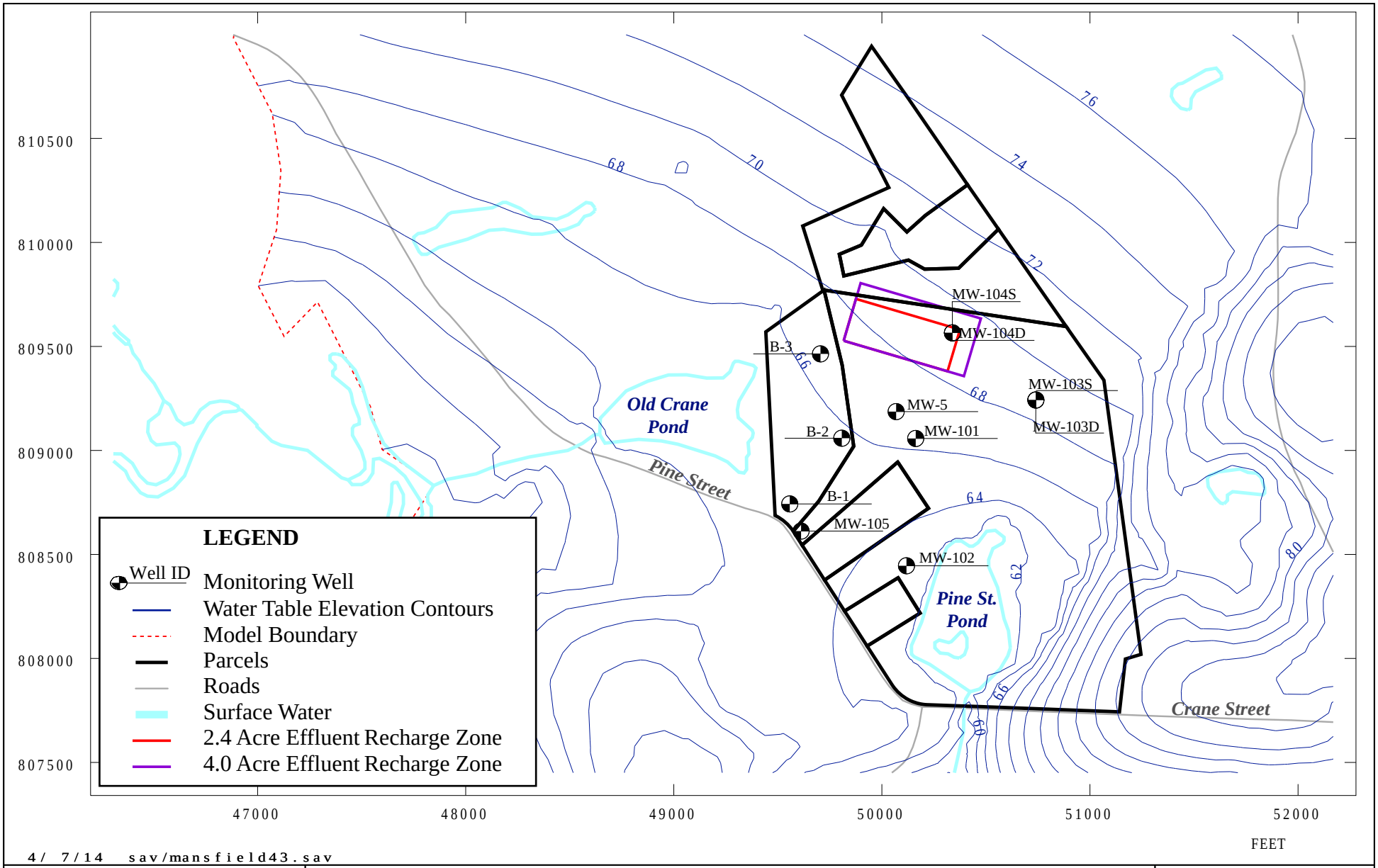
LEGEND

- Aerial Surveyed Ground Surface Elevation (ft NAVD88)
- 2013 New Groundwater Monitoring Well
- 2.4 Acre Effluent Recharge Zones
- 4.0 Acre Effluent Recharge Zones
- Surveyed Wetland Boundary
- DEP Wetlands
- Parcel Boundary

CDM Smith

Effluent Recharge Zones
Pine Street in Norton, MA

Figure
4-1

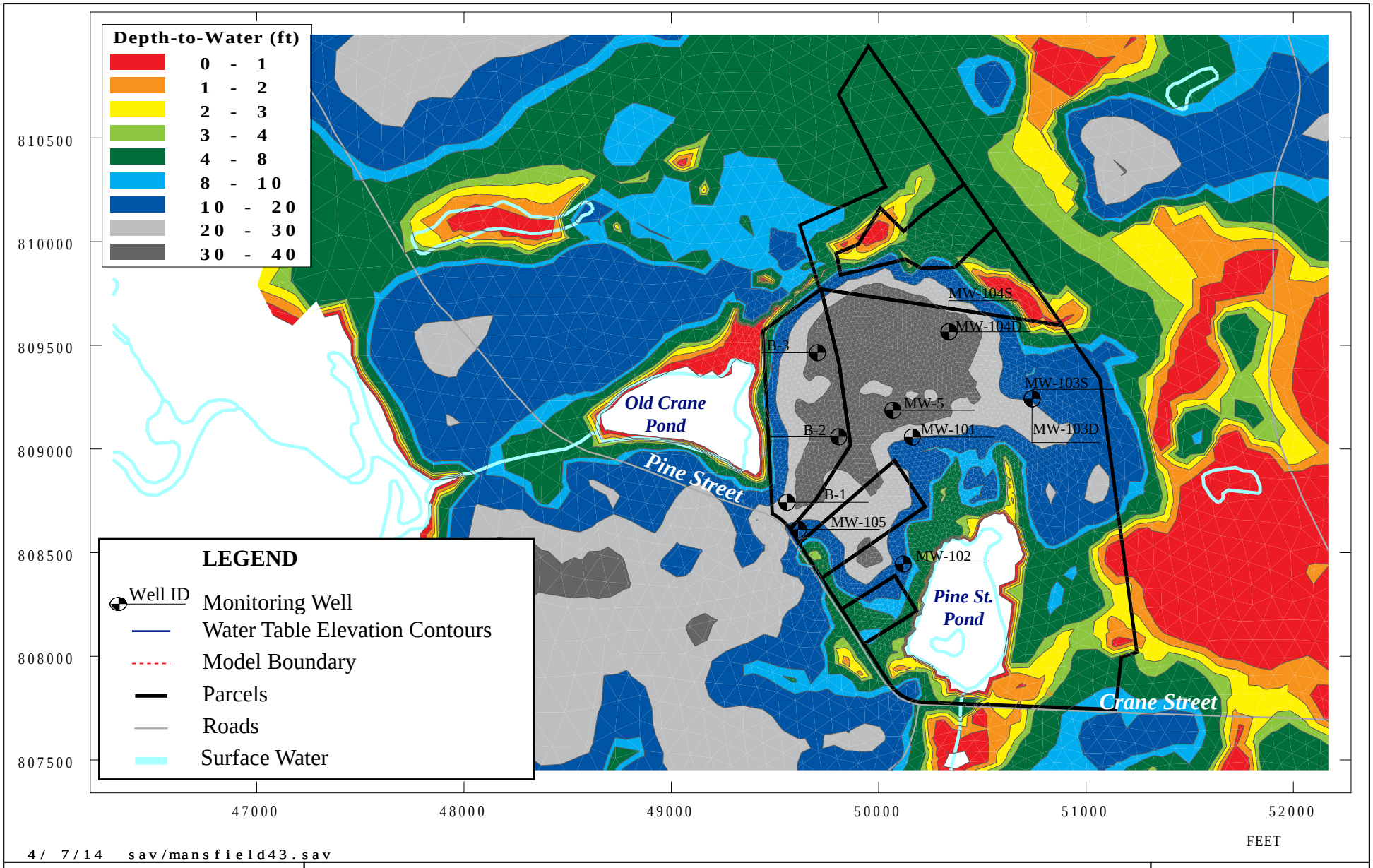


CDM Smith

Non-Loading, Existing Conditions
Simulated Water Table Elevations

Pine Street Site, Norton, MA

FIGURE
4-2



CDM Smith

Non-Loading, Existing Conditions
Simulated Separation Distance (ft) between Water Table & Ground Surface

Pine Street Site, Norton, MA

FIGURE
4-3

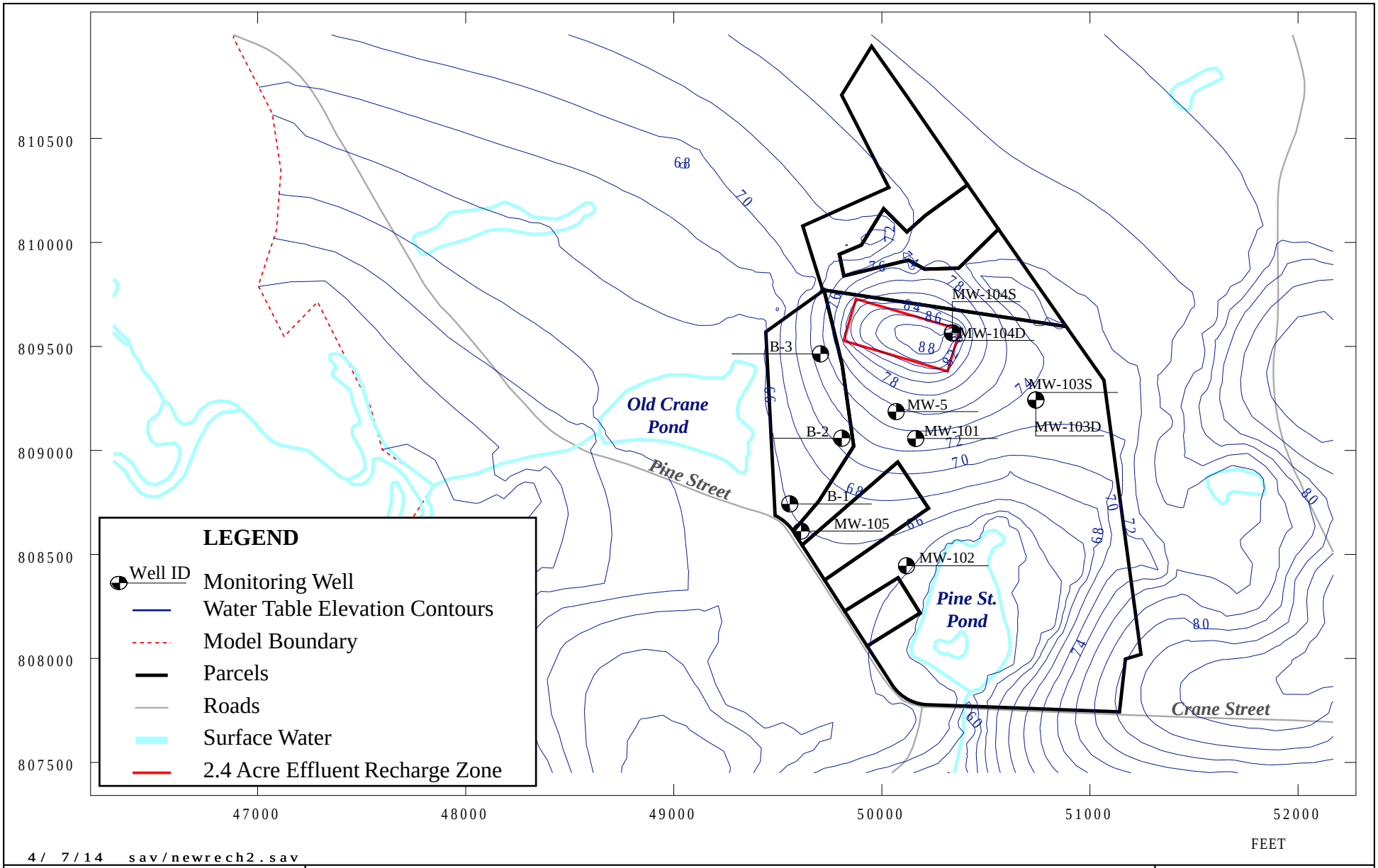
4.3.3 1.0 MGD/2.4 Acre Effluent Recharge Scenario Results

For this scenario, the 1.0 mgd infiltration rate was applied over an area of 2.4 acres, which equates to a scenario loading rate of 9.6 gpd/ft^2. This rate produced an acceptable separation distance of approximately 11.7 feet. Based on the model validation results for the transient simulation of the pilot load test as detailed in Section 3.5.2, the model is slightly higher than observed data in the area of the plateau, so additional conservatism is built into the predicted results. The simulated water table with this application scenario is shown in **Figure 4-4**. The separation distance between the simulated water table and the ground surface (depth-to-water) is shown in **Figure 4-5**.

The 1.0 mgd effluent application scenario was used to simulate the time-of-travel, with the DYNFLOW-produced groundwater flow-field used as the foundation for particle-track simulation. The DYNFLOW-companion mass transport simulation program, DYNTRACK, was used to perform the particle-tracking, with an assumed effective porosity (also called "mobile porosity") of 25 percent. **Figure 4-6** shows the non-dispersive particle tracks that were simulated by placing particles around the closest edge of the infiltration area and simulating their migration. Each tick mark shown on the figure indicates a one-year time-of-travel. Based on this simulation, most of the particles migrate to surface water bodies and wetlands within a year, without migrating directly to the well field. There was only one particle, placed on the southwestern edge of the infiltration area, which migrated to Well #1. It was simulated to take over four years to reach the well, including two years or more before reaching the delineated Zone II. The time-of-travel was further evaluated as part of the preliminary basin design scenario in Section 4.3.5 below.

Based on the predicted water table increase and the typical seasonal water table variations evaluated in Section 4.2.4, along with the simulated initial depths-to-water, it is concluded that the simulated effluent application rates are not likely to cause significant impacts (i.e. permanent ponding) at the certified vernal pools closest to the site. The ground surface near the two vernal pool sites is approximately 67 feet NAVD88. At MW-105, the closest monitoring well to the vernal pool sites, the observed water table elevation during the 2013 sampling period was 63.4 feet NAVD88. With the average seasonal high water table variation of 4 feet and a simulated water table rise of no more than 1.4 feet, the vernal pools could maintain both wet and dry seasonal conditions. The preliminary design layout kept the infiltration area as far away from the vernal pools as possible so as to limit the water table rise near these pools. As indicated in Section 6 Monitoring Plan, water level monitoring will be conducted at MW-105 to confirm that appropriate seasonal conditions are maintained at the vernal pools.

The discharge modeling consisted of particle-tracking from the entire footprint of the simulated infiltration basin, for the 1.0 mgd/2.4 acre scenario. The particles were distributed evenly throughout the basin footprint, providing the ability to quantify groundwater discharge to the two ponds and wetlands flowing into them, the Norton Well #1, and wetlands/streams east of the site. The predictive simulation indicated that 26% would discharge to Old Crane Pond, 15% to the Pine Street Pond, 1% to the wetlands between the site and Pine Street Pond, 2% to Norton Well #1, 35% to the wetlands to the north, and 21% to the wetlands and streams to the west of the site.

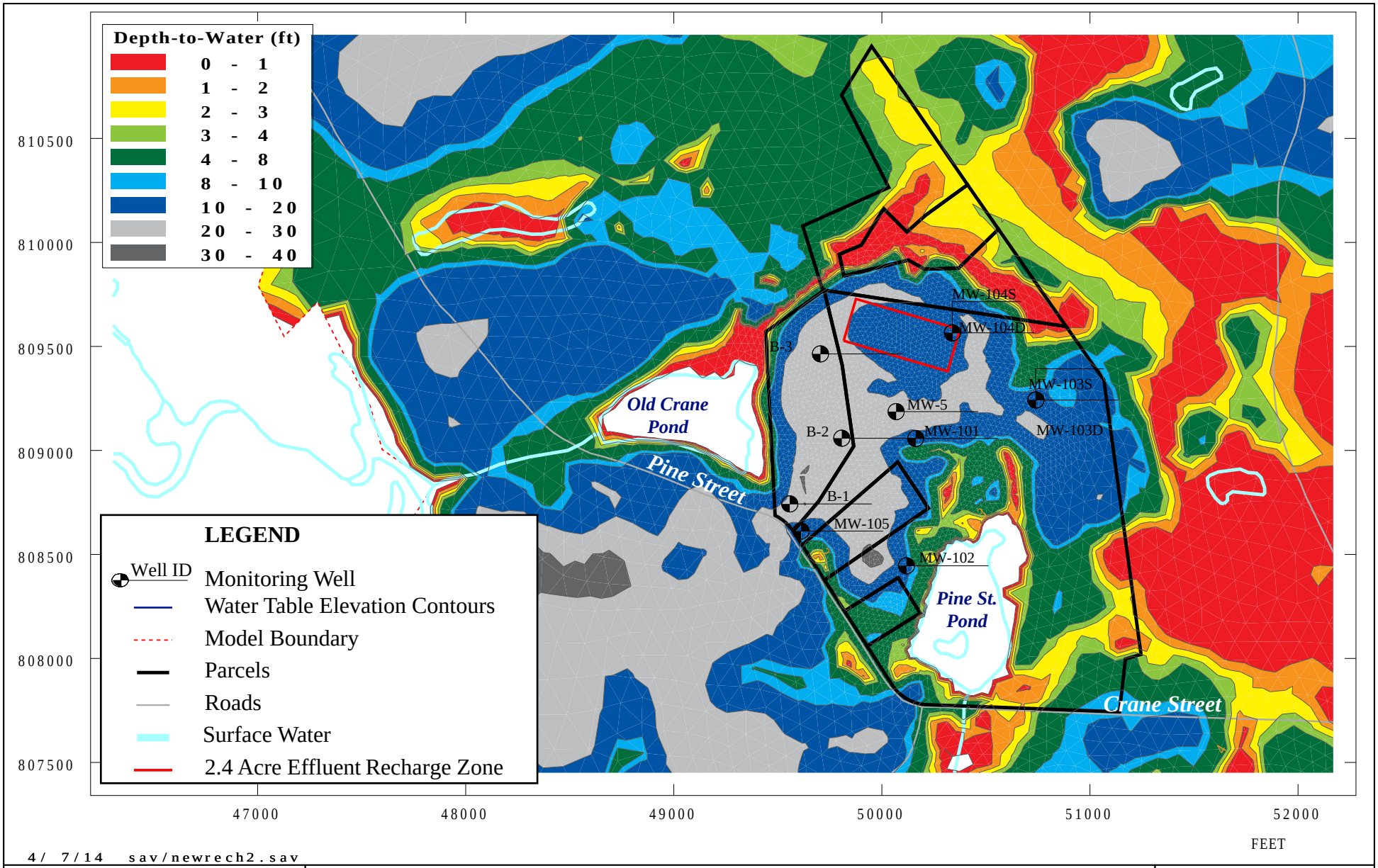


CDM Smith

Effluent Recharge Scenario (1.0 mgd/2.4 acres)
Simulated Water Table Elevations

Pine Street Site, Norton, MA

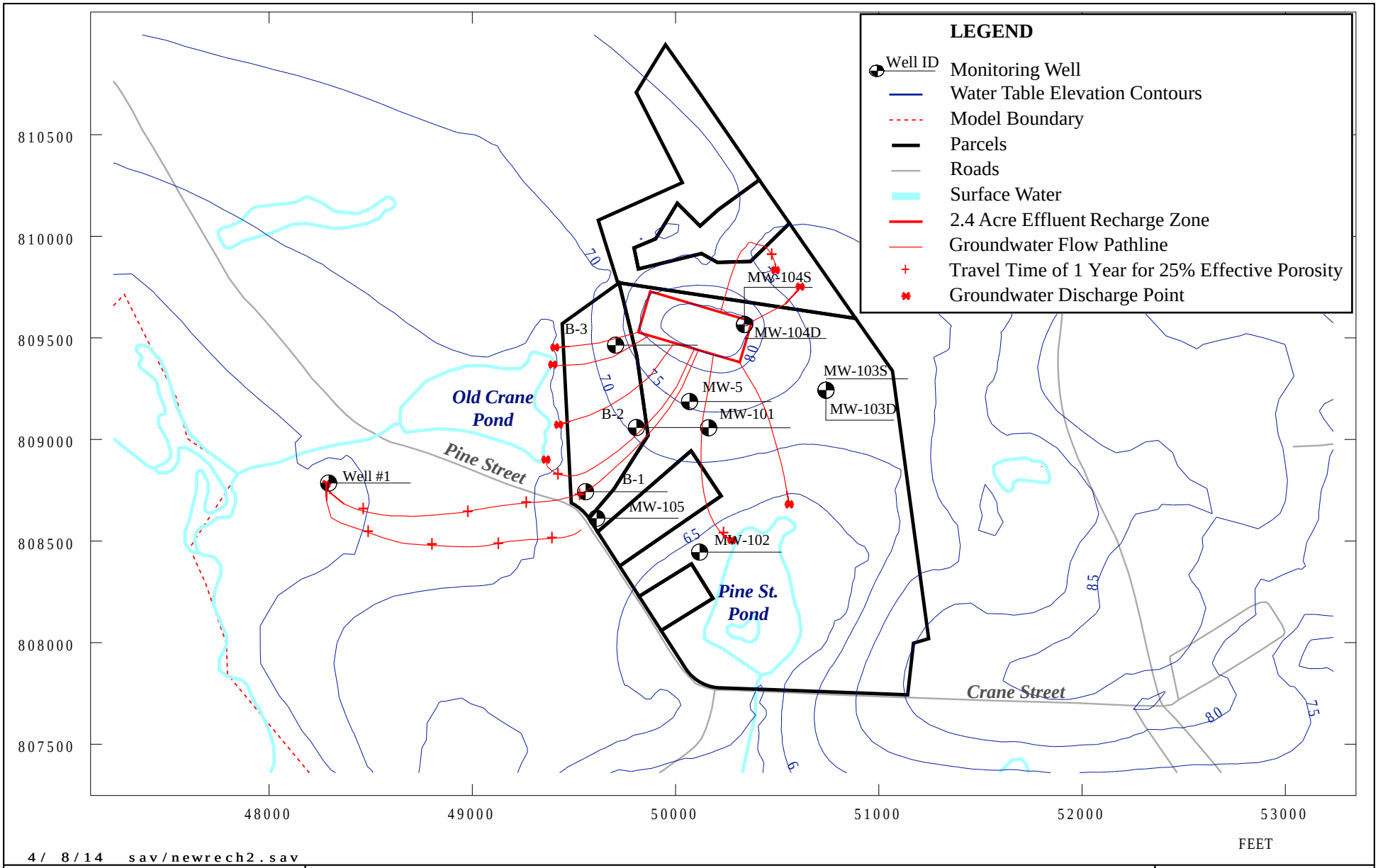
FIGURE
4-4



CDM Smith

Effluent Recharge Scenario (1.0 mgd/2.4 acres)
Effluent Recharge Zones and Simulated Separation Distance (ft)
between Water Table & Ground Surface
Pine Street Site, Norton, MA

FIGURE
4-5



CDM Smith

Effluent Recharge Scenario (1.0 mgd/2.4 acres)
Simulated Time-of-Travel Groundwater Flow Pathlines

Pine Street Site, Norton, MA

FIGURE
4-6

The predictive modeling of nitrate-laden groundwater from the simulated infiltration basin shows that the selected positioning and layout of the basin helps produce a reasonable distribution among the evaluated features. In effect, by positioning the basin toward the north/northeast limit of the plateau area, most of the infiltrated effluent is predicted to discharge to Old Crane Pond, which is anticipated to be able to assimilate the nitrate better than the Pine Street Pond.

4.3.4 1.5 MGD/4.0 Acre Effluent Recharge Scenario Results

This sensitivity scenario based on future needs was performed to predict the impacts of expanding the effluent application zone to accommodate a higher recharge rate. The 1.5 mgd infiltration rate was applied over an area of 4.0 acres, which equates to a scenario loading rate of 8.6 gpd/ft^2. This rate produced a separation distance of approximately 6.5 feet, which is less than the 8 feet theoretically required if seasonal high water levels are considered. The predicted water table elevation is shown in **Figure 4-7**. The separation distance between the simulated water table elevation and the ground surface (depth-to-water) is shown in **Figure 4-8**.

The separation distance simulated for this scenario is caused by water table mounding at the center of the effluent recharge zone. This led to further testing of an effluent recharge regime that targeted areas within the designated zone to accomplish an infiltration rate of at least 1.5 mgd.

Spatially-Targeted Variable Effluent Recharge Scenario Results

As stated above, since the 1.5 mgd/4.0 acre scenario did not produce the required separation distance, development and analysis of a strategic effluent recharge regime was performed. The 1.0 and 1.5 mgd scenarios, as described above, assumed an average, uniform loading rate over the entire recharge area. This produced maximum mounding of the water table at the center of the effluent recharge zone, which minimized the separation distance between the surface of the water table and the ground surface. Since mounding occurs at the center of the simulated infiltration basin, effluent recharge, if varied spatially and thus away from the center of the basin, could support a higher rate and still maintain the minimum separation distance.

Cross-sectional profiles through the effluent recharge zone indicated that additional distance from the top of the water table to the ground surface was available along the edges of the effluent recharge zone. Therefore, an enhanced scenario that maintained an appropriate separation distance over the entire effluent recharge zone of 4.0 acres that accounts for the MassDEP separation requirement of four feet and the seasonal high groundwater level, as described in Section 4.2.4, was simulated. The results demonstrated that this strategic, spatially-targeted effluent recharge scenario with recharge of a higher rate around the perimeter and a lower rate at the center of the zone can accommodate an infiltration rate of at least 1.5 mgd. The results of this spatially-targeted sensitivity analysis were used to develop the infiltration basin preliminary design, described in the next section.

Continuous monitoring of water level at MW-104S and MW-104D is proposed so as to determine the impact of effluent recharge once the basins are in operation. The system will be evaluated based on the data collected as part of the monitoring program to determine whether these future needs can be achieved.

4.3.5 Preliminary Basin Design Scenario Results (1.0 mgd)

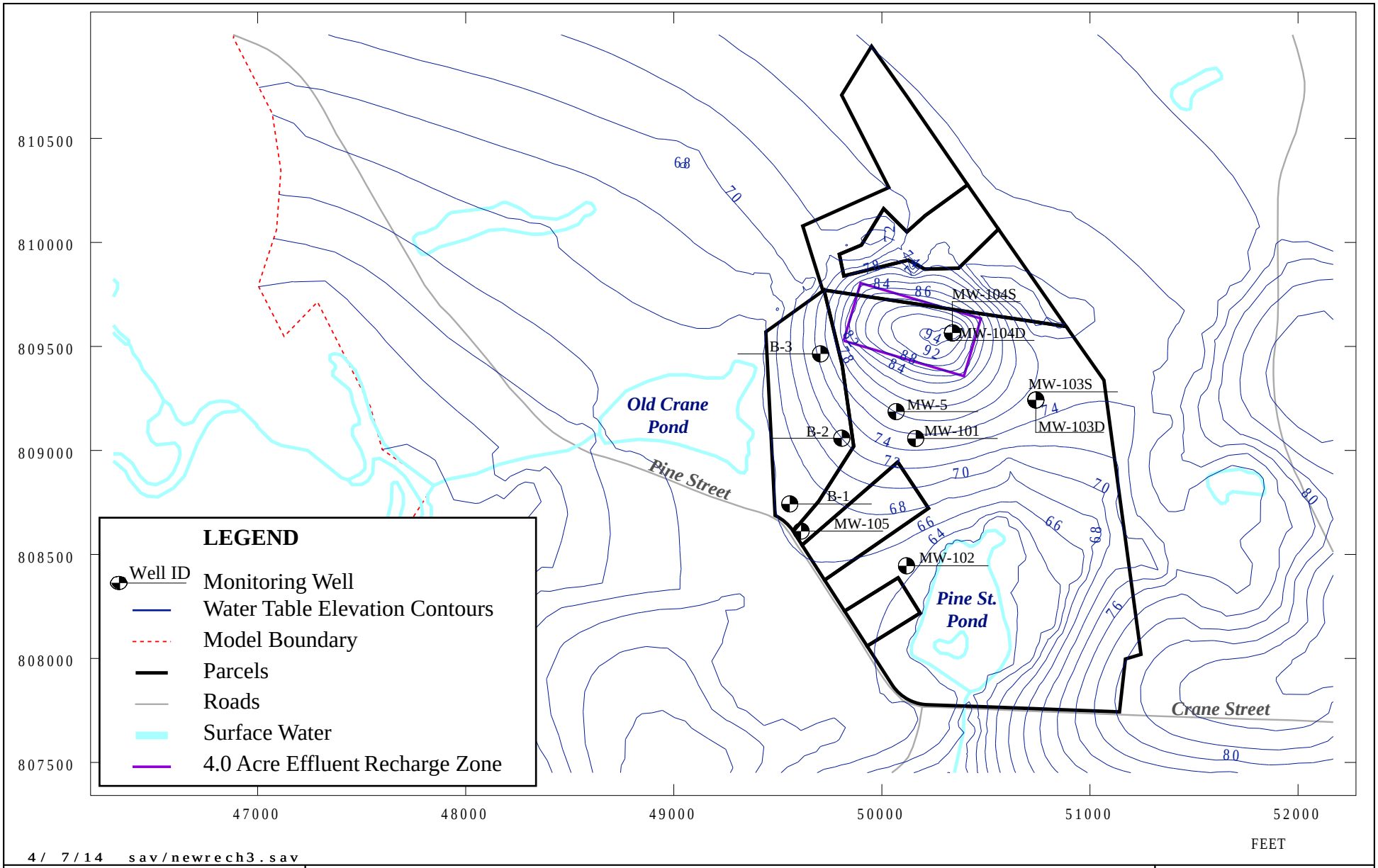
Based on the predicted results from Section 4.3.3 and 4.3.4, four effluent recharge basins were sited on the plateau area. Spacing between basins was included for vehicle access. Estimates for excavation between 2.5 to 4+ feet and re-grading the basin bottoms to a minimum elevation of 95.5 feet were incorporated into predictive simulations. Simulated effluent recharge was applied only at the bottom

of the basins. Each basin is approximately 0.7 acres (30,000 ft^2) with a total of 2.8 acres (120,000 ft^2) to be used for recharge. This equates to a design loading rate of 8.3 gpd/ft^2. **Figure 4-9** shows the proposed basin layout with the predicted water table elevation. **Figure 4-10** shows the separation distance. Based on the predictive simulation, the minimum separation distance is approximately 10 feet. This allows for both the recommended separation distance of 4 feet and the seasonal high groundwater table fluctuation of another 4 feet.

The effluent recharge basins are sited completely outside the Zone II area delineated for the Norton water supply wells. The time-of-travel to the Zone II area and Norton water supply Well #1 was estimated to be over 2 years to the outer limit of the Zone II area and 4 years to supply Well #1. Based on this travel time, regulations (314 CMR 5.10 (4A)(a)(3)) stipulate a Total Organic Carbon(TOC) limit of 3 mg/L unless otherwise determined by the Department.

It should be noted that it will be several years before effluent will be recharged at a rate of 1 mgd. A time-of-travel analysis was conducted for effluent recharged at a rate of 0.8 mgd, representing a start-up recharge rate. At this rate, it took nearly 5 years for the effluent to travel to the supply well. This is significantly longer than the 2-year travel time stipulated in the regulations (314 CMR 5). As a result of this travel time, it is recommended that no TOC limit be established at this time.

During the start-up period, a monitoring program will be implemented to evaluate water level and water quality at the effluent recharge site. As indicated in Setion 6, monitoring will be conducted on a quarterly basis. Water quality and time-of-travel will be evaluated based on the data collected at the site prior to increasing the effluent recharge limit to 1 mgd.

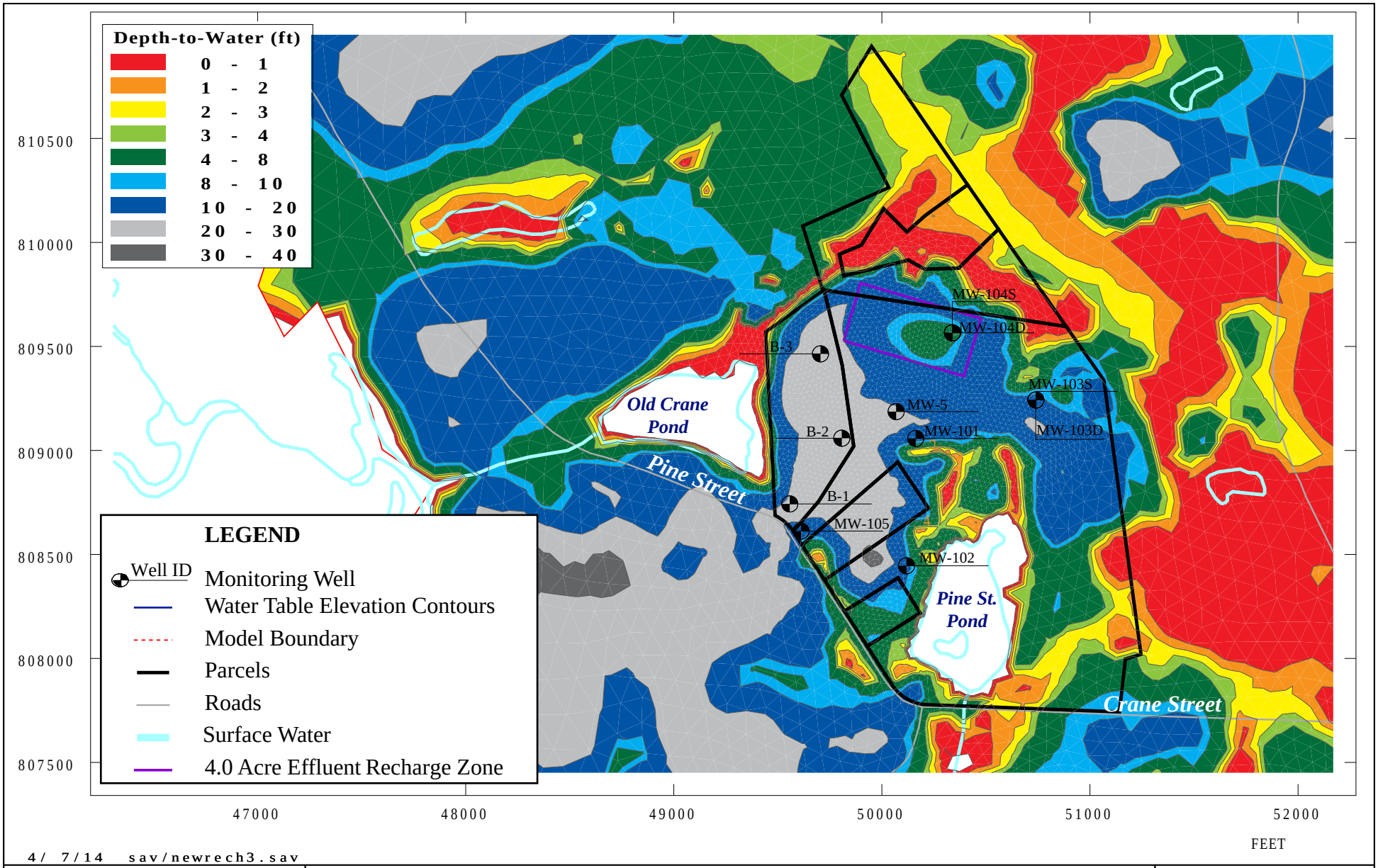


CDM Smith

Effluent Recharge Scenario (1.5 mgd/4.0 acres)
Simulated Water Table Elevations

Pine Street Site, Norton, MA

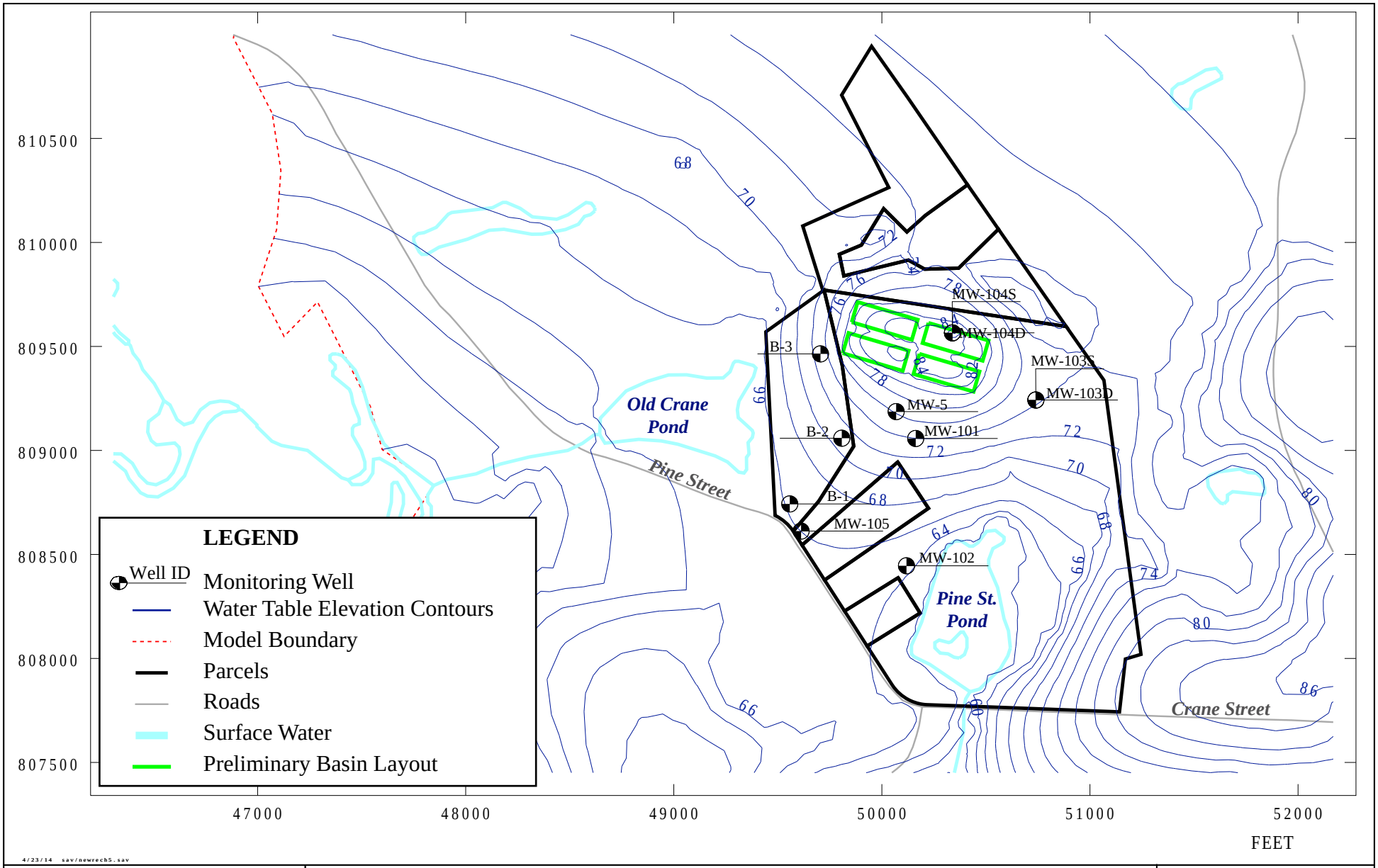
FIGURE
4-7



CDM Smith

Effluent Recharge Scenario (1.5 mgd/4.0 acres)
Effluent Recharge Zones and Simulated Separation Distance (ft)
between Water Table & Ground Surface
Pine Street Site, Norton, MA

FIGURE
4-8

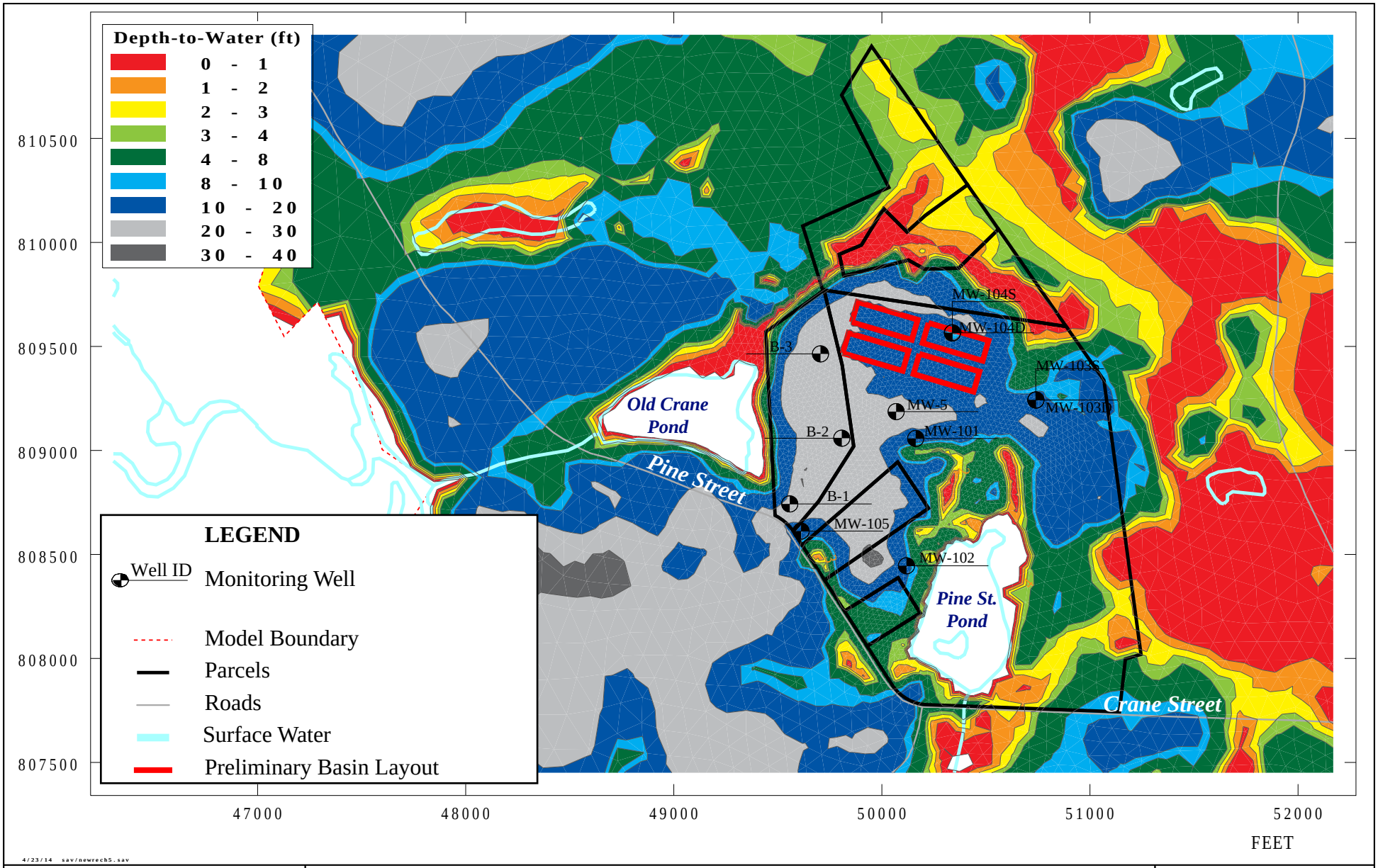


CDM Smith

Preliminary Basin Design Effluent Application Scenario
Simulated Water Table Elevations

Pine Street Site, Norton, MA

FIGURE
4-9



CDM Smith

Preliminary Basin Design Effluent Application Scenario
Effluent Recharge Zones and Simulated Separation Distance (ft)
between Water Table & Ground Surface
Pine Street Site, Norton, MA

FIGURE
4-10

Section 5
Conclusions and Recommendations

5.1 Conclusions

The primary result of the field data-collection and groundwater modeling efforts is that the site is predicted to be capable of infiltrating a steady rate of 1.0 mgd with potential for up to 1.5 mgd, using an infiltration basin area that would be nestled into the northeast quadrant of the site in the "plateau area".

In addition, the loading scenarios that were developed and simulated are predicted to produce impacts that would meet all regulatory limits, as was the case for the prior evaluations conducted.

The major differences between the modeling effort conducted in 2008 and the current set of results are as follows:

- The 2013 field work included a pilot load test that provided a stronger basis for estimating a design loading rate than the infiltrometer tests used in 2008. The average pilot loading rate was approximaltey 144 gpd/ ft^2. Based on these results, a very conservative loading rate of 14 gpd/ft^2 (approximaltey 10 percent) was assumed for analysis and design. Although higher than MassDEP guidance of 3 to 5 gpd/ft^2, USEPA guidance allows pilot load test results to be used to increase the design loading rate estimate significantly above the rates that would be estimated through use of methods such as infiltrometer tests.
- The recent field work also demonstrated that the silty-sand interval, identified during the installation several years ago of monitoring well MW-5, is not areally-extensive and thus does not represent a significant impediment to infiltration capacity, either vertically or horizontally.
- Also confirmed by the field work was the thickness of sandy overburden sediments above the bedrock and till that appears to mantle the bedrock in some areas. In addition, the hydraulic testing, including the pilot load test and slug tests, along with groundwater flow model updating, showed that the local water table aquifer has a higher lateral flow capacity (called "transmissivity") than simulated in the prior 2008 study. This finding has contributed to the confidence in estimation of the design loading rate cited above, and the determination that the predictive modeling adequately characterizes the situation in terms of potential impacts.

5.2 Recommendations

The following are recommendations to guide subsequent stages of the overall implementation process. The recommendations are intended to guide the infiltration basin design and operations toward achieving acceptable results in terms of site infiltration capacity and avoiding unacceptable impacts.

To help achieve acceptable infiltration capacity and associated impacts, the following recommendations have been developed, focusing on the positioning and layout of the infiltration basins as guided by the modeling results, while also targeting operational considerations based on the pilot testing results and the predictive modeling.

- Basin positioning and layout: Nestle the basin(s) into the far north/northeast quadrant of the plateau area. This will produce the following benefits:
  - Sufficiently long times-of-travel to the Norton well field located to the southwest are predicted to occur. Although the modeling shows at least two years of travel-time from the edge of the Zone II delineated to the Norton supply wells no matter where the infiltration basin area is located, extra buffering is created by positioning the basins as far from the well field as possible. Over four years of travel time to the supply well is predicted when 1 mgd is recharged at the basins.
  - Adequately small amounts of water table mounding are predicted at the two closest vernal pools to the site, which are beyond the southwest limit of the site. Thus, by placing the infiltration area as far to the northeast as possible, the water table rise at these two vernal pools is limited further when compared to other possible basin positions.
  - Similarly, adequately small amounts of water table rise are predicted to occur at the closest residential properties, and thus, there would be no concern related to potential septic system or basement flooding. As with the vernal pools and Norton water supply well field, the homes in question are in the general southwest direction, further substantiating the reasons for keeping the infiltration area in the site's northeast quadrant.
  - Because the closest pond south of the site (the Pine Street Pond) appears to be somewhat more susceptible to water quality impacts from additional nitrogen than the adjacent pond to the north/northwest (Old Crane Pond), it is advantageous for the highest percentage of effluent to discharge to Old Crane Pond. This is achieved by the recommended positioning of the infiltration area in the northeast site quadrant. Both ponds are currently phosphorous limited.
- Operational considerations:
  - For maximizing the total rate of infiltration given a fixed infiltration-area boundary, the simulation modeling has shown that the portion of the designated area along the perimeter should receive a higher net long-term rate of flow than the central portion. This is because the site is atop a local groundwater mound with essentially radial flow toward the local ponds and wetland areas. Therefore, the water table under ambient as well as infiltration-loaded conditions drops off approaching the edges of the plateau, offering more separation distance (I.e. depth to groundwater).

Current project plans call for in-field investigation during the spring 2014 season to identify presence of vernal pool habitat in the project area. Observations will be conducted to document presence, or absence, of obligate vernal pool indicator species such as amphibian

egg masses (e.g. Ambystoma maculatum or Rana sylvatica). The evaluation of these vernal pools will be submitted to the Norton Conservation Commission for concurrence.

The following section proposes a monitoring plan to establish baseline water level and water quality conditions as well as long-term monitoring once effluent recharge commences at the proposed site.

Section 6

Monitoring Plan

6.1 General

The following is a recommended groundwater monitoring plan which focuses on monitoring the mounding effects due to effluent recharge as well as impact to groundwater quality based on an established baseline. All discharge nutrient requirements will adhere to the groundwater discharge permit regulations and will be attained at the treatment plant. This program is designed to monitor anticipated constituents that will likely be included in the discharge permit and ones that are currently in the town's existing discharge permit. This section identifies sampling locations, a baseline monitoring plan that would occur prior to effluent recharge, and a long-term monitoring plan once effluent recharge has commenced.

6.2 Monitoring Points

It is recommended that six of the newly installed monitoring wells at the Pine Street site be monitored as part of the long-term monitoring plan to assess impact to groundwater as a result of the proposed effluent recharge at the site. The locations of these wells are shown on Figure 2-1. Below are the wells proposed to be monitored and the purpose of each:

MW-101 – Downgradient of the proposed effluent recharge area and upgradient of the nearest private property; monitor water level rise near private property.

MW-102 – Downgradient of the proposed effluent recharge area and upgradient of the other private property near the site; monitor water level rise near private property and wetlands.

MW-103S – Monitor water level rise and water quality east of the site.

MW-104S – Provide water quality data in the shallow aquifer below the effluent recharge site; monitor mounding at the recharge site.

MW-104D – Provide water quality data in the deep overburden aquifer at the effluent recharge site; monitor mounding at the recharge site.

MW-105 – Provide water quality data immediately upstream of the Norton well field property; provide water levels for monitoring the vernal pools.

6.3 Monitoring Parameters and Frequency

It is recommended that groundwater at each of the six wells listed above be sampled and analyzed for the following parameters at the frequency shown:

Parameter	Frequency
pH	Monthly
Static Water Level	Daily (2 wells)/Monthly (all wells)
Specific Conductivity	Monthly
Nitrate Nitrogen	Quarterly
Ammonia - Nitrogen	Quarterly
Total Nitrogen	Quarterly
Total Organic Carbon	Quarterly
Total Phosphorus	Quarterly
Orthophosphate	Quarterly
Boron	Quarterly
Volatile Organic Carbons	Annually

It is recommended that baseline monitoring of the above parameters be conducted for one year prior to the planned start of effluent recharge at the site. It is also recommended that water levels at MW-105 and MW-104S be taken using a pressure transducer that automatically takes readings at least once a day. This will allow for close monitoring of seasonal variability near the vernal pools and effluent loading site. At the other locations, water levels will be taken on a monthly basis. A baseline report will be submitted at the end of that one year that establishes background groundwater quality and pre-loading water table elevations. Once the construction of the effluent loading basins is completed, there will be annual reporting of the above parameters.

Section 7
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CDM Smith

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APPENDIX C

MFN REGIONAL WASTEWATER DISTRICT FACILITIES MAP

Appendix E - Description of Common District System

Norton Assessors ID	Location
Map 29 Lot 60	74 Hill Street, Norton (Wastewater Treatment Facility)
Map 24 Lot 4 & Map 24 Lot 63	Pine Street, Norton (Former Reilly Property)
Map 29 Lot 36	125 Crane Street, Norton (Former Kok Property)
Map 29 Lot 10-02	Rear Crane St (Sewer easement only)
Map 24 Lot 6	Rear Pine Street, Norton (Parcel abutting Railroad parcel)
Map 29 Lot 13	Rear Crane Street, Norton (Parcel abutting Railroad parcel)
Map 24 Lot 52	Rear Hill Street, Norton (Parcel abutting Railroad parcel)
Map 4 Lot 311	Rear N Washington Street, Norton (AKA Railroad Parcel)
Map 10 Lot 487-02	N Washington Street, Norton (AKA Railroad Parcel)
Map 10 Lot 522	N Washington Street, Norton (AKA Railroad Parcel)
Map 17 Lot 96	East Main Street, Norton (AKA Railroad Parcel)
Map 24 Lot 8	Rear Hill Street, Norton (AKA Railroad Parcel)
Map 29 Lot 54	Rear Crane Street, Norton (AKA Railroad Parcel)
Map 3 Lot 428	Woodland Road, Norton (Sewer easement to Common District System manhole No. 1 along Railroad portion of the Airport Parcel)

Mansfield Assessors ID	Location
Map 36 Lot 16	175 Fruit Street, Mansfield

(Easements for Sludge Landfill cells, pump station, utilities and related facilities)

Please refer to enclosed Figure 1 - Common District System Map

Figure 1 - Common District System

Water Pollution Control Facility

1 inch = 500 feet

0 500 1,000 2,000 Feet

0 0.2 0.4 Miles

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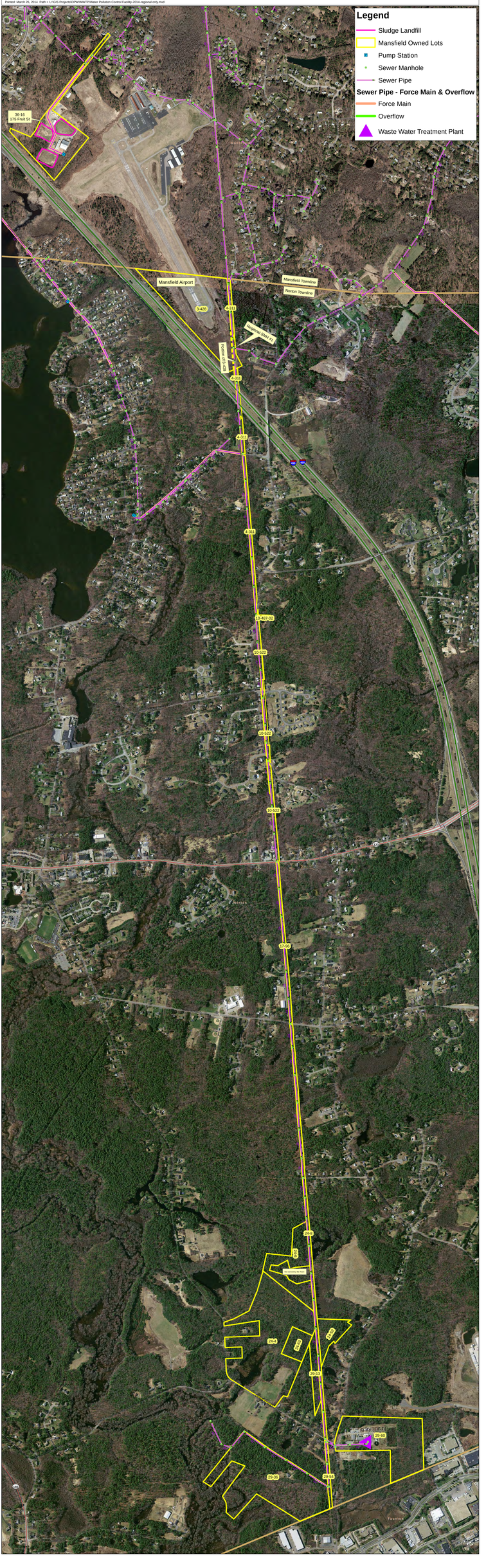

APPENDIX D

TOTAL COSTS PER COMMUNITY OVER 30 YEARS

Client: Mansfield, Massachusetts
Project: MFN Costs assuming 1.0 mgd expansion
Updated 10/24/2013

Project Costs (Excluding O&M Costs)

	1/2013 (ENR 9437)
Expansion Flow Capacity Allocation	$18,090,000
Expanded Total Flow Capacity Allocation (4-Stage Bardenpho & Phase 2)	$18,020,000
Total	$36,110,000

Construction Costs (& related construction engineering services)

	1/2013 (ENR 9437)	10/2017 (Const. midpt)	Construction Cost w/interest
Expansion Flow Capacity Allocation	$14,430,000	$16,600,000	**$23,500,000**
Expanded Total Flow Capacity Allocation (4-Stage Bardenpho & Phase 2)	$16,270,000	$18,800,000	**$26,600,000**
Total	$30,700,000	$35,400,000	**$50,100,000**

Design Costs

	1/2013 (ENR 9437)	10/2014 (Design start)	Design Cost w/interest
Expansion Flow Capacity Allocation	$1,550,000	$1,600,000	**$2,500,000**
Expanded Total Flow Capacity Allocation (4-Stage Bardenpho & Phase 2)	$1,750,000	$1,800,000	**$2,800,000**
Total	$3,300,000	$3,400,000	**$5,300,000**

Land Acquisition Costs

	10/2010 (ENR 8921)	Land Cost w/interest
Expansion Flow Capacity Allocation	$2,107,500	**$2,600,000**
Total	$2,107,500	**$2,600,000**

O&M Costs

	FY2012	Full WWTP Capacity
Expansion Flow Capacity Allocation	$2,865,000	$3,805,000
Total	$2,865,000	$3,805,000

Notes/Assumptions

1. All construction costs with the exception of the Phase 2 Facilities Assessment items were developed in January 2013 (ENR 9437). Construction costs include standard 22% for General Conditions/Contractor's Overhead and Profit and a construction contingency of 25%.
2. Construction costs for Phase 2 facilities assessment items are from March 2011 CDM Smith report "Water Pollution Control Facility - Evaluation of Expansion Alternatives" (costs were developed in October 2010 ENR 8920 and were adjusted to January 2013 ENR 9437).
3. Design begins 10/2014. Design lasts 18 months
4. Construction begins 4/2016. Construction lasts 30 months. First SRF payment begins in FY2016.
5. Construction cost escalation to midpoint of construction estimated at 3% per year.
6. Design cost escalation to beginning of design estimated at 3% per year.

7. Bond for Design is assumed to be 20 years at 4.5%	0.045	20 yrs
8. Loan for Construction is assumed to be 30 years at 2.4%	0.024	30 yrs
9. Loan for Land is assumed to be 20 years at 2%.	0.02	20 yrs

10. Design, Construction & Land Acquisition Costs for Expansion Flow Capacity Allocation based on following Percent Owned per Town:

Mansfield	66.5%	0.665
Foxborough	17.0%	0.170
Norton	16.5%	0.165
		1.00

11. Design and Construction Costs for Expanded Total Flow Capacity Allocation (4-Stage Bardenpho & Phase 2 Items) are based on the following Percent Owned per Town:

Mansfield	63.9%	2.6447	mgd
Foxborough	20.1%	0.8303	mgd
Norton	16.1%	0.665	mgd
		4.14	mgd

12. The first Annual Payment to Norton (APN) will be made in FY2016, increases $10,000 per year for years 2 through 16, resulting in year 16 payment of $350,000 in FY2031. Payment then increases 3% per year annually starting in year 17 (FY2032). Percentages are based on expansion not total capacity.

Mansfield	66.5%
Foxborough	17.0%
Norton	16.5%

13. For the Debt Service cost data provided by Mansfield, allocations based on current WWTP ownership percentages:

Mansfield	63.1%	1.9797	mgd
Foxborough	21.0%	0.6603	mgd
Norton	15.9%	0.5	mgd
		3.14	mgd

14. O&M Costs allocations are based on the following Percent Owned per Town:

	< FY2018	>= FY2018
Mansfield	63.1%	63.9%
Foxborough	21.0%	20.1%
Norton	15.9%	16.1%

15. Land Acqusition costs increased to $2,107,500 to reflect actual purchase price
16. O&M costs have been reduced to $3,805,000 to reflect reduction in total flow expansion to 1.0 mgd.

Total Flow Costs per Town
Updated 10/24/2013

	Mansfield							Foxborough							Norton							Total						
FY	Design	Construction	Land Acquisition	O&M	APN	Existing Debt Service	Total	Design	Construction	Land Acquisition	O&M	APN	Existing Debt Service	Total	Design	Construction	Land Acquisition	O&M	APN	Existing Debt Service	Total	Design	Construction	Land Acquisition	O&M	APN	Existing Debt Service	Total
2012				1,886,104		569,199	2,455,303				590,681		189,691	780,371				389,247		143,640	532,887				2,865,000		902,059	3,767,059
2013				1,896,210		567,076	2,463,286				595,395		188,983	784,379				399,012		143,104	542,116				2,889,579		898,694	3,788,272
2014			86,450	1,910,121		565,001	2,561,572			22,100	601,132		188,292	811,524			21,450	404,173		142,581	568,203			130,000	2,914,379		895,406	3,939,785
2015	86,263		86,450	1,922,916		562,856	2,658,485	24,675		22,100	606,535		187,577	840,887	21,563		21,450	411,007		142,039	596,059	132,500		130,000	2,939,404		892,006	4,093,911
2016	172,525	543,658	86,450	1,915,900	133,000	560,641	3,412,174	49,350	155,483	22,100	606,318	34,000	186,839	1,054,090	43,125	135,825	21,450	443,500	33,000	141,480	818,380	265,000	835,017	130,000	2,964,656	200,000	888,496	5,283,169
2017	172,525	543,658	86,450	1,929,218	139,650	558,355	3,429,857	49,350	155,483	22,100	611,784	35,700	186,077	1,060,495	43,125	135,825	21,450	450,203	34,650	140,903	826,157	265,000	835,017	130,000	2,990,136	210,000	884,874	5,315,027
2018	172,525	1,087,317	86,450	1,959,229	146,300	555,999	4,007,820	49,350	310,967	22,100	597,326	37,400	185,292	1,202,434	43,125	271,650	21,450	459,292	36,300	140,309	972,126	265,000	1,670,033	130,000	3,015,848	220,000	881,139	6,182,020
2019	172,525	1,087,317	86,450	1,972,327	152,950	553,572	4,025,140	49,350	310,967	22,100	602,513	39,100	184,483	1,208,512	43,125	271,650	21,450	466,952	37,950	139,696	980,824	265,000	1,670,033	130,000	3,041,792	230,000	877,293	6,214,118
2020	172,525	1,087,317	86,450	1,986,794	159,600	551,074	4,043,759	49,350	310,967	22,100	608,076	40,800	183,650	1,214,943	43,125	271,650	21,450	473,101	39,600	139,066	987,992	265,000	1,670,033	130,000	3,067,971	240,000	873,334	6,246,339
2021	172,525	1,087,317	86,450	2,000,593	166,250	548,564	4,061,699	49,350	310,967	22,100	613,430	42,500	182,814	1,221,160	43,125	271,650	21,450	480,365	41,250	138,432	996,273	265,000	1,670,033	130,000	3,094,388	250,000	869,356	6,278,778
2022	172,525	1,087,317	86,450	2,015,705	172,900	546,011	4,080,908	49,350	310,967	22,100	619,151	44,200	181,963	1,227,731	43,125	271,650	21,450	486,189	42,900	137,788	1,003,103	265,000	1,670,033	130,000	3,121,045	260,000	865,311	6,311,389
2023	172,525	1,087,317	86,450	2,029,842	179,550	543,398	4,099,082	49,350	310,967	22,100	624,573	45,900	181,093	1,233,982	43,125	271,650	21,450	493,530	44,550	137,129	1,011,434	265,000	1,670,033	130,000	3,147,944	270,000	861,170	6,344,148
2024	172,525	1,087,317	86,450	2,045,230	186,200	540,743	4,118,465	49,350	310,967	22,100	630,350	47,600	180,208	1,240,574	43,125	271,650	21,450	499,508	46,200	136,459	1,018,392	265,000	1,670,033	130,000	3,175,088	280,000	856,962	6,377,084
2025	172,525	1,087,317	86,450	2,058,752	192,850	538,033	4,135,927	49,350	310,967	22,100	635,561	49,300	179,305	1,246,582	43,125	271,650	21,450	508,165	47,850	135,775	1,028,015	265,000	1,670,033	130,000	3,202,478	290,000	852,668	6,410,179
2026	172,525	1,087,317	86,450	2,073,314	199,500	535,281	4,154,386	49,350	310,967	22,100	641,066	51,000	178,387	1,252,870	43,125	271,650	21,450	515,738	49,500	135,080	1,036,543	265,000	1,670,033	130,000	3,230,118	300,000	848,305	6,443,456
2027	172,525	1,087,317	86,450	2,086,996	206,150	532,484	4,171,922	49,350	310,967	22,100	646,294	52,700	177,455	1,258,866	43,125	271,650	21,450	524,718	51,150	134,375	1,046,468	265,000	1,670,033	130,000	3,258,009	310,000	843,874	6,476,916
2028	172,525	1,087,317	86,450	2,101,995	212,800	483,384	4,144,471	49,350	310,967	22,100	651,906	54,400	161,092	1,249,815	43,125	271,650	21,450	532,253	52,800	121,984	1,043,262	265,000	1,670,033	130,000	3,286,154	320,000	766,061	6,437,248
2029	172,525	1,087,317	86,450	2,117,196	219,450		3,682,938	49,350	310,967	22,100	657,567	56,100		1,096,083	43,125	271,650	21,450	539,792	54,450		930,467	265,000	1,670,033	130,000	3,314,555	330,000		5,709,588
2030	172,525	1,087,317	86,450	2,132,596	226,100		3,704,988	49,350	310,967	22,100	663,278	57,800		1,103,495	43,125	271,650	21,450	547,341	56,100		939,666	265,000	1,670,033	130,000	3,343,215	340,000		5,748,249
2031	172,525	1,087,317	86,450	2,148,194	232,750		3,727,236	49,350	310,967	22,100	669,041	59,500		1,110,957	43,125	271,650	21,450	554,902	57,750		948,877	265,000	1,670,033	130,000	3,372,137	350,000		5,787,170
2032	172,525	1,087,317	86,450	2,163,725	239,733		3,749,750	49,350	310,967	22,100	674,773	61,285		1,118,475	43,125	271,650	21,450	562,824	59,483		958,531	265,000	1,670,033	130,000	3,401,322	360,500		5,826,856
2033	172,525	1,087,317	86,450	2,179,457	246,924		3,772,674	49,350	310,967	22,100	680,559	63,124		1,126,099	43,125	271,650	21,450	570,758	61,267		968,250	265,000	1,670,033	130,000	3,430,774	371,315		5,867,123
2034	172,525	1,087,317		2,195,390	254,332		3,709,563	49,350	310,967		686,398	65,017		1,111,732	43,125	271,650		578,708	63,105		956,588	265,000	1,670,033		3,460,495	382,454		5,777,983
2035	86,263	1,087,317		2,211,521	261,962		3,647,062	24,675	310,967		692,290	66,968		1,094,900	21,563	271,650		586,676	64,998		944,887	132,500	1,670,033		3,490,488	393,928		5,686,949
2036		1,087,317		2,227,850	269,821		3,584,988		310,967		698,237	68,977		1,078,181		271,650		594,667	66,948		933,265		1,670,033		3,520,754	405,746		5,596,533
2037		1,087,317		2,244,377	277,916		3,609,610		310,967		704,239	71,046		1,086,252		271,650		602,681	68,957		943,288		1,670,033		3,551,298	417,918		5,639,249
2038		1,087,317		2,261,102	286,253		3,634,672		310,967		710,296	73,177		1,094,440		271,650		610,723	71,025		953,398		1,670,033		3,582,120	430,456		5,682,610
2039		1,087,317		2,278,023	294,841		3,660,181		310,967		716,408	75,373		1,102,748		271,650		618,794	73,156		963,600		1,670,033		3,613,226	443,370		5,726,628
2040		1,087,317		2,295,141	303,686		3,686,144		310,967		722,577	77,634		1,111,178		271,650		626,897	75,351		973,898		1,670,033		3,644,616	456,671		5,771,320
2041		1,087,317		2,312,456	312,797		3,712,569		310,967		728,803	79,963		1,119,733		271,650		635,035	77,611		984,296		1,670,033		3,676,293	470,371		5,816,697
2042		1,087,317		2,329,967	322,180		3,739,464		310,967		735,086	82,362		1,128,415		271,650		643,209	79,940		994,798		1,670,033		3,708,262	484,482		5,862,777
2043		1,087,317		2,347,674	331,846		3,766,837		310,967		741,427	84,833		1,137,226		271,650		651,422	82,338		1,005,409		1,670,033		3,740,523	499,016		5,909,573
2044		1,087,317		2,365,579	341,801		3,794,697		310,967		747,826	87,378		1,146,171		271,650		659,676	84,808		1,016,133		1,670,033		3,773,081	513,987		5,957,101
2045		1,087,317		2,383,680	352,055		3,823,052		310,967		754,285	89,999		1,155,250		271,650		667,972	87,352		1,026,974		1,670,033		3,805,937	529,406		6,005,377
Total	**3,450,500**	**31,532,183**	**1,729,000**	**71,985,176**	**7,022,147**	**9,311,672**	**125,030,679**	**987,000**	**9,018,033**	**442,000**	**22,465,180**	**1,795,135**	**3,103,201**	**37,810,550**	**862,500**	**7,877,850**	**429,000**	**18,189,032**	**1,742,337**	**2,349,842**	**31,450,561**	**5,300,000**	**48,430,967**	**2,600,000**	**112,633,085**	**10,559,620**	**14,757,008**	**194,280,679**

APPENDIX E

ORDER OF RESOURCE AREA DELINEATION (MASSDEP FILE NO. 250-0916) & APPROVED WETLAND DELINEATION MAP

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

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

Provided by MassDEP:
#250-916
MassDEP File Number

eDEP Transaction Number

Norton
City/Town

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.

Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

From: Norton
1. Conservation Commission

2. This Issuance is for (check one):

a. ☒ Order of Resource Area Delineation

b. ☐ Amended Order of Resource Area Delineation

3. Applicant:

Lee — a. First Name
Azinheira — b. Last Name
Town of Mansfield — c. Organization
6 Park Row — d. Mailing Address
Mansfield — e. City/Town
MA — f. State
02148 — g. Zip Code

4. Property Owner (if different from applicant):

SAME — a. First Name
b. Last Name
c. Organization
d. Mailing Address
e. City/Town
f. State
g. Zip Code

5. Project Location:

0 Pine Street — a. Street Address
Norton — b. City/Town
02766 — c. Zip Code
24 — d. Assessors Map/Plat Number
4 & 63 — e. Parcel/Lot Number
Latitude and Longitude (in degrees, minutes, seconds):
41 57' 22.6" N — f. Latitude
71 09 15.4" W — g. Longitude

6. Dates:
November 12, 2013 — a. Date ANRAD filed
December 16, 2013 — b. Date Public Hearing Closed
December 17, 2013 — c. Date of Issuance

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

Town of Mansfield, Massachusetts, Mansfield Comprehensive Waste-water Management Plan, Reilly Property, Abbreviated Notice of Resource Area Delineation, Prepared by CDM Smith, signed and stamped by Edward C. Sanderson, R.P.E. — a. Title
December 9, 2013 — b. Date
d. Date

Provided by MassDEP:
#250-916
MassDEP File Number

eDEP Transaction Number

Norton
City/Town

B. Order of Delineation

1. The Conservation Commission has determined the following (check whichever is applicable):

a. X **Accurate**: The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. X Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

a.

See Attached Sheet

b. ☐ **Modified**: The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

a.

c. ☐ **Inaccurate**: The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

3. ☐ The boundaries were determined to be inaccurate because:

DEP File Number 250-916 ORAD
Lee Azinheira/Town of Mansfield
Pine St (Map 24 parcels 4 and 63)

Findings:

1. Bank has been identified as a Resource Area subject to protection under 310CMR10.54. Bank has not been delineated or shown on the final approved plans.

2. Bordering vegetated wetland has been identified as a Resource Area subject to protection under 310CMR10.55 as shown on the final approved plans.

3. Wetland flag series WF#1 stops at 158 and is only confirmed through flags 158. Wetlands and a stream extend beyond flag WF#1-158, but are not delineated and therefore, are not confirmed with this ORAD.

4. Wetland 8 has been delineated as an isolated area. Due to inclement weather the flag locations cannot be verified prior to the close of the public hearing and therefore, is not confirmed with this ORAD. Further, calculations were submitted on December 16, 2013 under 310 CMR 10.57 regarding Isolated Land Subject to Flooding (ILSF) volume. The calculations submitted are incomplete and did not contain the contributing watershed map and therefore, could not be verified prior to the close of the public hearing.

5. Potential vernal pools are located within the WF#7 and WF#8 series flags.

6. Two Certified Vernal Pools (4447 and 4448) are shown on the plans on adjacent property.

7. The most recent FEMA F.I.R.M. shows portions of the property contain a shaded Zone X (panel number 25005C0133F dated 7/9/09).

8. The property is entirely located within the Three-Mile River Area of Critical Environmental Concern.

Administrative:

9. This Order verifies wetland resource areas only and does not authorize any work. A separate permit application shall be submitted to the Norton Conservation Commission for any proposed work within a resource area or buffer zone.

10. The commission shall require verification of Wetland 8 flags and ILSF calculations prior to any work proposed within 100 feet of Wetland 8.

11. It is strongly recommended that the owner perform a Vernal Pool investigation prior to proposing any work on the site. Vernal Pool investigations should take place during the breeding season and be confirmed by the Conservation Commission during the breeding season. An evaluation of all previously identified potential vernal pools on the site, should be conducted, at a minimum, between March 1 and May 30, on non-cloudy and non-precipitation days, with appropriate field equipment and recording devices.

12. Future projects submitted to the Conservation Commission should include a detailed Vernal Pool Investigation report.

END

C. Findings

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, § 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation.

This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see http://www.mass.gov/dep/about/region/findyour.htm).

D. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, 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 DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed 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 Order. 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.

Any appellants seeking to appeal the Department's Superseding Order of Resource Area Delineation will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

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

Provided by MassDEP:
#250-898
MassDEP File Number
#250-916
eDEP Transaction Number
Norton
City/Town

E. Signatures

December 17, 2013
Date of Issuance

Please indicate the number of members who will sign this form.

1. Number of Signers

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

This Order is valid for three years from the date of issuance.

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, which expires on unless extended in writing by the issuing authority.

This Order is issued to the applicant and the property owner (if different) as follows:

2. ☐ By hand delivery on

a. Date

3. ☒ By certified mail, return receipt requested on

December 17, 2013

a. Date

Norton Conservation Commission
70 East Main Street
Norton MA 02766

December 17, 2013

Lee Azinheira
Town of Mansfield
6 Park Row
Mansfield, MA 02048

Dear Ms. Azinheira,

Enclosed is the wetland permit (Order of Resource Area Delineation, File #250-916) issued December 17, 2013. The appeal period is 10 days and expires on December 31, 2013.

No work is approved by the Order of Resource Area Delineation.

This order shall expire on December 17, 2016. If you have any questions, please contact me at (508) 285-0275. Thank you.

Sincerely,

Jennifer Carlino
Conservation Director

JC/pmb

Phone (508) 285-0275 · Fax (508) 285-0277 · conservation@nortonmaus.com

1" = 100'

50 0 100

FOR PERMITTING PURPOSES ONLY

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: X
DRAWN BY: X
SHEET CHK'D BY: X
CROSS CHK'D BY: X
APPROVED BY: X
DATE: NOVEMBER 2013

CDM Smith
50 Hampshire Street
Cambridge, MA 02139
Tel: (617) 452-6000

TOWN OF MANSFIELD, MASSACHUSETTS

MANSFIELD COMPREHENSIVE WASTEWATER
MANAGEMENT PLAN REILLY PROPERTY
ABBREVIATED NOTICE OF RESOURCE AREA DELINEATION

WETLANDS DELINEATION OVERALL PLAN

PROJECT NO. 0201-99387
FILE NAME: CSTPL00X

SHEET NO.
6

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REUSE OF DOCUMENTS: THESE DOCUMENTS AND DESIGNS PROVIDED BY PROFESSIONAL SERVICE, INCORPORATED HEREIN, ARE THE PROPERTY OF CDM SMITH AND ARE NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CDM SMITH.

APPENDIX F

VERNAL POOL MONITORING
APRIL 22, 2014

Memorandum

To: *Norton Conservation Commission*

From: *Magdalena Lofstedt*

Date: *June 17, 2014*

Subject: *Vernal Pool Investigation – April 22, 2014*
Pine Street (Assessors Map 24, Parcels 4 and 63)

On behalf of the Town of Mansfield (the Town), CDM Smith Inc. (CDM Smith) performed a Vernal Pool Investigation on the two parcels of land on Pine Street (former "Reilly Properties") identified as Assessors Map 24, Parcels 4 and 63. These two parcels of land were recently purchased by the Town for effluent infiltration/groundwater recharge purposes. The purpose of the vernal pool investigation was to determine if the potential vernal pools identified by the Norton Conservation Commission agent (Jennifer Carlino) and by the NHESP Mass GIS data layer "Potential Vernal Pools" are able to support populations of obligate or facultative species of amphibians and meet the requirements of certified vernal pools. The investigation also included a reconnaissance survey of the two parcels to identify additional vernal pools.

Vernal Pool Facts

Vernal pools are temporary bodies of fresh water that provide important habitat for many vertebrate and invertebrate species. "Vernal" means spring and many vernal pools are filled by spring rains and snowmelt and then dry up during the summer months. Some pools may also fill up with rain in the fall (autumn pools) and persist through the winter, and others are semi-permanent and may not dry up every year. Vernal pools can be as small as a few yards across or several acres in size. Vernal pools can be found in small woodland depressions that collect spring runoff or intercept seasonally high groundwater tables as well as meadows, floodplains, and large bordering vegetated wetland complexes. Vernal pools do not support multi-age fish populations because they dry out annually or periodically. Some may contain water year round but do not support fish populations due to extremely low dissolved oxygen levels as a result of significant drawdowns, or no intermittent hydrologic connection to a permanent waterbody.

The wood frog (*Lithobates sylvaticus*) and the four local species of mole salamanders (*Ambystomid* salamanders)[spotted salamander (Ambystoma maculatum), blue-spotted salamander (*Ambystoma laterale)*, Jefferson salamander (*Ambystoma jeffersonianum)*, and marbled salamander (*Ambystoma opacum)*] depend upon vernal pools for their breeding, and are therefore considered obligate amphibian species of vernal pools. These obligate species have evolved breeding strategies that depend on fish free pools for reproduction. Other amphibian species including the American toad

(*Anaxyrus americanus*), spring peeper (*Pseudacris crucifer*), and gray treefrog (*Hyla versicolor*) are often found in the fish-free waters of vernal pools however these species also use a number of other wetland types. These species are referred to as facultative amphibian species of vernal pools. Invertebrates such as the fairy shrimp (*Eubranchipus* spp.) are also dependent upon vernal pools.

Permitting Background

The Norton Conservation Commission issued an Order of Resource Area Delineation (ORAD) on December 17, 2013 concurring with the limits of Bordering Vegetated Wetlands as shown on the Plan Sheet "*Town of Mansfield, Mass, Mansfield Comprehensive Wastewater Management Plan, Reilly Property, Abbreviated Notice of Resource Area Delineation,* Prepared by CDM Smith, signed and stamped by Edward C. Sanderson, P.E." The Vernal Pool Investigation reported on herein was performed per Conditions #5 and #11, which state:

Condition #11: *"It is strongly recommended that the owner perform a Vernal Pool investigation prior to proposing any work on the site. Vernal Pool investigations should take place during the breeding season and be confirmed by the Conservation Commission during the breeding season. An evaluation of all previously identified potential vernal pools on the site, should be conducted, at a minimum, between March 1 and May 30, on non-cloudy and non-precipitation days, with appropriate field equipment and recording devices."*

Condition #5: "*Potential vernal pools are located within WF#7 and WF#8 series flags".*

The results of this vernal pool investigation will be used to assess potential ecological impacts from infiltration basins on Parcels 4 and 63 (Map 24).

Approach and Method

The Vernal Pool Investigation consisted of a one day monitoring event on April 22, 2014 to perform a presence – absence survey of amphibian egg masses. On that day Magdalena Lofstedt, PWS (#1303) of CDM Smith inspected areas on the two parcels with the potential to support amphibian breeding habitat. The investigation focused on observing breeding evidence of obligate amphibian species (i.e. egg masses) in following areas:

- Previously identified potential vernal pools within WF#7 and WF#8 (delineated by CDM Smith Inc.);
- WF#2 (delineated by CDM Smith Inc.), primarily near flags 2-1 through 2-20 in the bordering vegetated wetland area; and
- Potential vernal pools within the vicinity of the two parcels as identified by NHESP's MassGIS data layer, see attached Figure 1.

The weather that day was sunny with a high temperature of 67°F and very good for observing egg masses within the water column.

The following field equipment and recording devices were used for the survey:

- Hip Waders,
- polarized sunglasses, dip net,
- glass jar,
- clip board,
- carpenter's ruler,
- vernal pool field observation forms,
- plastic bucket,
- camera,
- iphone 5,
- plan sheet (referenced above),
- aerial photograph showing certified and potential vernal pools, and
- vernal pool field guide.

The vernal pool investigation consisted of documenting presence of absence of obligate amphibian breeding evidence such as salamander egg masses and larvae, and wood frog egg masses and tadpoles in the designated locations identified above. Egg mass observations were recorded including health, number, clarity, stage, level of egg submergence in water, and whether or not the eggs were attached to branches or demersal. Water depths were also recorded. Vernal pool investigation was conducted around the perimeter of the pools to avoid disturbing the egg masses.

Findings

The following is a summary of the field observations:

Wetland Flagline 8 (WF #8)

The previously identified potential vernal pool within WF#8 lacked any standing water, refer to Photograph No. 1, and therefore this area does not constitute a vernal pool.

Photograph No. 1: View of WF#8 facing north.

Wetland Flagline 7 (WF#7)

One wood frog egg mass was observed within the previously identified potential vernal pool in WF#7 (see Photograph No. 2). A yellow spotted turtle was also observed along the perimeter of the pool (see Photograph No. 3). The lack of egg masses in this pool may be attributed to its close proximity to Dora Pond which provides excellent turtle habitat (numerous painted turtles were observed within the pond). Turtles that live in the pond year round may forage on egg masses present in WF#7. The pool was not investigated for fairy shrimp. WF#7 is considered to be a vernal pool.

Photograph No. 2: Wood frog egg mass, attached to branch, within WF#7

Photograph No. 3: Yellow spotted turtle observed in pool within WF#7.

Photograph No. 4: Pool in WF#7, view facing east.

Wetland Flagline 2 (WF#2)

Wetland flagline #2 (2-1 through 2-67) identifies a Bordering Vegetated Wetland (BVW) associated with Dora Brook (watershed upstream of Wading River). This wetland is characterized as a wooded swamp (PFO1). Standing water was observed within this wetland complex during the wetland delineation back in July 2013. The vernal pool investigation focused on the northeastern portion of the BVW which is bordered by a sewer interceptor to the northeast, Dora Brook to the north and northwest and upland slopes to the south and west. No egg masses were observed in this BVW and thus it is not considered to be a vernal pool. This likely can be attributed to the lack of sufficient water depth in the micropools.

The photograph below shows the standing water in the vicinity of Dora Brook, further west of the BVW described above.

Photograph No. 5: Standing water near Dora Brook in WF#2

Potential Vernal Pool West of Pine Street

The potential vernal pool west of Pine Street, near the access road into the Project Site was observed to be dry on April 22, 2014, See Photograph 6 below. A dry gravel pit is located is close proximity to the depression.

Photograph No. 6: Dry Depression west of Pine Street

Potential Vernal Pool east of Sewer Interceptor

The potential vernal pool along the sewer interceptor depicted on the PVP layer available at MassGIS is a large pond. No vernal pool investigations were conducted at this pond as it is a permanent body of water and most likely supports fish populations.

Vernal Pool east of Sewer Interceptor (North of Project Site)

A vernal pool was documented adjacent to the raised sewer interceptor, on the east side of the interceptor. The GPS longitude/latitude coordinates are 41° 57’ 33”N and 71° 09’ 12”W. The vernal pool is approximately 70 feet long and 50 feet wide, and located within a forested wetland dominated by red maple (*Acer rubrum*), sweet pepperbush (*Clethra alnifolia*), and skunk cabbage (*Symplocarpus foetidus*). The pool was identified as Vernal Pool A. The pool depth varied between 1 foot to 1.5 feet. The pool does not have a permanently flowing inlet or outlet which allows water to pond (see Photographs No. 7 and No. 8 below). Dora Brook is located approximately 65 feet north of the pool. Refer to Photograph No. 9 which was taken standing at the brook near the two culverts which convey Dora Brook beneath the raised interceptor.

Photograph No. 7: View of Vernal Pool facing northeast

Photograph No. 8: View of Vernal Pool facing southeast (sewer interceptor borders pool to the south)

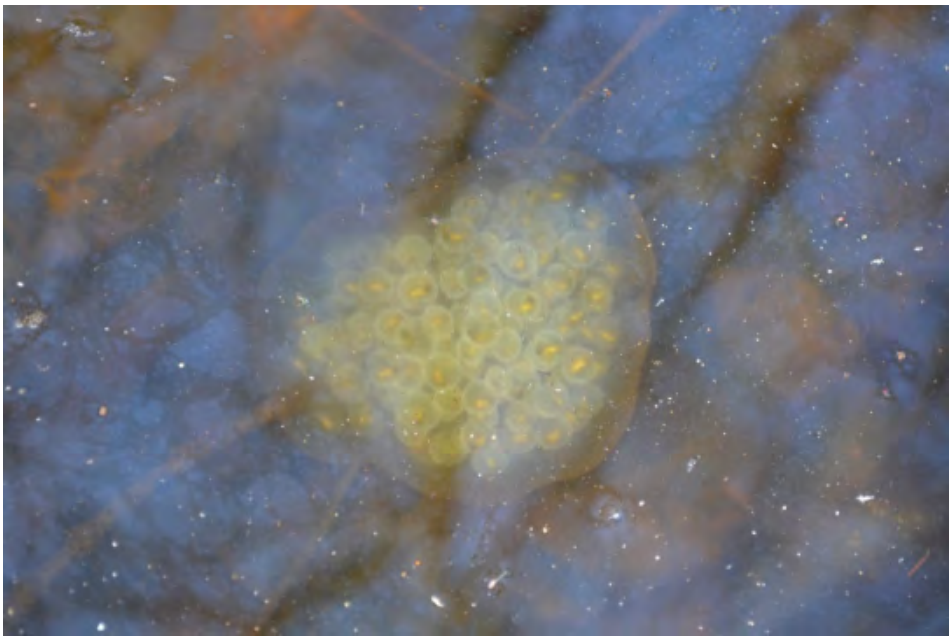
Photograph No. 9: View facing southeast of Vernal Pool #A from Dora Brook located app. 65 feet north.

Six spotted salamander (*Ambystoma maculatum*) egg masses were observed within this vernal pool. The egg masses looked healthy, clear, and all were attached to branches and submerged in water. The visible larvae were beginning to develop the shape of a head and estimated be about three weeks old. The egg masses are shown on Photographs 10 and 11 below.

Photograph No. 10: Six (6) spotted salamander egg masses within Vernal Pool #A

Photograph No. 11: Two (2) spotted salamander egg masses in Vernal Pool #A

Photograph No. 12: Close-up of the three (3) spotted salamander egg masses on Photograph 10



Photograph No. 13: Close up of one of the spotted salamander egg masses

In addition to the spotted salamander egg masses three large wood frog egg masses were observed. A number of the frog eggs had hatched and an estimated 500 tadpoles were observed swimming in close proximity to the egg masses.

Photograph No. 14: Three (3) wood frog egg masses observed with Vernal Pool A.

Photograph No. 15: Tadpoles from frog egg mass in Vernal Pool #A.

Certified Vernal Pools 4447 and 4448

Egg masses were also observed in the larger of the two Certified Vernal Pools near Pine Street. A total of five spotted salamander egg masses were observed (refer to Photograph 16 below). The water in the pool was very dark and tan in color which made it difficult to see the egg masses. The smaller certified vernal pool barely had any standing water and lacked any signs of amphibian breeding.

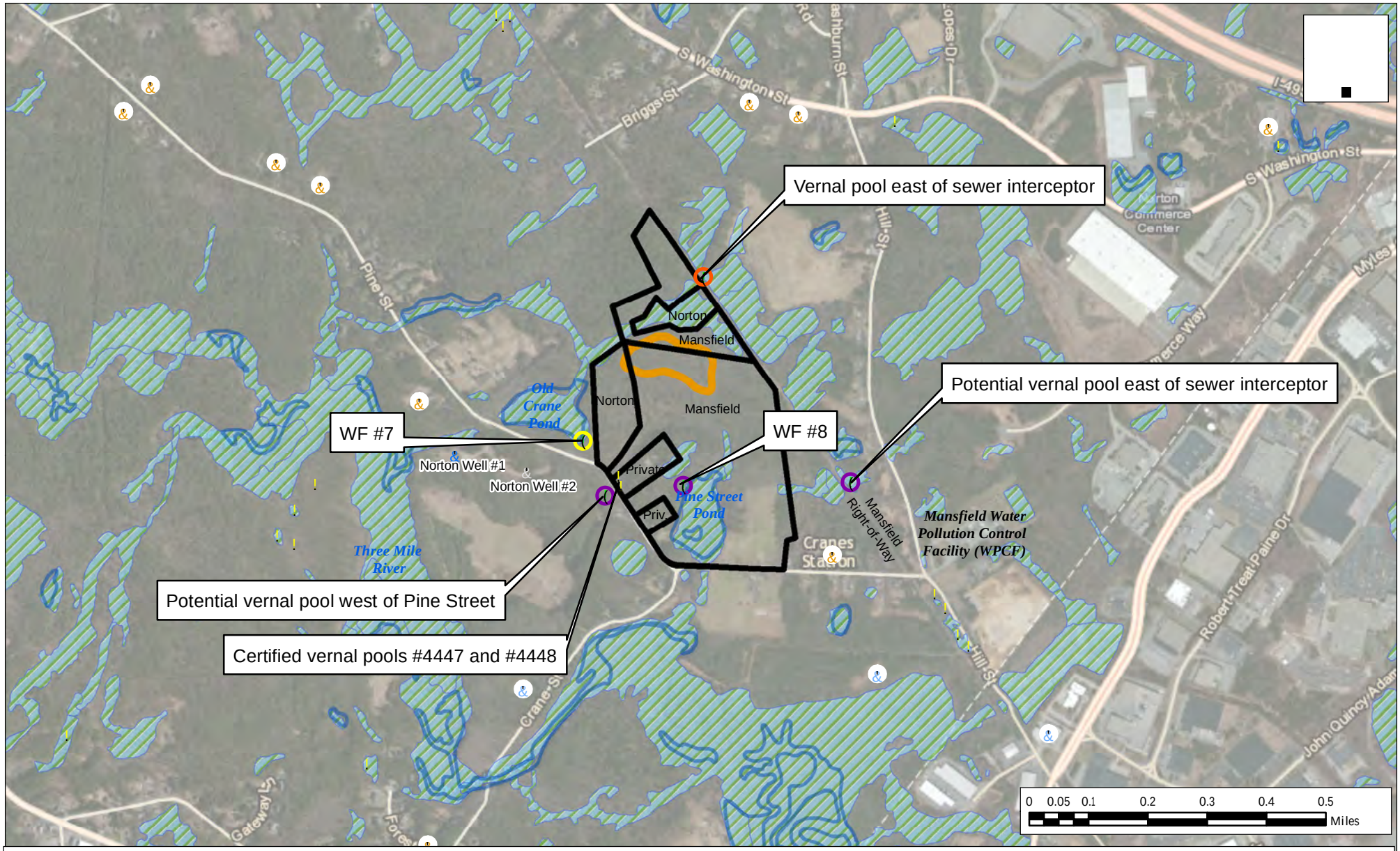
Photograph No. 16: Spotted salamander egg masses in Vernal Pool #4448

Photograph No. 17: Close up of spotted salamander egg mass in Vernal Pool #4448

Summary

The vernal pool investigation confirmed the presence of the previously certified vernal pools. No new additional vernal pools on the two parcels purchased by the Town for effluent infiltration purposes were observed. One wood frog egg mass was observed within the potential vernal pool in WF #7. A spotted yellow turtle was also observed within this pool; this species is well known for foraging on frog and salamander egg masses.

One new vernal pool that meets the NHESP certification requirements was identified on the neighboring parcel (Property ID: 24_31-03_0) east of the raised sewer interceptor.



Field investigation performed by CDM Smith on 4/22/2014

- Active Well - Norton Public Water Supply Well #1
- Off Line Well - Norton Well #2
- Private Potable Wells
- Private Non-Potable Wells
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Field Identified Potential Vernal Pool
- Provides Habitat for Obligate Vernal Pool Species
- Not a Vernal Pool
- Vernal Pool Meeting Certification Criteria
- Surface Water
- DEP Wetlands
- Plateau Area
- Parcel Boundaries

CDM Smith

Vernal Pool Investigations on April 22, 2014
Pine Street in Norton, MA

Figure
1

APPENDIX G

NHESP RESPONSE LETTER
AUGUST 13, 2014

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

August 13, 2014

Magdalena Lofstedt
Camp Dresser & McKee, Inc.
50 Hampshire Street
Cambridge MA 02139

RE: Project Location: Pine Street and Crane Street
Town: MANSFIELD
NHESP Tracking No.: 04-16478

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for information regarding state-listed rare species in the vicinity of the above referenced site.

Based on the information provided, the Natural Heritage has determined that at this time the site is not mapped as Priority or Estimated Habitat. The NHESP database does not contain any state-listed species records in the immediate vicinity of this site.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. If you have any questions regarding this letter please contact Lauren Glorioso, Endangered Species Review Assistant, at 508-388-6361.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

APPENDIX H

WATER RESOURCES COMMISSION INTERBASIN TRANSFER ACT APPLICABILITY REVIEW
DECEMBER 3, 2014

THE COMMONWEALTH OF MASSACHUSETTS

WATER RESOURCES COMMISSION

100 CAMBRIDGE STREET, BOSTON MA 02114

December 3, 2014

Lee Azinheira
Department of Public Works
Town of Mansfield
6 Park Row
Mansfield, MA 02048

Dear Mr. Azinheira:

Thank you for meeting with Water Resources Commission staff on November 20, 2014 to discuss the Town's Phase 2 Comprehensive Wastewater Management Plan (CWMP). The staff was concerned that, under this new plan, wastewater originating from Mansfield's water supply sources in the Ten Mile River Basin, which previously had been discharged via on-site septic systems, would now be transferred across both a municipal line and a river basin line, negating the intra-town exemption and subjecting this transfer to the Interbasin Transfer Act (ITA).

After reviewing Mansfield's project as proposed, we have determined that this project will not result in an increase in the present rate of interbasin transfer from the Ten Mile River Basin to the Taunton River Basin and **will not** be subject to the ITA for the following reasons:

- The Ten Mile River Basin portion of Mansfield will not be sewered, so there will not be an additional quantity of wastewater leaving this basin.

- The capacity of Mansfield's water supply sources in the Ten Mile River Basin will not be increased. Water from these sources is currently being transferred into the Taunton River Basin.

In the future, if Mansfield desires to sewer the Ten Mile River Basin portion of Town or to increase the capacity of its sources within the Ten Mile River basin, then it may need the Water Resources Commission's review and approval under the Interbasin Transfer Act.

If you have any questions, please contact Michele Drury at 617-626-1366.

Sincerely,

Kathleen M Baskin

Kathleen M. Baskin, P.E.
Executive Director

cc: Water Resources Commission
Michele Drury, DCR
David Young, CDM Smith
Representative Jay Barrows

APPENDIX I

2015 SRF IUP AND RELATED DOCUMENTATION

From: Dick, Lilla (DEP) <lilla.dick@state.ma.us>
Sent: Wednesday, March 18, 2015 3:10 PM
To: Sanderson, Edward; Lee Azinheira
Cc: Gabour, Ashraf (DEP)
Subject: Final IUP 2015 MNF Regional Wastewater District Landfill Closure CWSRF-4036

Hi Lee and Ed,
I would like to know if MNF Regional Wastewater District is interested in going forward under SRF with CWSRF-4036 Landfill closure ($1,400,00) project, and if MNF Regional Wastewater District will have the local appropriation. Since some projects dropped out from the Final IUP 2015, SRF money is available.

Please E-mail or call Ashraf Gabour, Program Manager by end of this week, if possible. (Also you could contact me till Thursday 3pm, I will be out till April 1)
Thank you.
Lilla

Ashraf R. Gabour, P.E.
Program Manager - Division of Municipal Services
Department of Environmental Protection - 6th Floor
1 Winter Street
Boston, MA 02108
Direct Telephone: 617-556-1076
Direct Facsimile: 617-292-5850
Email: Ashraf.Gabour@state.ma.us
Web : http://www.mass.gov/dep

Lilla Dick
Massachusetts Department of Environmental Protection
1 Winter Street, 6th Floor, Boston, MA 02108
Phone: 617-556-1083 Email : Lilla.Dick@state.ma.us

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

DEVAL L. PATRICK
Governor

MAEVE VALLELY BARTLETT
Secretary

DAVID W. CASH
Commissioner

December 31, 2014

To All Interested Parties:

The Massachusetts Department of Environmental Protection (MassDEP) is pleased to present the Final 2015 Intended Use Plan (IUP), which details the projects, borrowers and amounts that will be financed through the Clean Water State Revolving Fund (CWSRF) loan program. The CWSRF is a joint federal-state financing loan program that provides subsidized interest rate loans to improve or protect water quality in the Commonwealth.

As noted in Table 1, Massachusetts is offering approximately $400.3 million to finance clean water projects across the Commonwealth. Approximately $357.6 million will fund 27 new construction projects and an additional $12.8 million will be allocated towards funding 7 previously approved multi-year projects. $2 million has been allocated to the emergency set-aside account, and $5 million will be directed to the Community Septic Management Program to remediate failed septic systems in participating communities. An additional $10.4 million will fund 14 planning projects. MassDEP also is placing an anaerobic digester project deemed a high priority by the MassDEP on the 2015 IUP. Approximately half the cost of this $24.9 million project proposed by the Greater Lawrence Sanitary District will be allocated in 2015 while the remainder of the funding will be carried-over to 2016.

While Congress has not enacted the 2015 federal budget, based on trends from prior years' appropriations, MassDEP expects to receive an estimated $47.6 million federal grant to subsidize the CWSRF program. Last year, the Congress required at least 10% of the federal grant be used to fund "green infrastructure". MassDEP expects a similar requirement for 2015. The 2015 Final IUP lists 7 new "green infrastructure" construction projects. The exact monetary value of these projects will be determined when project applications are submitted.

In its 2014 SRF allocation, Congress also required states to use a portion of the CWSRF grant (30% of the national grant in excess of $1B-effectively about 15.7%) towards additional project subsidy for communities that might otherwise be unable to afford to undertake the project. MassDEP expects a similar requirement for its 2015 SRF grant, and has proposed to allocate that share (approximately $2.6 million) of its federal grant to subsidize renewable energy generation projects and to fund projects in the Environmental Justice Communities recognized by the

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TDD# 1-866-539-7622 or 1-617-574-6868
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

Commonwealth (http://www.mass.gov/mgis/ej_statewide.pdf) and defined by EEA as communities with median household income (MHI) less than 65% of the state MHI. The additional funds will be distributed in a pro-rated share to all of the proponents meeting either criteria and who execute a construction contract on or before April 30, 2016.

Section 302 of the 1996 Safe Drinking Water Act Amendments allows states the flexibility to move some funds between the Clean and the Drinking Water SRF programs, to better address specific state priorities. CW IUP capacity is frequently sufficient to allow Massachusetts to finance all of the Clean Water projects that request financing in a given year. On the Drinking Water side, generally one third to one half of the projects go unfunded each year. Transferring a limited amount of funds from CWSRF to DWSRF this year and in the future will help to modestly increase the capacity of the DWSRF and reduce this imbalance in our ability to provide financing. Therefore, Massachusetts will transfer funds from the CWSRF to the DWSRF program in the estimated amount of $5.4 million (33% of the anticipated 2015 DW grant amount of $16.4 million). These will be recycled funds freed up from the repayment of previous loans.

The Project Priority List (PPL) of the Final IUP is presented in Table 2. The PPL lists by ranking, all of the proposals that MassDEP received in the 2015 solicitation. The IUP is the subset of the PPL selected to receive financing offers.

MassDEP appreciates the efforts that proponents invested in the development of applications. We know that significant effort goes into every application, and appreciate your efforts to enhance and protect the quality of waters of the Commonwealth.

Sincerely,

Steve McCurdy, Director
MassDEP Division Municipal Services

I. Introduction

The Federal Water Quality Act of 1987 established a program of capitalization grants to the States to create Clean Water State Revolving Fund (CWSRF) loan programs. These programs provide state-administered below market rate financing for the construction of publicly owned water pollution abatement facilities and implementation of non-point source management projects. Under the CWSRF program, States provide a 20% match to the federal capitalization grant to create the loan fund. Projects to be financed are selected using a priority ranking system based upon the public health and environmental protection benefits of the proposed projects.

The CWSRF is jointly administered by the Massachusetts Department of Environmental Protection (MassDEP) and the Massachusetts Clean Water Trust (the Trust). MassDEP manages the technical aspects of the project development while the Trust manages the disbursement of funds and the sale of bonds to provide capital to the program.

Pursuant to the applicable provisions of the Federal Water Pollution Control Act of 1972, as amended, Chapter 21 of the General Laws, and 310 CMR 44.00, MassDEP has developed its Calendar Year 2015 Intended Use Plan/Project Priority List (IUP/PPL), with its attendant ranking of water pollution abatement projects. In order for a project to receive financial assistance under the State Revolving Fund Loan program, that project must appear on the Project Priority List and the Intended Use Plan Project Listing.

This Final IUP includes approximately $400.3 million in financing offers to 14 new planning projects, 27 new construction projects and 7 multi-phased carry-over projects continuing from prior years. The 2015 Final IUP also includes $5 million for the Community Septic Management Program and $2 million for an Emergency Set-A-Side. The IUP is a required element of the process to request the Federal Fiscal Year 2015 Capitalization Grant. The amount of the 2015 capitalization grant to Massachusetts is currently unknown, but for the purposes of this plan, it has been assumed to be equal to the 2014 grant. This IUP describes Massachusetts' intended uses for all funds available in the CWSRF program for 2015, including the projects that Massachusetts expects to provide financial assistance to in calendar year 2015 and an overview of how the state will comply with federally mandated requirements.

All new projects receiving financial assistance from the CWSRF will be eligible for loans at 2% interest. The Commonwealth subsidizes these loans, funding the spread between market interest rates and the 2% loan. This subsidy, so-called Contract Assistance, will continue to be allotted to the SRF programs in this and upcoming budget cycles. Certain projects, whose primary purpose is nutrient reduction, may be eligible for 0% interest rate loans, if they meet specific statutory requirements. MassDEP will review all submitted information to determine the project(s)' eligibility for the reduced rate financing prior to committing to permanent financing.

To be considered for funding priority, communities must have appropriated the necessary local project funds or have committed to a schedule to obtain those funds by June 30, 2015. Also, complete applications must be submitted to MassDEP at the earliest possible time, but not later than October 15, 2015. A complete application must contain the local funding authorization and the required supporting documentation. Any project not meeting these deadlines will be removed from the IUP Project Listing. Projects offered financing that do not advance, may be replaced by the highest ranked project on the Project Priority List that is ready to proceed.

All SRF related documents including this IUP, the priority ranking system, loan application forms, etc. may be found on the MassDEP web site at http://www.mass.gov/eea/agencies/massdep/water/grants/state-revolving-fund.html .

II. Calendar Year 2015 Project Funding

In 2015, MassDEP expects to finance 27 new construction projects, 7 carryover projects, and 14 planning projects totaling approximately $400.3 million. Included in this amount is a $2 million emergency reserve to finance unanticipated problems of acute public health concern that may arise during the year. A $5 million allocation to the Community Septic Management Program is also proposed. Table 1 is the funding list for 2015 and Table 2 is the extended Project Priority List.

Congress has not yet passed legislation funding the CWSRF for 2015. Draft legislation has been filed that includes varying amounts of funding and differing program conditions. For the purposes of this IUP, MassDEP is assuming that the capitalization grant for 2015 will be the same as 2014 and include the same program conditions. The following are some of the more notable requirements applicable to the CWSRF program:

a. Additional Subsidy

The 2014 appropriation required that a minimum of 20% of the federal grant amount over $1 billion be applied towards additional subsidy. MassDEP expects a similar requirement for 2015. MassDEP is limited by state law to distribute only the minimum required additional subsidy. For 2015 that amount is estimated at $2.6 million. Massachusetts provides the subsidy in the form of principal forgiveness towards projects in certain Environment Justice communities and for renewable energy generation projects.

MassDEP gives priority for additional subsidy in the form of Principal Forgiveness to communities with below average Median Household Income (MHI) as identified by the EOEEA Environmental Justice Program based on the Commonwealth's listing of Environmental Justice communities (http://www.mass.gov/mgis/ej_statewide.pdf). The 2015 Final IUP includes a proposed total expenditure of approximately $231.6 million for 19 new construction projects in communities within the Commonwealth having Environmental Justice designation(s) listed as below 65% of the State's MHI.

In addition proponents that included renewable energy generation as a component of the project are also eligible for enhanced subsidy. Additional subsidy for renewable energy loans is against the cost of the energy technology and not the total project. The 2015 Final IUP also contains 2 projects with renewable energy components.

Apportionment of the additional subsidy funding will be distributed over construction contracts that are executed by April 30, 2016. Award will be based on a prorated share of the total eligible cost of all of the subsidy-eligible projects that meet the deadline. The April 30, 2016 deadline insures that the subsidy will be used in a timely manner.

b. Green Infrastructure

For 2014, Congress required that at least 10 % of the federal grant be dedicated to Green Infrastructure projects or components as defined by USEPA. MassDEP expects a similar requirement for 2015. For Massachusetts this requires that an estimated $4.8 million be allocated towards Green Infrastructure projects. For 2015 MassDEP has identified and highlighted 7 projects on the Final IUP that meet EPA guidelines for Green Infrastructure. The total value of "green" components of those projects will be determined when detailed project applications are submitted. MassDEP expects to easily meet the minimum $4.5 million that EPA requires be allocated towards Green Infrastructure projects.

c. Applicant Cap

The Massachusetts SRF regulations (310 CMR 44) place a limit on any one proponent receiving any more than thirty-three percent of the available funding in a given year. Because of the shortfall of available funding relative to the number of worthwhile projects, and in order to extend financial assistance to as many highly ranked projects as possible, MassDEP is proposing to implement an applicant cap of $40 million for the 2015 funding period. MassDEP, however, reserves the right to waive the applicant cap limitation if MassDEP determines that one or more projects on the Intended Use Plan Project Listing are not ready to proceed. If the applicant cap is waived, communities may see an increase in financing support for projects not fully funded on the IUP listing.

III. Short and Long Term Goals

The following are the goals that Massachusetts has set for its CWSRF.

a. Short Term Goals

- Provide additional subsidy to designated low income Environmental Justice Communities in compliance with Congressional intent for the 2015 SRF allotments;
- Provide enhanced subsidy to projects that include renewable energy components recommended by comprehensive energy audits;
- Finance projects that focus on rehabilitation of wastewater infrastructure that promote sustainable infrastructure and smart growth principles; to include prioritization of regional wastewater management alternatives where appropriate;
- Finance projects to correct combined sewer overflows, including those affecting the Connecticut and Merrimack Rivers, Boston Harbor and Buzzards Bay;
- Finance wastewater treatment projects to address nutrient removal, especially in the Massachusetts Estuaries Program (MEP) areas;
- Utilize the SRF program to provide $5M in loan assistance for the correction/upgrade of failed septic systems through the Collection Systems, Nonpoint Source, and Community Septic Management Programs;
- Finance studies that encourage comprehensive water resource management planning;
- Perform outreach activities to Clean Water SRF borrowers that identify the focus on and eligibility of energy efficiency/alternative energy projects;
- Reserve $2.0 million in available program capacity, to finance at MassDEP's discretion unanticipated problems of acute public health concern that may arise during the year. To be financed under this reserve, proposed projects must constitute an imminent environmental or public health threat and otherwise meet MassDEP's applicable criteria.

b. Long Term Goals

- Continue correction of combined sewer overflows (CSO), Sanitary Sewer Overflows (SSO) and inflow/infiltration (I/I) problems, which retain high public health and environmental priority as serious sources of water quality degradation;
- Continue upgrading of secondary treatment to address nutrients;
- Support financing of non-traditional solutions to water quality problems, particularly those caused by stormwater;
- Develop infrastructure projects that promote and support smart growth by concentrating development and avoiding sprawl into green space;

- Ensure that wastewater treatment projects financed through the SRF fully consider cost-effective energy efficiency measures and/or renewable energy strategies;
- Promote investments in nutrient reduction particularly as they affect waterbodies that have established Total Maximum Daily Loads (TMDLs) or those that have been identified through the MEP; and
- Continue financing projects identified in the statewide Nonpoint Source Program.

IV. Allocation of Funds

a. Criteria and Method for Distribution of Funds

Massachusetts rates projects using the Commonwealth's priority ranking system (see http://www.mass.gov/eea/agencies/massdep/water/grants/state-revolving-loan-fund-programs.html). The ranking system is reviewed annually to reflect changing priorities at MassDEP. The criteria emphasize the nature of the public health problem that the project will address, the criticality of the resources affected, the environmental benefits of the project, the effectiveness of the project solution, the extent to which the project is consistent with regional or watershed wide plans and the extent to which projects qualify as green projects.

Once all projects have been rated and ranked, the Project Priority List is developed (Table 2). With input from the Trust, MassDEP identifies all of the sources of funds and spending limits, and develops the IUP Project Listing (Table 1).

To be considered for funding, projects must meet State and Federal eligibility requirements, must be ready to proceed during the funding period, must have appropriated local funds necessary to finance the project, and must have a MassDEP-approved planning element. An approvable planning element can be a Project Evaluation Report, Comprehensive Water Resources Management Plan, Long-term CSO Strategy, Stormwater Management Plan, or other MassDEP sanctioned planning document.

Eligibility includes consistency with the assurances described in this document and the requirements contained within MassDEP's financial assistance regulations. Certain projects on the 2015 Project Priority List may have higher priority point totals than the projects on the IUP Project Listing. That occurs because those particular projects on the Project Priority List are not ready to proceed. An important indicator of readiness to proceed is that a project has completed the State Environmental Review Process (SERP).

MassDEP reserves the right to increase the amount allocated to any project appearing on this IUP, should additional federal or state funding or program loan capacity, become available.

Project Bypass Procedure

A project on the IUP Project Listing may be bypassed if MassDEP determines that the bypassed project will not be ready to proceed during the Funding period. Project(s) bypassed will be replaced by the highest ranked priority project(s) on the Project Priority List that are ready to proceed or the funds may be used for cost increases to other projects previously approved. Complete project applications not received by MassDEP by October 15, 2015 will be automatically considered for bypassing.

b. Types of Projects to be Funded and Financing Rates

Any water pollution abatement project of an eligible borrower is eligible to receive financial assistance from the Trust. Such eligible projects include, but are not limited to:

- Wastewater Treatment Projects, as defined in 310 CMR 44.03;
- Infiltration Inflow ("I/I") Projects, as defined in 310 CMR 44.03;

- Collection System Projects, as defined in 310 CMR 44.03, provided, however, that 85% of the expected wastewater flow into the proposed collection system will be for wastewater flows in existence as of July 1, 1995;
- Nonpoint Source Projects, as defined in 310 CMR 44.03;
- Nutrient Management Projects, as defined in 310 CMR 44.03
- Stormwater Projects;
- Green Projects; and
- The planning or design for any project in one of the categories identified above.

Costs of construction that MassDEP determines are necessary for the completion of the project are eligible for financing in the loan and to receive a subsidy under the loan, subject to the applicant cap. Although costs for design are eligible, they will not be financed during this funding period due to the high demand for construction funding.

All projects on the Intended Use Plan are eligible for 2% interest rate loans. Certain projects that are primarily for nutrient removal are eligible for 0% rate interest loans (http://www.mass.gov/eea/agencies/massdep/water/grants/state-revolving-fund.html. Appendix J). These nutrient removal projects will be evaluated in accordance with 310 CMR 44.04(2) and a determination will be made as to the eligibility for 0% interest loans before the loan is permanently financed.

V. Financial Management

a. Source of State Match

Based on an estimated 2015 federal grant of $47.6 million, the required 20% state match totals $9.5 million. These funds are provided to the Trust from the Commonwealth's Capital Plan.

b. Fee Income

The Trust charges approximately $5.50 per $1,000 as a loan origination fee to offset the costs incurred during bond issuance. Recipients of SRF loans are charged an annual administrative fee of 0.15% (15 basis points) against the outstanding loan principle to fund salaries and expenses of the Trust and MassDEP related to SRF project development and loan management. As of October 31, 2013, the Trust has approximately $34.3 million in administrative fees available.

c. Program Administration

The Commonwealth of Massachusetts intends to use the full 4 percent of the Federal capitalization grant funds for administrative support of activities related to the Federal Fund. Use of those funds is detailed in the CWSRF Grant Application that the Trust files each year with the USEPA.

d. Anticipated Cash Draw Ratio

Massachusetts will draw 100 percent of the state match funds before drawing federal funds. This will ensure that Massachusetts remains in compliance with the required cash draw ratios.

e. Transfer of Funds to the Drinking Water State Revolving Fund (DWSRF)

Section 302 of the 1996 Safe Drinking Water Act Amendments allows states the flexibility to move some funds between the Clean and the Drinking Water SRF programs, to better address specific state priorities. The EPA allows an equivalent of up to 33% of the Drinking Water grant to be transferred between the Clean Water and Drinking Water funds.

CWIUP capacity frequently allows Massachusetts to finance all of the Clean Water projects that request financing in a given year. On the Drinking Water side, generally one third to one half of the projects go unfunded each year. Transferring a limited amount of funds from CWSRF to DWSRF this year and in the future will help to modestly increase the capacity of the DWSRF and reduce this imbalance in our ability to provide financing.

The level of federal grant funding of the MA Drinking Water SRF is insufficient to meet the need for project financing. Therefore, Massachusetts will transfer funds from the CWSRF to the DWSRF program in the estimated amount of $5.4 million (33% of the anticipated 2015 DW grant amount of $16.4 million). These will be recycled funds freed up from the repayment of previous loans. The purpose of this transfer is to help increase the capacity of the DWSRF.

This transfer of funds will not result in any changes to the 2015 list of projects. The transfer will be used to increase the capacity of the 2016 IUP.

f. Estimated Sources and Uses

The sources of funds available to the Massachusetts CWSRF include the federal capitalization grant, 20% state match and borrower free-ups. The Trust may leverage these funds up to 3 times. Under this authority, the Trust could finance well in excess of $400 million of projects; however, the capacity of the program is controlled by the amount of Contract Assistance provided by the Commonwealth. This limiting factor results in the overall size of the 2015 IUP of approximately $400.3 million, which is below the theoretical capacity limit of the program.

VI. Program Management

a. Assurances and Special Conditions

MassDEP and the Trust have provided the required assurances and certifications as part of the Operating Agreement between Massachusetts and the USEPA. The Operating Agreement (OA) describes the mutual obligations among EPA, MassDEP and the Trust. The purpose of the OA is to provide a framework of procedures to be followed in the management and administration of the CWSRF.

The OA addresses the commitment to key CWSRF requirements, including:

- 602(a) Environmental Reviews: The CWSRF will conduct environmental reviews according to the State Environmental Review Process developed for the SRF.
- 603(b) (3) Binding Commitments: The CWSRF will enter into binding commitments for 120 percent of each quarterly grant payment within one year of receipt of the payment.
- 602(b) (4) Expeditious and Timely Expenditures: The CWSRF will expend all funds in the CWSRF in a timely manner.
- Consistency with Planning. The Commonwealth agrees that it will not provide assistance to any project unless that project is consistent with plans developed under Section 205(j), 208, 303(e), 319 or 320.

b. Federal Requirements

A number of federal requirements apply in an amount equal to the capitalization grant including:

- Single Audit Act (OMB A-133)
- Disadvantaged Business Enterprise compliance (DBE)
- Federal environmental crosscutters
- Federal Funding Accountability and Transparency Act (FFATA) reporting

MassDEP and the Trust will identify the group of projects that must comply with these requirements in the grant application. Frequently, the group of projects changes as projects move towards construction, usually due to attrition. If changes are made to the group of projects, appropriate amendments to the grant application will be made.

c. Davis-Bacon Wage Rates

EPA's FY2014 Appropriations bill requires the application of Davis-Bacon prevailing wage rates to all treatment works projects funded in whole or in part by the CWSRF. The amendments to the Clean Water Act, as part of the Water Resources Reform and Development Act, apply the Davis-Bacon Act requirements to all treatment works projects going forward. The Davis-Bacon requirements do not apply to nonpoint source or decentralized wastewater treatment projects. MassDEP ensures that the required Davis Bacon language is included in contracts, and conducts field verifications of project compliance with the wage rate requirements.

d. Audits and Reporting

MassDEP and the Trust will comply with all of the auditing and reporting requirements of the USEPA. A single audit is conducted annually and reporting to the EPA is done through the Clean Water Benefits Reporting system, the National Information Management System, Annual Report and FFATA reporting.

VII. Public Review and Comment

Notice of the availability of the Draft Calendar Year 2015 IUP/PPL was made on November 7, 2014. A public hearing on the Draft IUP took place on December 10, 2014 at 1:00 PM at the MassDEP offices at One Winter Street, Boston, MA. Written public comments were accepted up until 5:00 PM on December 10, 2014. Records of this meeting will be maintained in the MassDEP files.

TABLE 1
CLEAN WATER STATE REVOLVING FUND
Calendar Year 2015 CWSRF Intended Use Plan

NEW PROJECTS

Rating	Applicant	SRF ID	Project	Project Cost	2015 IUP Cost
141	NEW BEDFORD (EJ)(RE)#	4008	CSO Abatement	$181,300,000	$40,000,000
139	GLSD (EJ)#	3965	CSO Abatement Program	$9,900,000	$9,900,000
120	NANTUCKET #	4034	Surfside WWTF Improvements	$8,827,000	$8,827,000
119	MARION	4005	WW and Drainage System Improvements	$17,280,000	$17,280,000
119	WORCESTER (EJ)	3988	Route 20 Sewer	$20,000,000	$20,000,000
116	NANTUCKET	4035	Sewer Extension	$55,752,000	$28,000,000
115	LOWELL REGIONAL WASTEWATER UTILITY (EJ)#	3976	CSO Phase II	$32,000,000	$10,000,000
112	FITCHBURG (EJ)#	3993	Easterly WWTF Upgrade	$27,383,000	$27,383,000
112	CHICOPEE (EJ)	3945	Sewer Separation - Area 5 Phase A	$11,939,000	$11,939,000
111	WORCESTER (EJ)	3998	Lake Ave Sewer Rehab	$3,256,000	$3,256,000
111	MWRA	3979	CSO Phase 16	$669,970,000	$26,200,000
107	REVERE (EJ)	3958	Sewer Rehab	$13,450,000	$13,450,000
107	REVERE (EJ)	3959	Illicit Connection Removal	$2,900,000	$2,900,000
106	LOWELL REGIONAL WASTEWATER UTILITY (EJ)#	3978	WWTF and PS Upgrades	$11,000,000	$11,000,000
106	SAUGUS (EJ)	3975	SSO Reduction Subsystem 4	$1,718,000	$1,718,000
102	BROCKTON (EJ)	4002	Sewer Rehab	$1,840,000	$1,840,000
102	SHREWSBURY	3987	Sewer & PS Improvements	$3,300,000	$3,300,000
99	LAWRENCE (EJ)	3964	Sewer Rehab	$12,808,000	$12,808,000
99	FRAMINGHAM (EJ)	3962	Pump Station Reconfiguration	$18,000,000	$12,000,000
97	GRAFTON (RE)#	3990	WWTP Improvements	$45,000,000	$15,000,000
97	HAVERHILL (EJ)	3963	Sewer Rehab	$4,979,000	$4,979,000
95	NORWOOD (EJ)	4014	Underdrain Area Sewer Rehab	$2,700,000	$2,700,000
93	MFN REGIONAL WASTEWATER DISTRICT	4037	WPCF Upgrades	$39,010,000	$20,000,000
93	WORCESTER (EJ)	3999	Sewer Interceptor	$8,267,000	$8,267,000
91	MIDDLEBOROUGH (EJ)	4006	WPCF Upgrades	$28,266,000	$28,266,000
89	GRANBY	3947	Sewer Expansion	$7,594,000	$7,594,000
88	BOSTON WATER AND SEWER COMMISSION (EJ)	3961	Sewer Separation	$14,644,000	$9,000,000
TOTAL OF NEW PROJECTS				**$1,253,083,000**	**$357,607,000**

(Count: 27) (Average Rating: 106.89)

(EJ) - Environmental Justice Communities
(RE) - Potential Renewable Energy Projects

- Projects contains Energy Efficiency, Renewable Energy, and/or meets EPA's definition of a Green Project (http://water.epa.gov/aboutow/eparecovery/index.cfm)

MULTI-YEAR CARRYOVER AND STATUTORY PROJECTS

Applicant	SRF ID	Project	Project Cost	2015 IUP Cost
MWRA	3668	Nut Island Headworks Electrical & Conveyor Improv.	$9,200,000	$1,500,000
MWRA	3134	Deer Island Treatment Plant Improvements	$81,559,117	$100,000
MWRA	2885	Wastewater Treatment Plant and Sewer Improvements	$48,685,168	$100,000
MWRA	2870	Electrical Upgrades	$73,215,641	$100,000
MWRA #	3543	DITP Electrical and Plant Upgrades	$51,436,276	$1,500,000
MWRA #	3542	DITP Digester and Cryogenics Upgrade	$21,780,000	$1,500,000
SPRINGFIELD WATER AND SEWER COMMISSION (EJ)	3916	Dickinson Siphon/Main Interceptor Rehab	$17,880,000	$8,022,000
TOTAL OF MULTI-YEAR CARRYOVER AND STATUTORY PROJECTS			**$303,756,202**	**$12,822,000**

(Count: 7)

MassDEP PRIORITY PROJECTS

Applicant	SRF ID	Project	Project Cost	2015 IUP Cost
COMMUNITY SEPTIC MANAGEMENT PROGRAM	3850		$5,000,000	$5,000,000
EMERGENCY SRF SET-A-SIDE	2977		$2,000,000	$2,000,000
GLSD (EJ)(RE)#	3966	Organics to Energy	$24,895,000	$12,500,000
TOTAL OF MassDEP PRIORITY PROJECTS			**$31,895,000**	**$19,500,000**

(Count: 3)

PLANNING PROJECTS

Applicant	SRF ID	Project	Project Cost	2015 IUP Cost
ACUSHNET	4020	CWMP	$375,000	$375,000
BROCKTON	4015	Stormwater Management Plan	$400,000	$400,000
HAVERHILL	3953	CSO LTCP phase II	$2,000,000	$2,000,000
LOWELL REGIONAL WASTEWATER UTILITY	3954	WWTF Capacity Assessment	$500,000	$500,000
NANTUCKET	4033	I/I Study	$225,000	$225,000
NANTUCKET	4032	Stormwater Master Planning	$350,000	$350,000
NEW BEDFORD	4009	IWW and SWP	$1,000,000	$1,000,000
NORTHBOROUGH	3994	I/I and SSES	$430,000	$430,000
NORWOOD	4013	SSES/SMOM/Stormwater Planning	$500,000	$500,000
REVERE	3957	Illicit Connection Detection	$800,000	$800,000
REVERE	3956	SSES	$1,700,000	$1,700,000
REVERE	3955	FOG Study	$250,000	$250,000
RUTLAND	3995	CWMP	$350,000	$350,000
UBWPAD	3997	Wet Weather Management and FP Nutrient Upgrade	$1,500,000	$1,500,000
TOTAL OF PLANNING PROJECTS			**$10,380,000**	**$10,380,000**

(Count: 14)

	TOTAL OF INTENDED USE PLAN	**$1,599,114,202**	**$400,309,000**

TABLE 2
CLEAN WATER STATE REVOLVING FUND
Calendar Year 2015 CWSRF Project Priority List

NEW PROJECTS

Rating	Applicant	NPDES/PERMIT	SRF ID	Project	Project Cost
141	NEW BEDFORD (EJ)(RE)#	MA0100781	4008	CSO Abatement	$181,300,000
139	GLSD (EJ)#	MA0100447	3965	CSO Abatement Program	$9,900,000
120	NANTUCKET #	GW Discharge	4034	Surfside WWTF Improvements	$8,827,000
119	MARION	MA0100030	4005	WW and Drainage System Improvements	$17,280,000
119	WORCESTER (EJ)	MA0102369	3988	Route 20 Sewer	$20,000,000
116	NANTUCKET	GW Discharge	4035	Sewer Extension	$55,752,000
115	LOWELL REGIONAL WASTEWATER UTILITY (EJ)#	MA0100633	3976	CSO Phase II	$32,000,000
112	FITCHBURG (EJ)#	MA0100986	3993	Easterly WWTF Upgrade	$27,383,000
112	CHICOPEE (EJ)	MA0101508	3945	Sewer Separation - Area 5 Phase A	$11,939,000
111	MWRA	MA0103284	3979	CSO Phase 16	$669,970,000
111	WORCESTER (EJ)	MA0102369	3998	Lake Ave Sewer Rehab	$3,256,000
107	REVERE (EJ)	MA0103284	3959	Illicit Connection Removal	$2,900,000
107	REVERE (EJ)	MA0103284	3958	Sewer Rehab	$13,450,000
106	LOWELL REGIONAL WASTEWATER UTILITY (EJ)#	MA0100633	3978	WWTF and PS Upgrades	$11,000,000
106	SAUGUS (EJ)	MA0100552	3975	SSO Reduction Subsystem 4	$1,718,000
102	BROCKTON (EJ)	MA0101010	4002	Sewer Rehab	$1,840,000
102	SHREWSBURY	MA0100412	3987	Sewer & PS Improvements	$3,300,000
99	LAWRENCE (EJ)	MA0100447	3964	Sewer Rehab	$12,808,000
99	FRAMINGHAM (EJ)	MA0103284	3962	Pump Station Reconfiguration	$18,000,000
97	GRAFTON (RE)#	MA0101311	3990	WWTP Improvements	$45,000,000
97	HAVERHILL (EJ)	MA0101621	3963	Sewer Rehab	$4,979,000
95	NORWOOD (EJ)	MA0103284	4014	Underdrain Area Sewer Rehab	$2,700,000
93	WORCESTER (EJ)	MA0102369	3999	Sewer Interceptor	$8,267,000
93	MFN REGIONAL WASTEWATER DISTRICT	TBD	4037	WPCF Upgrades	$39,010,000
91	MIDDLEBOROUGH (EJ)	MA0101591	4006	WPCF Upgrades	$28,266,000
89	GRANBY	MA0100455	3947	Sewer Expansion	$7,594,000
88	BSWC (EJ)	MA0103284	3961	Sewer Separation	$14,644,000
82	BROCKTON (EJ)	MA0101010	4000	AWRF Nutrient Removal Upgrade	$7,300,000
82	GREAT BARRINGTON (EJ)#	MA0101524	3948	WWTF Upgrades & Sewer Improvements	$4,300,000
80	HOLDEN	MA0102369	3991	PS Upgrades	$1,513,000
79	NORTON	MA0100897	4004	Sewer Extensions	$12,826,000
71	CHICOPEE (EJ)#	MA0101508	3946	WWTP Upgrades	$9,156,500
69	CARVER	TBD	4003	Carver Public Schools WWTF	$964,000
69	TYNGSBOROUGH	MA0100633	3968	Sewer Extension Phase 2	$9,669,000

69	TYNGSBOROUGH	MA0100633	3967	Sewer Extension Phase 1	$8,834,000
65	MFN REGIONAL WASTEWATER DISTRICT	TBD	4036	Landfill Closure	$1,400,000
64	MWRA	MA0100404	3982	Clinton WWTP Phosphorous Removal	$6,333,800
63	NORTHBOROUGH #	MA0100480	3992	PS Rehab	$1,195,000
62	LWSC (EJ)	MA0100552	3977	WWTP Incinerator Upgrade & Chlorine Gas Conversion	$6,390,000
62	BILLERICA #	MA0101711	3960	Sewer Contract 36 & Salem Rd Upgrades	$16,413,000
54	MWRA	MA0103284	3981	Remote Headworks Upgrade	$166,760,000
48	MWRA	MA0103284	3980	Caruso Pump Station	$2,679,050
45	GARDNER (EJ)	MA0100994	3989	WWTP Upgrade	$23,000,000
43	QUINCY (EJ)#	MA0103284	3974	PS Renovation	$4,000,000
TOTAL OF NEW PROJECTS					**$1,535,816,350**

(Count: 44) (Average Rating: 90.75)

(EJ) - Environmental Justice Communities
(RE) - Potential Renewable Energy Projects
- Projects contains Energy Efficiency, Renewable Energy, and/or meets EPA's definition of a Green Project (http://water.epa.gov/aboutow/eparecovery/index.cfm)

MULTI-YEAR CARRYOVER AND STATUTORY PROJECTS

Applicant	NPDES/PERMIT	SRF ID	Project	Project Cost
MWRA	MA0103284	3668	Nut Island Headworks Electrical & Conveyor Improv.	$9,200,000
MWRA	MA0103284	3134	Deer Island Treatment Plant Improvements	$81,559,117
MWRA	MA0103284	2885	Wastewater Treatment Plant and Sewer Improvements	$48,685,168
MWRA	MA0103284	2870	Electrical Upgrades	$73,215,641
MWRA #	MA0103284	3543	DITP Electrical and Plant Upgrades	$51,436,276
MWRA #	MA0103284	3542	DITP Digester and Cryogenics Upgrade	$21,780,000
SPRINGFIELD WATER AND SEWER COMMISSION (EJ)	MA0101613	3916	Dickinson Siphon/Main Interceptor Rehab	$17,880,000
TOTAL OF MULTI-YEAR CARRYOVER AND STATUTORY PROJECTS				**$303,756,202**

(Count: 7)

MassDEP PRIORITY PROJECTS

Applicant	NPDES/PERMIT	SRF ID	Project	Project Cost
COMMUNITY SEPTIC MANAGEMENT PROGRAM	N/A	3850		$5,000,000
EMERGENCY SRF SET-A-SIDE	N/A	2977		$2,000,000
GLSD (EJ)(RE)#	MA0100447	3966	Organics to Energy	$24,895,000
TOTAL OF MassDEP PRIORITY PROJECTS				**$31,895,000**

(Count: 3)

PLANNING PROJECTS

Applicant	SRF ID	Project	Project Cost
ACUSHNET	4020	CWMP	$375,000
BROCKTON	4015	Stormwater Management Plan	$400,000
HAVERHILL	3953	CSO LTCP phase II	$2,000,000
LOWELL REGIONAL	3954	WWTF Capacity Assessment	$500,000

WASTEWATER UTILITY			
NANTUCKET	4033	I/I Study	$225,000
NANTUCKET	4032	Stormwater Master Planning	$350,000
NEW BEDFORD	4009	IWW and SWP	$1,000,000
NORTHBOROUGH	3994	I/I and SSES	$430,000
NORWOOD	4013	SSES/SMOM/Stormwater Planning	$500,000
REVERE	3957	Illicit Connection Detection	$800,000
REVERE	3956	SSES	$1,700,000
REVERE	3955	FOG Study	$250,000
RUTLAND	3995	CWMP	$350,000
UBWPAD	3997	Wet Weather Management and FP Nutrient Upgrade	$1,500,000
TOTAL OF PLANNING PROJECTS			**$10,380,000**

(Count: 14)

TOTAL OF PROJECT PRIORITY LIST **$1,881,847,552**

APPENDIX J

ENERGY AUDIT AND GHG ANALYSIS
APRIL, 2015

ENERGY AUDIT

MFN Regional Wastewater District

Water Pollution Control Facility

April 2015

CDM Smith

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Section 1
Introduction

As requested by the Massachusetts Department of Environmental Protection (MassDEP), this report summarizes the energy audit performed at the Mansfield Foxborough Norton Regional Wastewater District (MFN District) Water Pollution Control Facility (WPCF) by CDM Smith.

The WPCF has been in continuous operation since 1985 with a Phase I upgrade completed between 2008 and 2010. The energy audit was performed as part of the preliminary design for the Phase II upgrade. The energy audit was performed by conducting site visits and reviewing existing documents.

The purpose of the audit was to summarize the existing conditions of the facility as they relate to energy consumption and efficiency and the planned improvements identified to date as part of the preliminary design stage of the Phase II upgrade. The information gathered in the energy audit serves as a first step to comply with the Massachusetts Environmental Policy Act (MEPA) Greenhouse Gas (GHG) Emissions Policy. Compliance with the MEPA GHG Emissions Policy is required as part of the Town of Mansfield's Phase 2 Comprehensive Wastewater Management Plan (CWMP) and related Final Environmental Impact Report (FEIR), Executive Office of Energy and Environmental Affairs (EOEEA) Certificate No. 13388.

As part of the FEIR, a baseline and mitigated GHG analysis of the CWMP recommended plan will be conducted using the United States Environmental Protection Agency (EPA) Energy Star Portfolio Manager. In addition, GHG reduction and energy conservation measures will be identified as part of the GHG analysis and will be based on the recommendations identified herein.

The WPCF energy audit was performed for the following disciplines: architectural, heating, ventilating and air conditioning (HVAC), process mechanical, and electrical.

1.1 Summary of Phase II Upgrade

The Phase II upgrade consists of the following improvements:

- Expand capacity of the WPCF from 3.14 to 4.14 million gallons per day (mgd), including but not limited to the following:
  - New influent wastewater pumps
  - New primary clariflocculator and associated pumps
  - Reconfigured aeration tanks with fine bubble diffusers and new anoxic tanks
  - New secondary clarifier
  - Converted existing sand filter into a cloth filter to match the upgraded filter from Phase I
  - New effluent pumping station to convey a portion of the treated wastewater effluent to new recharge infiltration basins

- Replace all equipment that has reached or is nearing the end of its service life including pumps, blowers, etc. and replace all motors with high efficiency motors utilizing variable frequency drives where applicable
- Remove all sludge thickening and dewatering equipment not currently in use
- Repurpose a portion of the process building to allow for further office or maintenance space, storage, or to construct a new electrical room
- Replace or renovate all HVAC systems not upgraded in Phase I
- Install new lighting in areas where lighting was not upgraded in Phase I
- Install new electrical wiring to support new process equipment
- Complete of plant communication system upgrades
- Convert from oil fuel to natural gas (if allowed by the gas provider)

The baseline energy consumption and efficiency discussed in the following sections, as well as energy consumption, efficiency and recommendations related to WPCF upgrade and expansion, are generally focused around the improvements noted above.

Section 2

Architectural Audit

The architectural energy audit included assessing the existing glazing systems, sealant joints and openings, and weather stripping. A general review of existing space allocations and future allocation was also conducted and discussed with the WPCF staff to better understand these allocations on energy use and efficiency.

2.1 Energy Review, Existing Conditions, and Recommendations

Glass block with operable, insulating glass, window units in the process and filter buildings:

- Many of the operable, insulating glass, window units are fogged indicating perimeter seal failure between the glass panes. The steel window frames transmit exterior cold and heat to interior spaces. Some of the steel frames are rusted.
- Some of the glass block units are cracked. The glass block existing U value is 0.51 and the R value is 1.96. Replacing with thermal efficient aluminum frame and new insulating glass can improve the U and R values to approximately .35 and 3.0 respectively. While energy cost savings would not be large, comfort level would increase within office areas.
- Clerestory glass frame gaskets at one or more frames show signs of failure as fogging of the glass is visible (from corridor at second floor locker room areas). Replacement of the insulating glass gaskets or the entire glass unit in selected frames should be considered. The glass is in satisfactory condition, but replacing the entire glass unit may be more cost effective than just replacing the gaskets.

Sealant joints and openings in all buildings:

- Most sealant joints are cracked and many newer sealant joints are poorly installed allowing bond failure. Replacement sealant joints are needed around most glass block, louvers and doors. At the electrical room, the newer glass block opening has a perimeter mortar joint. This joint will crack due to differential movement. This should be replaced with a proper perimeter sealant joint.
- Sunlight can be seen through clerestory metal panel joints (from corridor at second floor HVAC room). A proper sealant joint is required at these openings.
- Chlorine building: Sunlight can be seen through two small holes, one inch and two inches in diameter, drilled in the exterior of the building. The holes need to be sealed.

Doors requiring weather stripping adjustments or replacement:

- Machine shop exterior double door center weather stripping and door bottom are not working properly and need to be replaced.
- Electrical room and generator room double doors center weather stripping is not working properly and needs to be replaced.
- Door D18 (exterior door at stairway) door bottom weather stripping is allowing cold air to infiltrate. This should be replaced.

- Front entrance, weather stripping at top corner of jamb has 1 foot length missing.
- Door D66, second floor, jamb weather stripping is not tight against door. This should be adjusted.
- Primary pump station, door to lower level: the bottom weather stripping is not working or missing. Other doors may be similar but were locked and uninspected. New weather stripping should be installed.

2.2 General Upgrades and Issues

The following consists of a general review of the existing space allocations, the planned future allocations, and general architectural improvements to be made throughout the WPCF. This review is presented for informational purposes as there will be no major energy savings; however, where changes are made, energy efficient materials will be used.

2.2.1 Review of Existing and Future Space Allocations

Basement:
New chemical storage, ferric tanks, will be isolated within a new fire rated room with a chemical resistant seamless resinous flooring system.

First Floor (in Former Flotation Thickener Area):

- A clean room (i.e. SCADA room) for the existing servers, now located in the control room, will be constructed Servers will be relocated to this new location.
- A new mechanics office for three maintenance personnel will be constructed adjacent to the existing machine shop. The new space will have three tables, chairs and a shop bench and layout table. Storage cabinets will be provided.
- The existing machine shop working area will be expanded after moving existing desk space to the new mechanics office and removal of the existing lime feed equipment. Remaining available open space will be converted to parts storage.
- A new electrical room for the proposed electrical upgrades will be located within this first floor area.
- A new administration office will be constructed as space allows (option: this could be on the second floor).

Second Floor (in Former Flotation Thickener Area; note, this is an existing two story space):

- Construction of a new second floor level is proposed for a new MFN District meeting/training room for at least 20 people.
- If space is available within the new second floor area, possibly construct new, larger, chief operators office (and renovate the existing) and locate the new SCADA room on this level.

Second Floor (other areas):

- The existing filter press area will be converted to storage. With the removal of the filter presses, new floor hatches will be added for access to the lower garage area. If process equipment, such as compressors, are relocated to this space, sound control measures need to be reviewed.

- The existing second floor men's restroom/locker room is in need of redesign for a better efficiency of staff movement at the locker area or, if practical, expansion into the existing women's restroom which would require a redesign of the women's restroom.

2.2.2 Miscellaneous Upgrades and Issues

Based on a review of the existing conditions and existing and future space allocations, the following recommendations should be considered:

Miscellaneous Upgrades – Process Building:

- First floor lobby and superintendent's office area needs updating of space, finishes and furnishings. Work space needed for pretreatment coordinator and future receptionist.
- First floor lobby flooring and ceilings should be replaced. CMU walls should be painted or refinished with gypsum or similar material.
- Replace exterior curved glass block in lobby with an efficient glazing system to improve visual control of the site and energy efficiency.
- Replace exterior glass block/operable frame and glass in superintendent's office with a new energy efficient window wall system.
- The seamless flooring within the first floor area is worn. The concrete floor slab has minor cracking which has telescoped up through the seamless flooring system. Consider crack repair and resurfacing.
- Existing second floor laboratory is generally in good condition. Some counter tops at sink areas are worn, although workable. The existing fume hood is in working order. The unit next to the fume hood is not used and can be removed and replace with casework. General casework finishes show little but some rust and are in fair condition. Refinishing of the casework should be considered. The lab office is to remain.
- Existing second floor lunch room needs updating of finishes, appliances and furnishings.

General Issues:
Process Building:

- Add kick plate at guard railing from basement level to lower basement level for worker safety.
- One exit door at the stairway from basement level has a loose door handle.
- Stair railing height is 30 inches above nosing. Current code requires 34 to 38 inches.

Pump Stations:

- Newer exterior waterproofing traffic coatings on concrete slab has worn away. Replace or replenish to control moisture infiltration through the concrete slab to interior space below.

Section 3

HVAC Audit

An HVAC energy audit was performed based on the requirements of American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Energy Assessment Preliminary Energy Use Analysis and Level 1 Audit.

3.1 HVAC System Types and Condition

HVAC equipment is distributed across five major building structures at this facility:

- Chemical building (formerly chlorine building)
- Gravity filter building
- Primary sludge pump station
- Secondary sludge pump station
- Process building

Original WPCF construction was completed in the early 1980s. Except for some partial renovations completed as part of the Phase I upgrade completed between 2008 and 2010 and maintenance related equipment replacements, most HVAC and domestic water heating equipment is original.

Table 1 provides a brief summary of HVAC equipment type and condition status for each building:

Table 1: HVAC Equipment Summary

Building	Type of HVAC Equipment	HVAC Energy Source	Equipment Age/Condition Status	Controls Age/ Condition Status	Comments
Chemical	Heat & Vent	Electricity	Original	Original	Maintenance Replacement
Gravity Filter	Heat, Vent, Dehumidify	Electricity and Fuel Oil	Less than 10 years	Less than 10 years	Phase I upgrade renovation
Primary Sludge	Heat & Vent	Electricity	Original	Some less than 10 years	Partial ATC Renovation
Secondary Sludge	Heat & Vent	Electricity	Original	Some less than 10 years	Partial ATC Renovation
Process	Heat, Vent and Air Conditioning	Electricity and Fuel Oil	Mostly original; some less than 10 years	Most original; some less than 10 years	Partial Equipment and ATC Renovation

Note: ATC = automatic temperature control

3.2 Energy Use

The WPCF utilizes electricity and fossil fuel to heat its buildings. All HVAC motors are electrically powered. Fuel oil use is documented in this section. See Section 5 for total electrical usage.

3.2.1 Fossil Fuel Heat

The process and gravity filter buildings have the most extensive floor space and are primarily heated by No. 2 fuel oil which is used to produce low pressure steam for distribution to various loads within the process building. A portion of the steam load is also used in a steam to water converter to produce heating hot water for heating the gravity filter building.

The fuel bills from March 11, 2013 to March 12, 2014 yield the following information. All values are gallons of No. 2 fuel oil.

- Average monthly usage: 2,504 gallons
- Average daily usage: 82 gallons
- Total usage for one year: 30,050 gallons

As part of the Phase II upgrade, the oil fuel system will be replaced with natural gas. This is contingent on the gas company having the supply to serve the WPCF.

3.2.2 Electric Heat

Self-contained thermostatically controlled electric unit heaters or electric duct heaters are used for heating of the chemical building and for the primary sludge and secondary sludge pump stations. Electricity is also used to provide spot heating in some areas of the process building. Most electrical heating energy use is associated with heating continuous ventilation air required by code.

3.2.3 HVAC Motors

HVAC motors are primarily employed on air handling systems used for ventilation of process areas required to have continuous ventilation. Some fan coil units and direct expansion packaged air conditioning is utilized in the plant office and administrative areas, however these loads are relatively small. Electric motors are also utilized for steam boiler burners, fuel oil transfer pumping, steam condensate return pumping, hot and chilled water circulation, and seasonal water chiller operation. Many of the HVAC electric motors are original and therefore inefficient by today's standards. All HVAC motors are across the line full voltage starting.

3.3 HVAC Recommendations

The following low cost/no cost HVAC changes should be considered for implementation:

- An inspection of the boiler room indicates there are many steam and condensate piping and related heating equipment areas where insulation should be added or replaced where it has been removed. Adding insulation will reduce heat loss by at least 90 percent compared to uninsulated surfaces.
- An inspection of the basement chilled water piping indicates the system piping insulation may be compromised and should be inspected further for evidence of moisture infiltration. Further remedial steps may be required based upon the results of the investigation.

- Some HVAC motors are old and inefficient, and when run to failure they should be replaced with premium efficiency type. This will result in a 1 to 5 percent energy savings but this is application dependent. Motor replacement may be warranted through utility rebate incentives.
- A review of existing plant space usage and equipment loads should be undertaken to evaluate the suitability and efficiency of the original plant ventilation system to effectively serve the present and future expected plant needs. There are many plant areas in which equipment is no longer in use or where, due to changed space usage, the original HVAC system equipment is no longer suitable or efficient.
- An inspection and evaluation of the existing ATC should be undertaken to identify any defective, inoperable or out of adjustment ATC equipment. A particular focus should be made to review existing pneumatic control sequences to determine if any sequence adjustments or updates could be inexpensively made in order to more efficiently meet current space HVAC needs.
- Updating motors to the latest efficiency levels and the use of variable frequency drives (VFDs) are both methods for energy savings. VFDs can yield up to 50 percent energy savings, but this can vary be application. A more detailed analysis will be required to determine the extent of changes and capital costs associated with these changes.

Section 4

Process Mechanical Audit

The process mechanical energy audit included assessing the current motor loads on all equipment and the projected motor loads for the planned upgrades. It also explored the benefits of upgrading to newer motors including the use of VFDs.

4.1 Existing Process Mechanical Equipment

The existing equipment at the WPCF contains a combination of original equipment from the 1980s and some newer equipment from the Phase I upgrade. There is currently about 1,450 horsepower (HP) of equipment utilized for the treatment and conveyance of raw wastewater including primary and secondary clarification and disinfection. This also includes power required for all solids handling and processing, and all chemical feed systems.

4.2 Process Equipment Upgrades and Modifications

Below is a summary of the planned modifications in each area of the plant and the resulting change in horsepower.

4.2.1 Influent Pumping

The WPCF currently has four 50 HP raw wastewater pumps which will be replaced by four 100 HP pumps to account for the increase in plant capacity resulting in an increase of 200 HP.

4.2.2 Screening and Aerated Grit Removal

The only modification in this area will be to the aerated grit blowers which will be replaced in kind. There will be no change in power requirements for this area.

4.2.3 Primary Clariflocculation

A new distribution box with new mixers will be constructed to accommodate the new primary tank and a future fourth tank. The existing tank and mixers will be taken offline. With the expansion of the plant capacity a new clarifier drive and associated equipment will be added. The existing pumps including the thickened primary sludge pumps, the primary return sludge pumps, and the primary scum pump will all be replaced in kind. An additional two pumps will be added to account for the new clariflocculator. Overall, the modifications in this area will result in an additional 29 HP being added to the system.

4.2.4 Aeration

The WPCF currently has four 75 HP surface aerators which will be replaced with fine bubble diffusers requiring new blowers. A new large bubble mixing system and internal recycle pumps will be added as well. This system will have four 75 HP blowers, three 8.3 HP internal recycle pumps, and two 15 HP submersible mixers resulting in a power increase of 55 HP.

4.2.5 Secondary Clarification

With the expansion of the plant capacity a new secondary clarifier drive will be required as well as an additional RAS pump. The secondary scum pump will be removed and submersible scum pumps will be used in their place. The existing WAS pumps and RAS pumps will be replaced in kind. These modifications will add 20.75 HP.

4.2.6 Filtration

The gravity sand filter will be upgraded to match the cloth filter installed as a part of the Phase I upgrade. This will include a new drive unit and new washwater and backwash pumps. These changes will add 2.5 HP to the system.

4.2.7 Effluent Pumping

A new effluent pumping station will need to be constructed to pump treated wastewater effluent to the recharge infiltration basins. This will require three, 17 HP pumps.

4.2.8 Process Building: Sludge Handling

Other than the sludge holding tank mixers and blowers, all other sludge handling and processing equipment will be removed. This will result in a reduction of 400 HP from the system.

4.2.9 Chemical Systems

All of the chemical systems will be replaced. There will be a negligible change in power requirement for all chemical systems.

4.2.10 Plant Water System

The plant water system will be replaced with a slightly larger set up pumps to accommodate the upgrades to the plant resulting in a 15 HP increase.

4.2.11 Other Systems

All other systems not mentioned above, including odor control, septage receiving, air compression, and post aeration, will be unchanged in the Phase II upgrade.

4.2.12 Summary of Upgrades

Table 2 below provides a summary of the changes in horsepower anticipated as part of the Phase II upgrade:

Table 2: Net Change in Horsepower in Process Areas

Process Area	Addition or Reduction of Power
Influent Pumping	+200 HP
Screening and Aerated Grit	No Change.
Primary Clariflocculation	+29 HP
Aeration	+55 HP
Secondary Clarification	+20.75 HP
Filtration	+2.5 HP
Effluent Pumping	+ 51 HP
Process Building: Sludge Handling	-400 HP
Chemical Systems	No Change
Plant Water System	+15 HP
Other Systems	No Change
Total	**-26 HP**

The upgrades to the WPCF will result in a 26 HP reduction as shown in Table 2. This will be accomplished while increasing the capacity of the plant by 1 mgd, approximately 33 percent of the current capacity.

4.3 Motor Efficiency

Many of the pumps currently in operation are from the original plant design and are now considered out of date. Any new equipment and all replacements in kind will utilize new motors with higher or premium efficiencies.

4.4 Variable Frequency Drives (VFDs)

VFDs allow for a motor to operate at varying speeds and therefore draw less power. A single speed drive requires more across the line starts which require a large amount of power. A VFD reduces the number of starts and it allows for smoother starts. Overall a VFD will reduce the electrical consumption of a motor. At a minimum it is planned for VFDs to be utilized on the new influent pumps, the blowers for the fine bubble diffusers, the internal recycle pumps, the submersible scum chopper pumps, and the RAS pumps.

As the design progresses, additional applications for VFDs will be considered.

Section 5

Electrical Audit

An electrical energy audit was performed based on the requirements of ASHRAE Energy Assessment Preliminary Energy Use Analysis and Level 1 Audit. The audit includes a discussion of existing electrical distribution and power usage, recommendations for improvement and an analysis of possible renewable energy sources.

5.1 Existing Electrical Distribution

The main electrical service to the WPCF is from National Grid via a pole and underground distribution to a pair of padmount transformers. The secondary of these transformers feeds into the WPCF main switchgear at 480 volts, 3 phase. The switchgear is double ended to provide redundancy and is connected to a standby diesel generator providing back up power to the WPCF in the event of a utility outage.

The main switchgear feeds motor control centers (MCC) throughout the WPCF. These MCC's distribute power to motors and lighting system transformers.

5.2 Existing Power Usage

Electric bills from National Grid from August 2012 to August 2013 yields the following information. These values include all electrical power to run all equipment at the WPCF including all process equipment, HVAC equipment, and electric heat.

- Maximum kilowatt usage: 350.7 kW
- Minimum kilowatt usage: 273 kW
- Average kilowatt usage: 314.3 kW
- Total kilowatt hours for August 2012 to August 2013: 2,310,630 kWh
- Watt per square foot using a sum total of all buildings: 5.81 – 7.46

This information is further summarized in Table 3 below.

5.2.1 Lighting

Plant lighting consisted of two lamp fluorescent, high pressure sodium and metal halide fixtures. See Tables 4 through 9 for details of each area of the WPCF.

- Estimated lighting load is: 30 kW
- Kilowatt hours per year: 98,440 kWh

Table 3: Process Building Lighting

Area-See Plans	Lighting Fixtures		Total Wattage	Control Switching	Estimated Operating Hours per Day	KiloWatt Hours Per Day	KiloWatt Hours Per Year
B-1	18	2 lamp fluorescent	1224	2 area switches	10	12.24	4467.6
B-2	11	2 lamp fluorescent	748	2 area switches	10	7.48	2730.2
B-3	11	2 lamp fluorescent	748	2 area switches	10	7.48	2730.2
B-4	4	2 lamp fluorescent	272	2 area switches	2	0.544	198.56
1-1	16	2 lamp fluorescent	1088	2 area switches	10	10.88	3971.2
1-2	6	2 lamp fluorescent	408	2 area switches	10	4.08	1489.2
1-3	21	2 lamp fluorescent	1428	2 area switches	10	14.28	5212.2
1-4	6	2 lamp fluorescent	408	1 area switches	4	1.632	595.68
1-5	5	2 lamp fluorescent	340	1 area switch	10	3.4	1241
1-6	8	2 lamp fluorescent	544	2 area switches	4	2.176	794.24
1-7	8	2 lamp fluorescent	544	2 area switches	4	2.176	794.24
1-8	15	2 lamp fluorescent	1020	2 area switches	10	10.2	3723
1-9	4	2 lamp fluorescent	272	2 area switches	4	1.088	397.12
1-10	10	2 lamp fluorescent	680	2 area switches	4	2.72	992.8
1-11	4	2 lamp fluorescent	272	2 area switches	4	1.088	397.12
1-12	6	2 lamp fluorescent	408	1 area switch	1	0.408	148.92
2-1	4	2 lamp fluorescent	272	1 area switch	10	2.72	992.8
2-2	8	2 lamp fluorescent	544	2 area switches	10	5.44	1985.6
2-3	14	2 lamp fluorescent	952	2 area switches	10	9.52	3474.8
2-4	10	1 lamp fluorescent	680	2 area switches	10	6.8	2482
2-5	16	2 lamp fluorescent	1088	2 area switches	10	10.88	3971.2
2-6	3	3 lamp fluorescent	204	1 area switch	10	2.04	744.6
2-7	16	2 lamp fluorescent	1088	2 area switches	10	10.88	3971.2
2-8	12	2 lamp fluorescent	816	1 area switch	10	8.16	2978.4
2-9	8	2 lamp fluorescent	544	2 area switches	10	5.44	1985.6
2-10	8	2 lamp fluorescent	544	2 area switches	10	5.44	1985.6
2-11	5	2 lamp fluorescent	340	2 area switches	4	1.36	496.4
2-12	16	High Pressure Sodium		not used	0	0	0
2-13	14	High Pressure Sodium		not used	0	0	0
2-14	9	Metal Halide	1600	1 area switch	10	16	5840
2-15	9	High Pressure Sodium			24	0	0
stairwells	14	2 lamp fluorescent	952	2 area switches	10	9.52	3474.8
outdoor	11	High Pressure Sodium	1500	photocell	24	36	13140
Total			**21,528**			**176**	**64,266**

Total Process Building Area: 33,500 Square Feet

Table 4: Filter Building Lighting

Area	Lighting Fixtures		Total Wattage	Control Switching	Estimated Operating Hours per Day	KiloWatt Hours Per Day	KiloWatt Hours Per Year
N/A	24	2 lamp fluorescent	1632	2 area switches	10	16.32	5956.8
Total			**1,632**			**16**	**5,957**

Total Process Building Area: 6,000 Square Feet

Table 5: Activated Sludge Pumping Building Lighting

Area	Lighting Fixtures		Total Wattage	Control Switching	Estimated Operating Hours per Day	KiloWatt Hours Per Day	KiloWatt Hours Per Year
Pump room	10	2 lamp fluorescent	680	1 area switch	10	6.8	2482
Elect. room	3	2 lamp fluorescent	204	1 area switch	10	2.04	744.6
Total			**884**			**8.8**	**3,227**

Total Activated Sludge Pumping Building Lighting Area: 2,500 Square Feet

Table 6: Primary Sludge Pumping Building Lighting

Area	Lighting Fixtures		Total Wattage	Control Switching	Estimated Operating Hours per Day	KiloWatt Hours Per Day	KiloWatt Hours Per Year
Pump room	10	2 lamp fluorescent	680	1 area switch	10	6.8	2482
Elect. room	2	2 lamp fluorescent	136	1 area switch	10	1.36	496.4
Total			**816**			**8.2**	**2,978**

Total Primary Sludge Pumping Building Lighting Area: 2,200 Square Feet

Table 7: Chemical Building Lighting

Area	Lighting Fixtures		Total Wattage	Control Switching	Estimated Operating Hours per Day	KiloWatt Hours Per Day	KiloWatt Hours Per Year
Control room	4	2 lamp fluorescent	272	1 area switch	4	1.088	397.12
Storage	6	2 lamp fluorescent	408	1 area switch	4	1.632	595.68
Scale room	4	2 lamp fluorescent	272	1 area switch	4	1.088	397.12
Evapor. room	2	2 lamp fluorescent	136	1 area switch	4	0.544	198.56
Chlorine room	3	2 lamp fluorescent	204	1 area switch	4	0.816	297.84
Total			**1,292**			**5.2**	**1,886**

Total Chemical Building Lighting Area: 1,300 Square Feet

Table 8: Outdoor and Roadway Lighting

Area	Lighting Fixtures		Total Wattage	Control Switching	Estimated Operating Hours per Day	KiloWatt Hours Per Day	KiloWatt Hours Per Year
Roadway	13	250 W HPS	3575	1 area switch	12	42.9	15658.5
Tanks	12	70 W HPS	1020	1 area switch	12	12.24	4467.6
Total			**4595**			**55**	**20,126**

5.2.2 Motors

Motor loads are the greatest percentage of electrical consumption in the WPCF. Horsepowers range from 75 HP down to 0.25 HP. Most motors are across the line full voltage starting. See Section 4 for details on the change in power loads from the process equipment.

5.3 Electrical Recommendations

The lighting within the facility is manually switched. Many parts of the plant lend itself to the installation of motion detection switching to turn an area of lighting on when personnel enter and automatically shut off after a certain pre-selected time. This method works well with fluorescent fixtures. However, areas with high intensity discharge (HID) fixtures should not be implemented with motion detection switches due to long restrike times.

Many fluorescent fixtures in the process building hallways have been replaced relatively recently, however many fixtures are older and have T12 lamps. Newer T8 lamps are much more efficient and would lend themselves in these areas as a lower cost, one to one, replacement option.

The existing sludge dewatering areas have high pressure sodium fixtures. These areas are not currently used in the WPCF process and are scheduled for an upgrade in the future.

Updating motors to the latest efficiency levels and the use of VFD's are both methods to improve energy efficiency. A more detailed analysis will be required to determine the extent of changes and capital costs associated with these changes.

5.4 Renewable Energy Generation

The energy audit included an evaluation of possible renewable energy sources, specifically the potential for using solar panels or micro wind turbines for energy generation onsite.

5.4.1 Solar Feasibility Study

A solar study was conducted at the WPCF at four proposed installation locations. These locations are labeled 1 through 4 and are depicted on the site plan, Sheet E-3 (see attached). These four areas total approximately 82,200 ft^2 and it is estimated that a total of 350 kW direct current (DC) of solar can be installed within their boundaries. A solar installation of this size can potentially produce approximately 510,000 kWh annually and will cost approximately $2,000,000 for equipment and installation. Note that costs listed herein are planning level costs and the installation cost ***does not include civil site preparation***.

5.4.1.1 Site 1

The first proposed location is northeast of secondary clarifier No. 2. The available area at this location is approximately 11,300 ft^2 and it is estimated that a total of 50 kWDC of solar can be installed, producing 70,000 kWh annually. The estimated cost of an installation in this location is approximately $250,000.

5.4.1.2 Site 2

The second proposed location is to the north of the detention basin and east of the aeration basins. The available area at this location is approximately 43,800 ft^2 and it is estimated that a total of 215 kWDC of solar can be installed, producing 271,000 kWh annually. The estimated cost of an installation in this location is approximately $1,000,000.

5.4.1.3 Site 3

The third proposed located is between the chemical building and primary clarifier No.1. The available area at this location is approximately 5,900 ft^2 and it is estimated that a total of 30 kWDC of solar can be installed, producing 37,000 kWh annually. The estimated cost of an installation in this location is approximately $150,000.

5.4.1.4 Site 4

The fourth proposed location is between Hill Street and northwest of the chemical building. The available area at this location is approximately 21,300 ft^2 and it is estimated that a total of 100 kWDC of solar can be installed, producing 131,000 kWh annually. This site will require substantial site work prior to the installation and may lead to an increased cost of installation. The estimated cost of an installation in this location is $600,000.

5.4.1.5 Summary

Overall, the energy production from all four sites would not be enough to recoup the costs to install the solar panels as the payback period would be over 30 years. Additionally, no individual site or combination of sites would yield a better payback period. CDM Smith does not recommend pursing solar technologies for onsite energy generation at the WPCF.

5.4.2 Micro Wind Turbine Feasibility Study

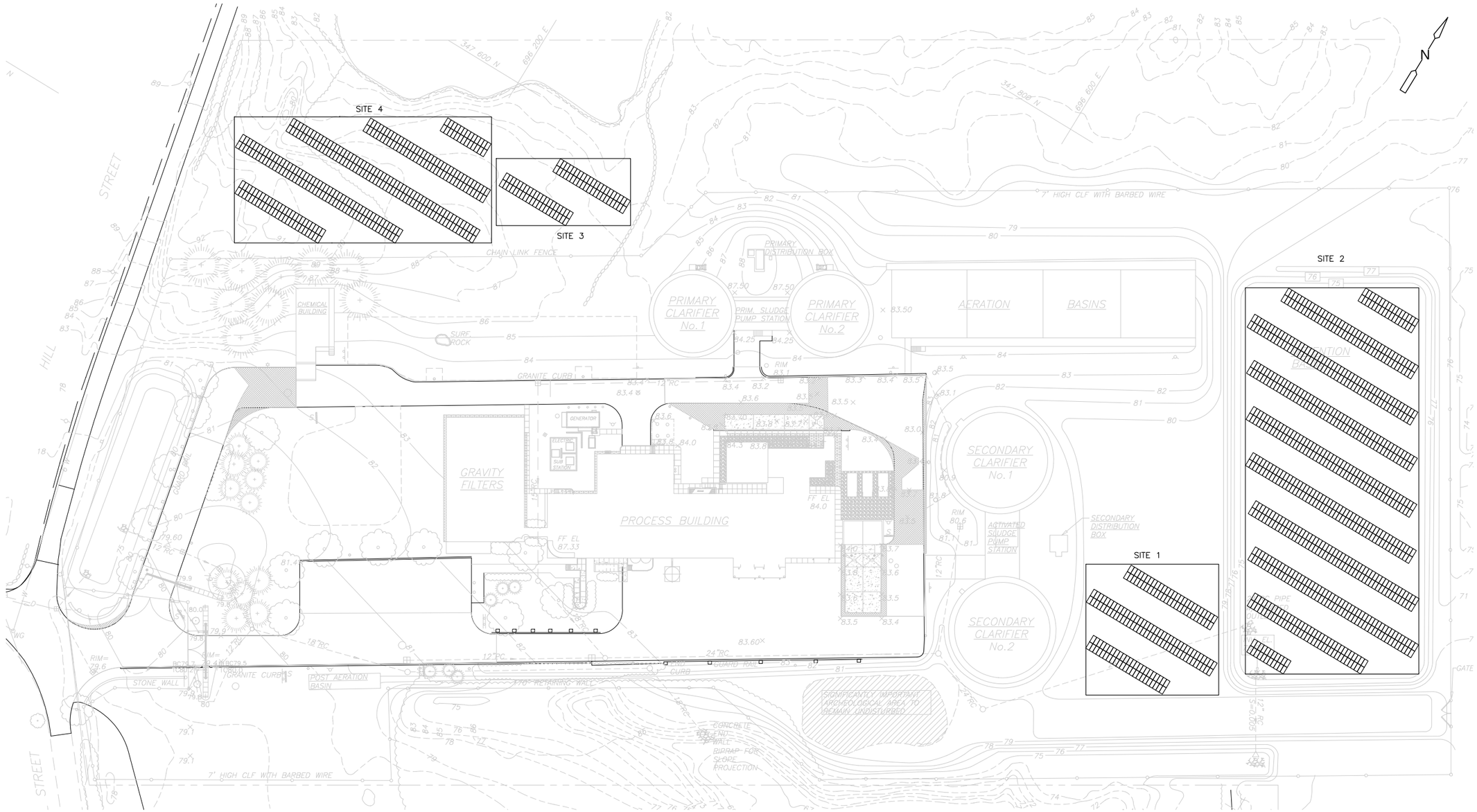
A preliminary study to evaluate the installation of micro wind turbines at the WPCF was performed in conjunction with the Massachusetts Clean Energy Center Commonwealth Wind website. Also, information was obtained from the Database of State Incentives for Renewables & Efficiency (DSIRE). Based on this analysis the following was determined:

- As shown in the Wind Project System Summary Report, the most efficient wind turbine is manufactured by the company Proven, with a rated output of 16.07kW at 50 meters above existing grade.
- Estimated annual energy out is approximately 28,000 kWh.
- Assuming a cost of 12 cents per kWh, the annual cost savings is approximate $3,000 in electricity that would be generated onsite and therefore would not need to be purchased from the electrical company.

A general cost assumption puts the price of a 15kW micro wind turbine at $60,000 assuming $4,000 per kilowatt. This would not include the cost for design, permitting, installation and other civil costs, and connections to the WPCF. Even with the possibility of receiving rebates, CDM Smith anticipates the payback period for this micro wind turbine to be greater than 20 years and therefore does not recommend using micro wind turbines at the WPCF.

Attachments:

- Drawing E-3
- Wind Project System Summary Report



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: O. DEL OLMO
DRAWN BY: O. DEL OLMO
SHEET CHK'D BY: X
CROSS CHK'D BY: X
APPROVED BY: X
DATE: FEBRUARY 2015

CDM Smith
111 Founders Plaza, Suite 1600
East Hartford, CT 06108
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MFN REGIONAL WASTEWATER DISTRICT

WPCF PHASE II UPGRADE

SOLAR STUDY

PROJECT NO. 146529-106015
FILE NAME: E003STPL.DWG

SHEET NO.
E-3

30% SUBMITTAL - NOT FOR CONSTRUCTION

XREFs: [CDMS_2436, CSVPL001] Images: []
Last saved by: DELOLMOO Time: 2/18/2015 6:01:20 PM
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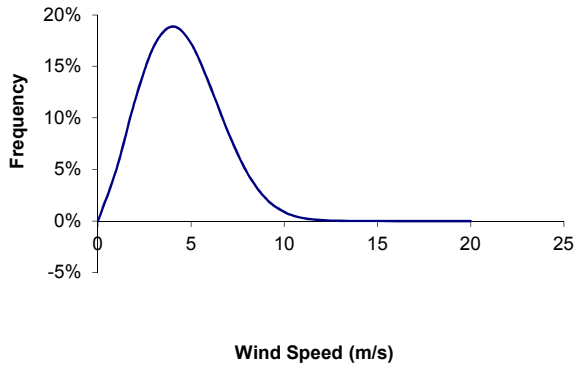
Wind Project System Summary Report

Customer Name:	0
System Designer:	Tom DiSiliva
Report Date:	2/24/2015

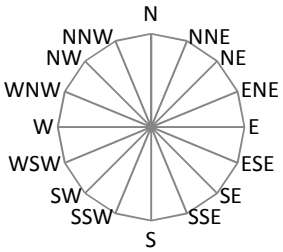
0 Project Annual Wind Speed Distribution



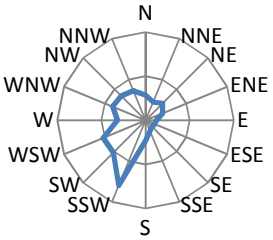
Site Information

Latitude (Tower Location):	41.9528
Longitude (Tower Location):	-71.1448
Annual Avg. Wind Spd:	4.5 m/s
Avg. Wind Shear Exp:	0.37 m
Avg. Obstacle Height:	0
Avg. Hub Height Wind Spd:	4.5 m/s
Conversion Losses	11%
Misc. Losses	0%
Wind Speed Derate Factor	10%
Weibull K Factor:	2.34

Obstacle Height by Direction
10 ft/division



Site Wind Rose (5% per division)



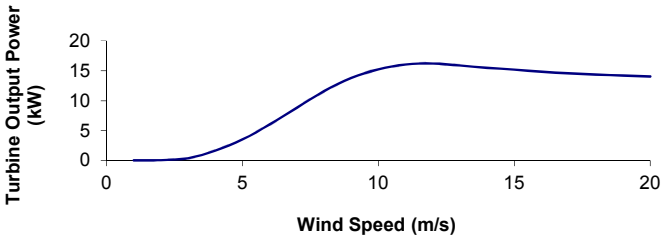
Wind Map Wind Speed Point

Latitude:	41.9522696
Longitude:	-71.144023

System Information

Turbine Manufacturer:	Proven
Turbine Model:	WB6000-15kW
Tower Height:	50 Meters
Rated Output Power:	16.07 kW
Rated Wind Speed:	11 m/s

Proven WB6000-15kW Power Curve



Energy Production Estimates

As Proposed		
Estimated Annual Energy Output:	27,744	kWh/yr
Estimated Annual Capacity Factor:	19.7%	
Increase Hub Height by 20 Feet (6 meters)		
Estimated Annual Energy Output:	30,737	kWh/yr
Estimated Annual Capacity Factor:	21.8%	
Production Increase vs. Proposed System	11%	

Environmental Benefits of Small Wind System

Annual Pounds of CO2 Emissions Offset	34,014
Equivalent Acres of Trees Planted	4.22
Equivalent Cars Taken Off Road	3.0

MCEC Minimum Technical Requirements

Turbine Hub Height is 30+ Feet Above All Surrounding Obstacles? Yes

Report Generated Using CWEST

Developed by The Cadmus Group, Inc. www.cadmusgroup.com

For questions/comments, send email to: PTS@cadmusgroup.com

MASSACHUSETTS CLEAN ENERGY CENTER

Section 6

Summary and Conclusions

The following summarizes the fuel and electricity use at the WPCF, and outlines the mitigations measures to be taken.

6.1 Fuel Use

As stated in Section 3, the WPCF used 30,050 gallons of No. 2 fuel oil for heating from March 11, 2013 to March 12, 2014 for a monthly average of 2,504 gallons.

It is not anticipated that there will be increase in fuel consumption after the Phase II upgrade is complete. Additionally, the WPCF will be converted to natural gas assuming the natural gas company has sufficient supply.

6.2 Electricity Use

As stated in Section 5, the WPCF used 2,310,630 kWh of electricity in fiscal year 2013. This is an average of 192,553 kWh per month. This includes all electricity for the WPCF including lighting, process equipment, HVAC equipment, etc.

The majority of the electricity used was for the process equipment. As shown in Section 4, the increase in plant capacity will not increase the required power to operate the plant. Therefore, it can be assumed that the electrical consumption will not significantly change following the Phase II upgrade.

6.3 Renewable Energy Generation

Section 5 included the summary of two studies to determine the feasibility of generating electricity onsite through solar panels and micro wind turbines. In both studies, it was concluded that neither technology would be feasible for the WPCF as the payback period would be too great to justify use.

6.4 Mitigation Measures

In addition to the recommendations included in this report, the following mitigation measures will be taken to improve energy use and efficiency.

- Improve building envelope through higher R-value insulation in walls, roof, and if appropriate, basement walls and ceiling
- Conduct inspection and comprehensive air sealing of building envelope to minimize air leakage
- Install lower U-value windows to improve envelope performance
- Incorporate window glazing to balance and optimize daylighting, heat loss and solar heat gain performance
- Maximize interior daylighting through floor plates, and use of skylights, celestories and light wells
- Install high-efficiency HVAC systems and premium efficiency motors

- Use energy efficient boilers, heaters, furnaces, incinerators, or generators
- Seal and leak-check all supply air ductwork
- Incorporate motion sensors into lighting, daylighting, and climate controls
- Size piping systems to minimize pressure loss
- Design pumping, blower, filtration and associated control systems to achieve overall efficiency
- Select high efficiency equipment including pumps, blowers, and motors
- Include sufficient metering and controls for real-time monitoring and optimization of the process operations

As the design progresses additional mitigation measures may be considered.

Memorandum

To: *Ed Sanderson, CDM Smith*

From: *Lauren Miller, CDM Smith*

Date: *April 30, 2015*

Subject: *MFN Regional Wastewater District Greenhouse Gas Analysis*

The project to increase the capacity of the Mansfield-Foxborough-Norton Regional Wastewater District (District) is subject to the MEPA Greenhouse Gas Emissions Policy and Protocol (the Policy). The Draft Environmental Impact Report Certificate (DEIR) directed the District to establish an energy and greenhouse gas (GHG) baseline case using EPA's Energy Star Program Manager (ESPM). The DEIR is interested in the average monthly energy use and GHG emissions of the future design of the facility. It directed that the future design should be compared to a baseline rank of 50, which corresponds to the 50th percentile of energy use of other wastewater treatment plants. The ESPM program was run for three scenarios:

1. The existing facility prior to any upgrades, for comparison purposes.
2. The as-proposed facility which will: increase the capacity (as directed by the DEIR), energy and facility upgrades - include energy reduction/mitigation measures, increase the area of buildings by approximately 2,200 square feet, and convert #2 fuel oil usages to natural gas (pending utility approval). It also reduces the horsepower capacity at the plant by 26 hp, translating into additional electricity use savings.
3. The DEIR required baseline case with an EPSM ranking of 50.

The inputs used for EPSM for the as-proposed case are summarized in Table 1. The outputs from the EPSM are summarized in Table 2.

Table 1 Inputs to the EPSM

Item	Value at Full Build out
Average Influent Flow (MGD)	2.18
Design Flow – Existing Facility (MGD)	3.14
Design Flow – As Proposed (MGD)	4.14
Average Influent Biological Demand (BOD) Concentration (mg/l)	185
Average Effluent Biological Demand (BOD) Concentration (mg/l)	5
Fixed Film Trickle Filtration System Process	No
Nutrient Removal	Yes
Facility Zip Code	02766

Table 2 Outputs from ESPM

Project Case	ESPM Energy Performance Rank	Monthly Site kBTU	Site kBTU/gpd	CO_2 Emissions (short tons per year)
Existing Facility	28	1,007,572.5	3.85	1074.9
As-Proposed Facility	61	764,021.4	2.21	758.5
DEIR required Baseline	50	883,998.4	2.56	865.4

The As-Proposed Facility is expected to increase the ESPM Energy Performance Rank by 33 points, pushing the facility ahead of the DEIR required Baseline. This is largely due to the District reducing horsepower capacity while other systems using approximately the same amount of energy as the existing facility as at the As-Proposed facility, while increasing the capacity of the plant by one MGD. Upgrades and mitigation measures are explained in the Energy Audit Report for this project.

Attachments: MFN_ESPM output report_as proposed_043015.pdf

MFN_ESPM output report_existing_032715.pdf

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]

Mansfield Foxborough Norton Regional Wastewater District

LEARN MORE AT energystar.gov

61

ENERGY STAR® Design Score[2]

Primary Property Function: Wastewater Treatment Plant

Gross Floor Area (ft^2): 49,200

Estimated Date of Certification of Occupancy: _____

Date Generated: April 30, 2015

1. This form may be used to apply for the ENERGY STAR Designed to Earn. This form was generated from Portfolio Manager's target finder: http://www.portfoliomanager.energystar.gov/targetfinder.
2. The ENERGY STAR Score is based on total source energy. The scale is 1-100. A score of 75 is the minimum to be eligible for the ENERGY STAR.

Property & Contact Information for Design Project

Property Address	**Project Architect**	**Owner Contact**
Mansfield Foxborough Norton Regional Wastewater District 80 Hill St Norton, Massachusetts 02766	____ _____ , (____)____-_____ _____	____ _____ , (____)____-_____ _____
Property ID: 4375725	**Architect Of Record** _____ _____ _____, ____ _____ (____)____-_____	**Property Owner** _____ , (____)____-_____

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Electric - Grid	1,823,932 kWh (thousand Watt-hours)	Not Provided
Natural Gas	2,945 MBtu (million Btu)	Not Provided

Estimated Design Use Details

Wastewater Treatment Plant	
Gross Floor Area	49,200 Sq. Ft.
Average Effluent Biological Oxygen Demand (BOD5)	5
Nutrient Removal	Yes
Plant Design Flow Rate	4.14 Million Gallons per Day
Average Influent Biological Oxygen Demand (BOD5)	185
Fixed Film Trickle Filtration Process	No

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**61**	50	N/A
Energy Reduction (from Median)(%)	**-11.6**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**460**	520	60
Site Energy Use Intensity (kBtu/ft²/yr)	**186**	210	24
Source Energy Use (kBtu/yr)	**22,633,277**	25,594,801	2,961,524
Site Energy Use (kBtu/yr)	**9,168,257**	10,367,906	1,199,649
Energy Costs ($)	**283,094**	320,136	37,042
Total GHG Emissions (Metric Tons CO2e)	**758**	857	99

Designed to earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

1) Does the intended function or use for the property match the criteria of a property type that's eligible to receive an ENERGY STAR score? ☐ **Yes** ☐ **No/Not Sure**

If you are not sure that your property design is eligible for a design ENERGY STAR score, please describe the property's major functions:

2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☐ **No**

If no, please explain:

3) Is the property unoccupied and not yet generating energy bills? ☐ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☐ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) an ENERGY STAR partner? ☐ **Yes** ☐ **No**

6) Will the AOR review the SEDI with building owner before they sign the Owner Letter of Intent? ☐ **Yes** ☐ **No**

7) Do the AOR and Building Owner agree that EPA may use information from this document in ENERGY STAR program materials? ☐ **Yes** ☐ **No**

8) Are you seeking other qualifications for this design project? ☐ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☐ LEED
- ☐ Other, please indicate: _____

Professional Verification

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____Date: _____

Verifying Professional

____ _____
,
(____)____-_____
_____

Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

Verifying Professional Stamp (if applicable)

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]

Mansfield Foxborough Norton Regional Wastewater District - Existing

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28

ENERGY STAR® Design Score[2]

Primary Property Function: Wastewater Treatment Plant

Gross Floor Area (ft^2): 47,000

Estimated Date of Certification of Occupancy: _____

Date Generated: March 27, 2015

1. This form may be used to apply for the ENERGY STAR Designed to Earn. This form was generated from Portfolio Manager's target finder: http://www.portfoliomanager.energystar.gov/targetfinder.
2. The ENERGY STAR Score is based on total source energy. The scale is 1-100. A score of 75 is the minimum to be eligible for the ENERGY STAR.

Property & Contact Information for Design Project

Property Address	Project Architect	Owner Contact
Mansfield Foxborough Norton Regional Wastewater District - Existing 80 Hill St Norton, Massachusetts 02766	____ _____ , (____)____-_____ _____	____ _____ , (____)____-_____ _____
Property ID: 4376523	**Architect Of Record** _____ _____ _____, ____ _____ (____)____-_____	**Property Owner** _____ , (____)____-_____

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Electric - Grid	2,310,630 kWh (thousand Watt-hours)	Not Provided
Fuel Oil (No. 2)	4,207 MBtu (million Btu)	Not Provided

Estimated Design Use Details

Wastewater Treatment Plant	
Gross Floor Area	47,000 Sq. Ft.
Average Effluent Biological Oxygen Demand (BOD5)	5
Nutrient Removal	Yes
Plant Design Flow Rate	3.14 Million Gallons per Day
Average Influent Biological Oxygen Demand (BOD5)	185
Fixed Film Trickle Filtration Process	No

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**28**	50	N/A
Energy Reduction (from Median)(%)	**25.7**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**617**	491	-126
Site Energy Use Intensity (kBtu/ft²/yr)	**257**	204	-53
Source Energy Use (kBtu/yr)	**29,004,418**	23,083,185	-5,921,233
Site Energy Use (kBtu/yr)	**12,090,869**	9,622,525	-2,468,344
Energy Costs ($)	**395,896**	315,074	-80,822
Total GHG Emissions (Metric Tons CO2e)	**1,074**	855	-219

Designed to earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

1) Does the intended function or use for the property match the criteria of a property type that's eligible to receive an ENERGY STAR score? ☐ **Yes** ☐ **No/Not Sure**

If you are not sure that your property design is eligible for a design ENERGY STAR score, please describe the property's major functions:

2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☐ **No**

If no, please explain:

3) Is the property unoccupied and not yet generating energy bills? ☐ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☐ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) an ENERGY STAR partner? ☐ **Yes** ☐ **No**

6) Will the AOR review the SEDI with building owner before they sign the Owner Letter of Intent? ☐ **Yes** ☐ **No**

7) Do the AOR and Building Owner agree that EPA may use information from this document in ENERGY STAR program materials? ☐ **Yes** ☐ **No**

8) Are you seeking other qualifications for this design project? ☐ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☐ LEED
- ☐ Other, please indicate: _____

Professional Verification

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____Date: _____

Verifying Professional

____ _____
,
(____)____-_____
_____

Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

Verifying Professional Stamp (if applicable)

APPENDIX K

MHC APPROVAL LETTER, FEBRUARY 2015
&
PAL INTENSIVE (LOCATIONAL) ARCHAEOLOGICAL SURVEY REPORT, JANUARY 2015

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth

Massachusetts Historical Commission

February 25, 2015

John Felix
Deputy Associate Commissioner
Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108

RE: Mansfield-Foxborough-Norton Regional Wastewater District Land Treatment Project, Pine and Crane Streets, Norton, MA. MHC #RC.49493/35618. EEA # 13388.

Dear Mr. Felix:

Staff of the Massachusetts Historical Commission (MHC) have reviewed the technical archaeological report, *Intensive (Locational) Archaeological Survey: Water Pollution Control Facility, Pine Street Site, Norton, Massachusetts*, prepared and submitted by the PAL, Inc., received February 6, 2015 for the project referenced above.

Results of the intensive (locational) survey identified six small ancient Native American archaeological sites, WPCF Loci 1-6, within the water pollution control facility development area. These ancient Native American archaeological sites include finds of several different types of the chipping debris by-products of stone tool maintenance and manufacture. WPCF Locus 6 includes a projectile point fragment suggestive of a bifurcate-base style associated with the Early Archaic Period (10,000 to 7,500 years ago). Although this artifact indicates the long term human occupation of this portion of the Three Mile River drainage, the intensive archaeological testing at WPCF Locus 6 suggests that this projectile point fragment may be an isolated artifact. An historical period earth fill and fieldstone dam was also identified adjacent to the project impact area. The dam is located outside of the primary infiltration beds and should be readily avoidable during project construction.

While the sites provides information on ancient Native American and historical period land use and occupation in the Three Mile River drainage, in the MHC's staff opinion, the sites do not meet the criteria of eligibility (36 CFR 60) for listing in the National Register of Historic Places because they do not possess substantial research value. No further archaeological investigations for the project are recommended.

After review of MHC files and the information provided, in the MHC's staff opinion, the Pine Street Water Pollution Control Facility as proposed will have "no adverse effect" (36 CFR 800.5(b); 950 CMR 71.07(2)(b)(2)) to the Crane Farm (MHC #NRT.J). If project plans change in future for the Pine Street Water Pollution Control Facility, then current project information should be submitted to the MHC for review and comment.

The MHC notes that a future phase of the overall project may include development of the Crane Street infiltration basin. This location is archaeologically sensitive and may contain significant archaeological resources associated with the G.B. Crane Site. If the Crane Street infiltration basin will be considered for development during future phases of the overall CWMP project, then scaled existing and proposed conditions project plans should be submitted to the MHC for review and comment for this location.

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), Massachusetts General Laws Chapter 9, Section 26-27C (950 CMR 70-71) and MEPA (301 CMR 11). If you have questions please contact Jonathan K. Patton at this office.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc: Lee Azinheira, Director, Mansfield Department of Public Works
Bernard Marshall, Water & Sewer Superintendant, Town of Norton
DEP-SERO, Wetlands & Waterways
Bettina Washington, Wampanoag Tribe of Gay Head (Aquinnah)
Ramona Peters, Mashpee Wampanoag Tribe
Nancy Putnam, DCR-ACEC
Norton Conservation Commission
Norton Historical Commission
Magdalena Lofstedt, CDM Smith, Inc.
Deborah C. Cox, PAL, Attn: Duncan Ritchie

Public Archaeology Laboratory

February 3, 2015

Brona Simon
State Archaeologist
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125

Re: Water Pollution Control Facility, Pine Street, Norton, Massachusetts
Intensive (Locational) Archaeological Survey
PAL #3038

Dear Ms. Simon:

Enclosed please find one copy of the technical report entitled *Intensive (Locational) Archaeological Survey Water Pollution Control Facility, Pine Street Site, Norton, Massachusetts* for your review and comment.

If you have any questions or require further information, please do not hesitate to contact Deborah Cox, President, or me, at your convenience.

Sincerely,

Duncan Ritchie

Duncan Ritchie, RPA
Senior Archaeologist

Enclosure

cc: Edward Sanderson, CDM Smith, Inc. (w/o encl.)

26 Main Street Pawtucket, RI 02860 | 401.728.8780 Main | 401.728.8784 Fax
palinc.com

CONTAINS CONFIDENTIAL INFORMATION - NOT FOR PUBLIC DISTRIBUTION

TECHNICAL REPORT

INTENSIVE (LOCATIONAL) ARCHAEOLOGICAL SURVEY: WATER POLLUTION CONTROL FACILITY, PINE STREET SITE

Norton, Massachusetts

Duncan Ritchie, RPA

Submitted to:

CDM Smith, Inc.
50 Hampshire Street
Cambridge, Massachusetts 02139

MFN Regional Wastewater District
Mansfield Town Hall
Six Park Row
Mansfield, MA 02048

Submitted by:

The Public Archaeology Laboratory, Inc.
26 Main Street
Pawtucket, Rhode Island 02860

PAL Report No. 3038 January 2015

PAL Publications

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MANAGEMENT ABSTRACT

PAL has completed an intensive (locational) archaeological survey of the Mansfield/Foxborough/Norton Regional Wastewater District's proposed Water Pollution Control Facility (WPCF) Project (project) at the Pine Street Site in Norton, Massachusetts. Archival research indicated that the sensitivity of the project area for pre-contact Native American archaeological resources was defined primarily by its proximity to a cluster of known pre-contact archaeological sites along wetlands and tributary streams within the Wading/Three Mile River drainage, an area used intensively from the Middle Archaic to Late Woodland periods. The sensitivity of the project area for post-contact Euro-American archaeological resources was defined by its proximity to zones of settlement along Pine, Crane and Hill streets and a railroad crossing. An initial walkover survey and surface inspection confirmed that most of the project area was wooded, in good condition, and sensitive for pre-contact and post-contact archaeological resources.

Subsurface testing was done using 95, 50-x-50- cm test pits placed within 3, 30-x-30-m sampling blocks on four judgmentally placed transects and in 7 close interval (2.5-m and 5-m) array patterns. Seven judgmentally placed test pits (JTP-01 to JTP-07) were used to sample specific archaeologically sensitive locations. Six small find spots of pre-contact cultural material designated as WPCF Loci 1–6 were found within the proposed location of four infiltration basins, access road, force main route, and surrounding buffer zone. One post-contact archaeological resource, a small earth fill dam with fieldstone rubble, was found along a stream in the northwest corner of the project area. The dam was probably built to impound and store water for a small late nineteenth-century mill site (Briggs Wheelwright Shop) downstream near Pine Street.

Five of the pre-contact archaeological resources (WPCF Loci 1–5) yielded non-diagnostic chipping debris or burned rock. Although these loci contribute to current knowledge of pre-contact Native American settlement and resource use in the Three Mile River and upper Taunton drainage basins, they are not considered potentially significant resources due to their low information content and lack of temporal/cultural affiliation. WPCF Locus 6 yielded a unifacial pebble tool and what may be a shoulder barb from an Early Archaic bifurcate-base projectile point. Close interval subsurface testing of this find spot yielded one piece of chipping debris. WPCF Locus 6 is not considered potentially significant, and additional archaeological investigation is unlikely to yield more information.

The post-contact dam and associated borrow pit are within a wetland and buffer zone outside the project's Area of Potential Effects for direct effects (APE-DE) but are within the larger parcel of land controlled by the MFN Regional Wastewater District. PAL recommends that the dam and borrow pit be avoided during any construction-related project activities. No additional archaeological investigation of the WPCF project area is recommended.

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CHAPTER ONE

INTRODUCTION

This report presents the results of an intensive (locational) archaeological survey conducted by The Public Archaeology Laboratory, Inc. (PAL) for the proposed Water Pollution Control Facility (WPCF) Pine Street Site Project (project) in Norton, Massachusetts (Figure 1-1) under contract to CDM Smith, Inc., the design consultant for the Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD). The project area is located at 74 Hill Street, north of Pine Street and west of an abandoned railroad easement (Figure 1-2).

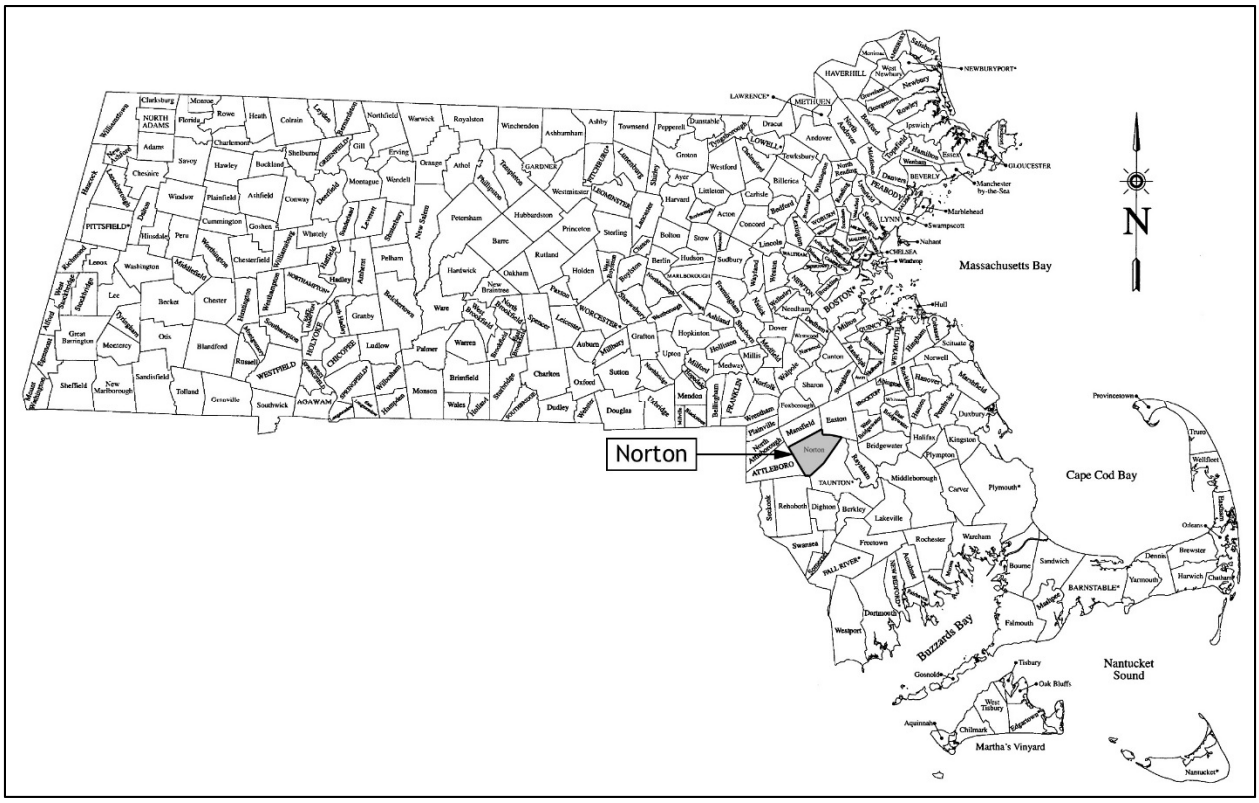

Figure 1-1. Map of Massachusetts showing the location of the town of Norton.

Project Description

The construction proposed for the WPCF within an approximately 10-acre project area on Pine Street in Norton is one effluent recharge site, including an effluent force main and new infiltration basins with pipelines, access road improvements, and stormwater management improvements.

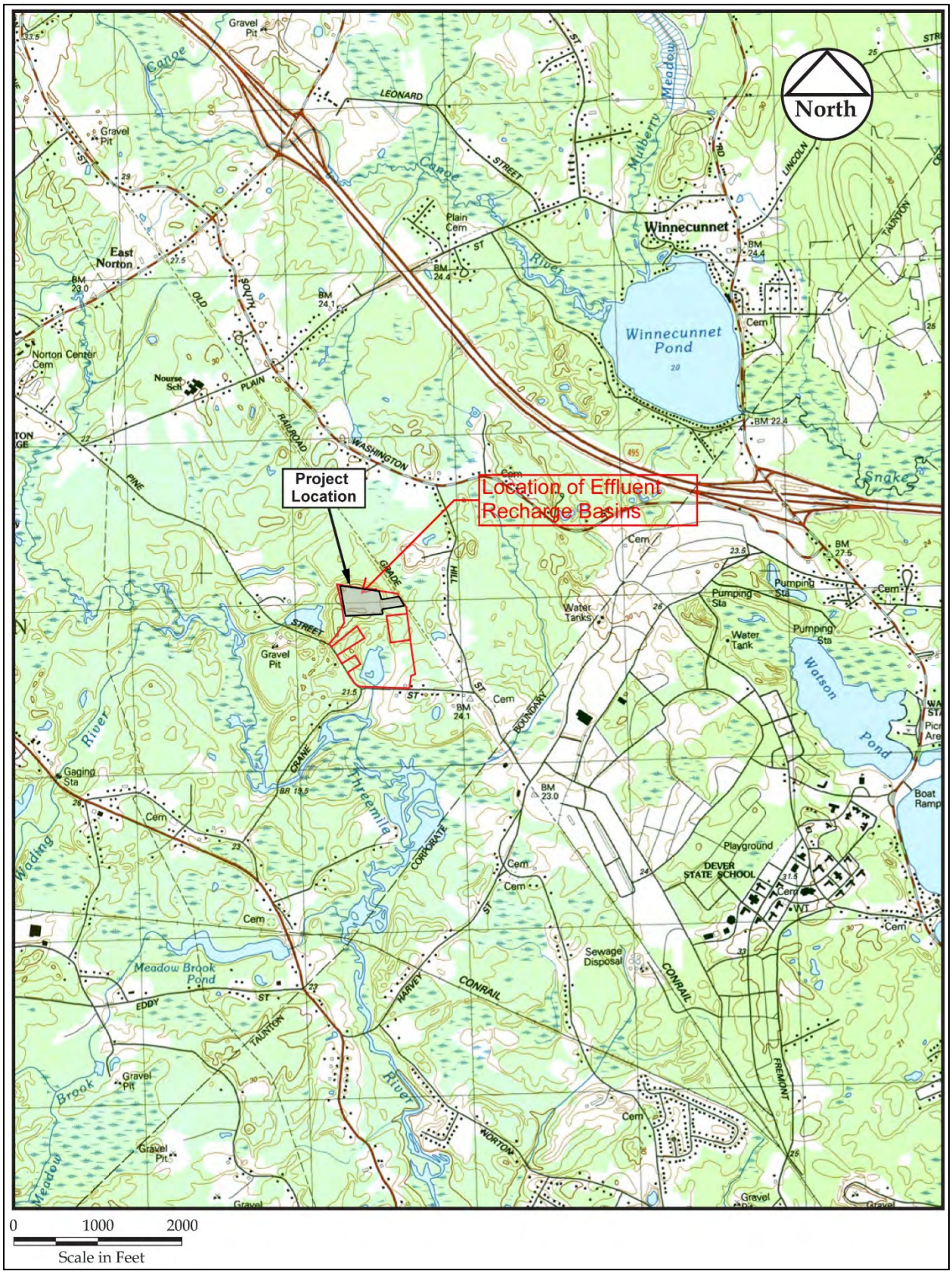

Figure 1-2. Location of the Water Pollution Control Facility project area on the Norton, Massachusetts, 7.5 minute USGS topographic quadrangle.

Authority

The Massachusetts Historical Commission (MHC) reviewed the Project Notification Form (PNF) and project information submitted by CDM Smith, Inc. in August 2014. The proposed project will use federal funding through the State Revolving Fund administered by the Massachusetts Department of Environmental Protection (DEP). MHC reviewed the project under Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), in consultation with the DEP.

In August 2014, MHC noted that project impact areas at the proposed WPCF are adjacent to two recorded pre-contact Native American archaeological resources that are significant and eligible for listing in the National and State Registers of Historic Places: the White Crow Site (19-BR-213) and G. B. Crane Site (19-BR-214). The archaeological sensitivity of the project area is also defined by the presence of well-drained, elevated soils in proximity to the Three Mile River and associated wetlands. Based on its review, the MHC requested an intensive (locational) archaeological survey (950 CMR 70) be conducted for the WPCF project area. The intensive archaeological survey was undertaken in compliance with Massachusetts General Laws, Chapter 9, Sections 26-27C (950 CMR 70-71).

PAL Scope

The goal of the intensive (locational) survey was to locate and identify any significant archaeological resources that may be present within the project's Area of Potential Effects for direct effects (APE-DE), which includes the proposed locations of a force main and new infiltration basins with pipelines, access road improvements, stormwater management improvements, and a buffer zone surrounding the proposed facilities.

The intensive survey was also designed to collect basic information about the locations and densities of any cultural deposits within the project area and to make recommendations about any need for additional archaeological testing. The survey was conducted under State Archaeologist's permit number 3504 issued by the MHC on November 4, 2014.

PAL's intensive (locational) archaeological survey was conducted in accordance with the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (48 Fed. Reg. 44716–44742, 1983) and the MHC's *Public Planning and Environmental Review: Archaeology and Historic Preservation* (MHC 1985c) PAL personnel involved in the survey meet the Secretary of the Interior's *Professional and Qualification Standards* (36 CFR Part 61, Appendix A). This report follows the guidelines established by the National Park Service in *Recovery of Scientific, Prehistoric, Historic, and Archaeological Data* (36 CFR Part 66, Appendix A).

Personnel

PAL staff involved in the intensive (locational) archaeological survey were Duncan Ritchie (principal investigator); Erin Flynn (project archaeologist); Dawn Beamer, Jessica Jay, Shawn Joy, Maggie Klejbuk, and Melissa Wales (archaeologists); and Kirk Van Dyke (cultural resource specialist). Tribal monitor Ryan Monteiro from the Wampanoag Tribe of Gay Head/Aquinnah accompanied PAL staff during fieldwork, which was conducted from November 17 to December 11, 2014. Laboratory processing and analysis were conducted under the supervision of Heather Olson (laboratory manager).

Disposition of PAL Project Materials

All documentation and materials for the intensive survey, including field forms, maps, and photographs, are on file at PAL, 26 Main Street, Pawtucket, Rhode Island. PAL serves as a temporary curation facility until the Commonwealth of Massachusetts designates a permanent state repository.

CHAPTER TWO

RESEARCH DESIGN AND FIELDWORK METHODS

The goal of the intensive archaeological survey of the Water Pollution Control Facility (WPCF) project area was to locate and identify any pre- and/or post-contact archaeological resources that may be potentially eligible for listing in the State or National Registers of Historic Places (National Register). To accomplish this objective, two research strategies were used:

- archival research, including a review of historical literature and maps; and
- field investigations, consisting of a "walkover" assessment survey and subsurface archaeological testing.

The archival research and walkover survey provided the information necessary to develop environmental and historic contexts for the project area and a predictive model for archaeological sensitivity. Archaeological sensitivity is defined as the likelihood for belowground cultural resources to be present and is based on the following:

- geographical, functional, and temporal characteristics of previously identified cultural resources in the study area and its vicinity; and
- local and regional environmental data reviewed in conjunction with existing study area conditions documented during the walkover survey, and archival research about the study area's land use history.

Subsurface archaeological testing was conducted in areas with high and moderate sensitivity for containing archaeological deposits. Cultural materials recovered during the survey were processed in the laboratory and analyzed to interpret the nature of past human activities they represent. The artifact analyses were correlated with the subsurface testing and other field survey data and the resulting information was interpreted within the environmental and historic contexts developed for the project area. The result was an assessment of potentially significant archaeological resources and their eligibility for listing in the National Register, the official federal list of properties that have been studied and found worthy of preservation.

Significance and Historic Contexts

The different phases of archaeological investigation (reconnaissance survey, intensive [locational] survey, site examination, and data recovery) reflect preservation planning standards for the identification, evaluation, registration, and treatment of archaeological resources (National Park Service [NPS] 1983). An essential component of this planning structure is the identification of archaeological and traditional cultural properties that are eligible for inclusion in the National Register. Archaeological properties can be a district, site, building, structure, or object, but are most often sites and districts (Little et al. 2000). Traditional cultural properties are defined generally as ones that are eligible for inclusion in the National Register because of their association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (Parker and King 1998). The results of professional surveys and consultation with Native

American or other ethnic communities are used to make recommendations about the significance and eligibility of archaeological and traditional cultural properties.

An archaeological property may be pre-contact, post-contact, or contain components from both periods. Pre-contact (or what is often termed "prehistoric") archaeology focuses on the remains of indigenous American societies as they existed before substantial contact with Europeans and the resulting written records (Little et al. 2000). In accordance with the NPS guidelines, "pre-contact" is used, unless directly quoting materials that use "prehistoric." There is no single year that marks the transition from pre-contact to post-contact.

Post-contact (or what is often termed "historical") archaeology is the archaeology of sites and structures dating from time periods since significant contact between Native Americans and Europeans. Documentary records and oral traditions can be used to better understand these properties and their inhabitants (Little et al. 2000). Again, for reasons of consistency with the NPS guidelines, "post-contact" is used when referring to archaeology of this period, unless directly quoting materials that use "historical."

The NPS has established four criteria for listing significant properties in the National Register (36 CFR 60). The criteria are broadly defined to include the wide range of properties that are significant in American history, architecture, archaeology, engineering, and culture. The quality of significance may be present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association. The criteria (known by the letters Criteria A–D) allow for the listing of properties

A. that are associated with events that have made a significant contribution to the broad patterns of our history; or
B. that are associated with the lives of persons significant in our past; or
C. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. that have yielded, or may be likely to yield, information important to prehistory or history.

Archaeological and traditional cultural properties can be determined eligible for listing in the National Register under all four criteria (Little et al. 2000; Parker and King 1998). Significance under any of these criteria is determined by the kind of data contained in the property, the relative importance of research topics that could be addressed by the data, whether these data are unique or redundant, and the current state of knowledge relating to the research topic(s). A defensible argument must establish that a property "has important legitimate associations and/or information value based upon existing knowledge and interpretations that have been made, evaluated, and accepted" (McManamon 1990:15).

Another critical component in assessing the significance of a historic property is an evaluation of its integrity. Historic properties either retain integrity (i.e., convey their significance) or they do not. The National Register criteria recognize seven aspects or qualities that, in various combinations, define integrity:

- location, the place where the historic property was constructed or the place where the historic event occurred;
- design, the combination of elements that create the form, plan, space, structure, and style of a property;
- setting, the physical environment of a historic property;

- materials, the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property;
- workmanship, the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory;
- feeling, a property's expression of the aesthetic or historic sense of a particular period of time; and
- association, the direct link between an important historic event or person and a historic property.

To retain historic integrity, a property will always possess several, and usually most, of these qualities. The retention of specific aspects of integrity is paramount for a property to convey its significance. Determining which of these aspects or qualities are most important to a particular property requires knowing why, where, and when the property is significant (NPS 2002).

The criteria are applied in relation to the historic contexts of the resources as follows:

> A historic context is a body of thematically, geographically, and temporally linked information. For an archaeological property, the historic context is the analytical framework within which the property's importance can be understood and to which an archaeological study is likely to contribute important information (Little et al. 2000).

For traditional cultural properties, a historic context is further defined as follows:

> A historic context is an organization of available information about, among other things, the cultural history of the area to be investigated, that identifies "the broad patterns of development in an area that may be represented by historic properties" (48 FR 44717). The traditions and lifeways of a planning area may represent such "broad patterns," so information about them should be used as a basis for historic context development. Based on federal standards and guidelines, groups that may ascribe traditional cultural values to an area's historic properties should be contacted and asked to assist in organizing information on the area (Parker and King 1998).

The formulation of historic contexts is a logical first step in the design of an archaeological investigation and is crucial to the evaluation of archaeological and traditional cultural properties in the absence of a comprehensive survey of a region (NPS 1983:9). Historic contexts provide an organizational framework that groups information about related historic properties based on a theme, geographic limits, and chronological periods. A historic context should identify gaps in data and knowledge to help determine what significant information may be obtained from the resource. Each historic context is related to the developmental history of an area, region, or theme (e.g., agriculture, transportation, and waterpower), and identifies the significant patterns of which a particular resource may be an element. Only those contexts important to understanding and justifying the significance of the property need be discussed.

Historic contexts are developed by

- identifying the concept, time period, and geographic limits for the context;
- collecting and assessing existing information about these time periods;
- identifying locational patterns and current conditions of the associated property types;
- synthesizing the information in a written narrative; and
- identifying information needs.

"Property types" are groupings of individual sites or properties based on common physical and associative characteristics. They serve to link the concepts presented in the historic contexts with properties illustrating those ideas (NPS 1983, 48 FR 44719).

The following historic research contexts have been developed to organize the data relating to the archaeological resources identified within the project area:

1. Pre-contact Native American land use and settlement in the upper and middle Taunton River drainage, circa (ca.) 12,500 to 450 years before present (B.P.) and
2. Post-contact land use and settlement in Norton, Massachusetts, ca. 1650 to present.

Archival Research

The development of a cultural context and a predictive model of expected property types and densities within the project area began with archival research, consisting of an examination of primary and secondary documentary sources. These sources include written and cartographic documents relating both to past and present environmental conditions as well as documented/recorded sites in the general project area. The information contained in the following archival sources formed the basis of the predictive models developed for the project area and were an integral part of the archaeological investigations.

State Site Files, Artifact Collection Reports, and Town Reconnaissance Surveys

PAL reviewed state site files at the MHC, including the Massachusetts Cultural Resource Information System (MACRIS) to locate any recorded archaeological sites in or close to the Water Pollution Control Facility (WPCF) project area. MHC inventories include archaeological resources listed or eligible for listing in the National Register and reconnaissance surveys of every city and town in the Commonwealth with compiled narrative summaries of their development, including the town of Norton (MHC 1981). Reports and publications describing artifact collection made by avocational archaeologists were also examined for background information about the archaeological record of the upper Taunton River drainage (Mahlstedt 1985; Taylor 1976).

Cultural Resource Management Reports

Reports documenting cultural resource management (CRM) investigations in Norton and adjacent towns were reviewed for information about Pre-Contact through Modern Period land uses, settlement patterns, and recorded archaeological sites, including studies by PAL in the town of Norton and adjacent parts of Taunton (Doucette and Glover 1989; Leveillee 1980; 1981; Mair 2014; Ritchie 1976; Ritchie and Graves 2006; Thorbahn 1982a; 1982b, 1982c; Thorbahn et al 1983).

Investigations by other firms and individuals in the vicinity of the WPCF project area were also reviewed for relevant information (Decima and Donahue-Putnam 1997; Dudek 2004a, 2004b; Goodby 1991, 1993).

Histories and Maps

Primary and secondary histories and historical maps and atlases were examined to assess changes in land use, to locate any documented structures, and to trace the development of transportation networks (an important variable in the location of post-contact archaeological sites), such as the railroad line (Conrail) bordering the project area, Routes 123 and 140 in Norton and Taunton; and local routes such as Pine, Hill and Crane streets (Barber 1839; Beers 1871; Clark 1859; Cobb 1795; Leonard and Lincoln 1830; Walker

1895; Walling 1858). PAL also examined the online Massachusetts state archives and planning reports by town boards and commissions for any relevant information about the section of Norton forming the vicinity of the project area.

Environmental Studies

Bedrock and surficial geological studies provided information about the region's physical structure and about geological resources near the project area (Zen at al 1983; Hartshorn 1967). The United States Department of Agriculture (USDA) Soil Conservation Service soil survey supplied information about soil types and surficial deposits within the project area and the general categories of flora and fauna that these soil types support (USDA 1978). In addition, studies of past environmental settings of New England were consulted. Other sources were reviewed to obtain information on drainage patterns, hydrology, and past environmental settings to reconstruct the pre-modern natural landscape (Bickford and Dymon 1990); Williams 1973).

Native American Coordination and Consultation

PAL notified the tribal historic preservation office (THPO) of federally recognized Native American tribes in Massachusetts about the proposed WPCF project. In November 2014, the Wampanoag Tribe of Gay Head/Aquinnah (WTGH/A) THPO responded that a cultural resource monitor (Ryan Monteiro) would accompany PAL staff during fieldwork (Appendix B).

Walkover Survey

PAL conducted a walkover survey of the project area to document and to assess present environmental conditions. Environmental information documented on project maps during the walkover included the presence, types, and extent of fresh water; drainage characteristics; presence of bedrock outcrops and level terraces; and the angle of any slopes.

The current physical condition of an area is largely defined by the absence or degree of natural or human disturbances to the landscape. Typically encountered disturbances within a given area may include those resulting from agricultural plowing, gravel or soil mining, or previous construction and site preparation activities. Extensive survey experience indicates that such disturbances can reduce the probability for encountering contextually intact archaeological sites. However, plowing (which can move artifacts from their primary vertical and horizontal contexts and is the most common type of disturbance in New England) does not necessarily compromise the physical integrity of all cultural deposits.

Another purpose of the walkover survey was to document surface indications of archaeological sites. While pre-contact sites in New England are most often found belowground, artifact scatters are sometimes exposed on the surface through cultural agents such as pedestrian and vehicular traffic and by natural processes such as erosion. Post-contact archaeological site types that might be visible include stone foundations, stone walls, and trash deposits. If the remains of a built resource such as a farmstead are present within a given area, it is likely that a cellar hole and associated landscape features such as stone walls, overgrown orchards and fields, and ornamental plantings may be visible on or above the ground’s surface.

Archaeological Sensitivity Assessment

Information collected during the archival research and walkover survey was used to develop a predictive model of potential site types and their cultural and temporal affiliations. The development of predictive models for locating archaeological resources has become an increasingly important aspect of CRM planning.

The predictive model considers various criteria to rank the potential for the WPCF project area to contain terrestrial archaeological sites: proximity of recorded and documented sites, local land use history, environmental data, and existing conditions. The project area was stratified into zones of expected archaeological sensitivity (low, moderate, and high) to determine which areas would be tested.

Pre-Contact Period Archaeological Sensitivity

Archaeologists have documented nearly 12,000 years of pre-contact Native American occupation of the region, and oral traditions of some contemporary tribes tell of a 50,000-year cultural legacy. Prior to 7,000 years ago, peoples focused primarily on inland-based resources and on hunting and collecting along the Northeast's waterways. After 7,000 years ago, settlement became more concentrated within the region's major river drainages. By 3,000 years ago, concurrent with a focus on coastal and riverine settlement, large populations lived in nucleated settlements and developed complex social ties, with language, kinship, ideology, and trade linking peoples across the Northeast. During the centuries before European contact, these groups began to coalesce into the peoples known as Pocumtuck, Nipmuck, Massachusett, Wampanoag, Pokanoket, Mohegan, Pequot, and Narragansett.

Assessing the pre-contact archaeological sensitivity of any given area requires consideration of past and present geographical and ecological characteristics, known site location databases, and knowledge of distinctive temporal and cultural patterns.

The choices that pre-contact Native Americans made about where they settled, how they organized themselves, and what technologies they used were all results of the dynamic relationship between culture and environment. Predictive modeling for large-scale site location in southern New England has its roots in academic research, including Dincauze's (1974) study of reported sites in the Boston Basin and Mulholland's (1984) research about regional patterns of change in pre-contact southern New England. Peter Thorbahn and others (Thorbahn et al. 1980) applied ecological modeling and quantitative spatial analysis to synthesize data from several hundred sites in southeastern New England and demonstrated that the highest concentration of pre-contact sites occurred within 300 meters (m) of low-ranking streams and large wetlands. The distribution of sites found along a 14-mile I-495 highway corridor in the same area reinforced the strong correlations between proximity to water and site locations (Thorbahn 1982). These studies and other large-scale projects provided data for developing models of Native American locational and temporal land use (MHC 1982a, 1982b, 1984; RIHPC 1982) that became the foundation for site predictive modeling used during CRM surveys.

Today, assessment of archaeological sensitivity within a given area, and the sampling strategy applied to it, continues to take existing physiographic conditions into consideration but at multiple scales, from bedrock geology, to river drainages, to microenvironmental characteristics. These categories of data are used to establish the diversity of possible resources through time, the land use patterns of particular cultures, and the degree to which the landscape has been altered since being occupied (Leveillee 1999). Increasingly, social and cultural perspectives, as reflected in both the archaeological and historical records (Johnson 1999), and as expressed by representatives of existing Native American communities (Kerber 2006), are considered when assessing archaeological sensitivity. Archaeological sampling strategies have also been evaluated and refined through applications of quantitative analyses (Kintigh 1992).

Geologic data provide information about lithic resources and current and past environmental settings and climates. Bedrock geology helps to identify where pre-contact Native Americans obtained raw materials for stone tools and indicates how far from their origin lithic materials may have been transported or traded. The variety and amount of available natural resources depend on soil composition and drainage, which also play a significant role in determining wildlife habitats and forest and plant communities.

Geomorphology assists in reconstructing the paleoenvironment of an area and is particularly useful for early Holocene (PaleoIndian and Early Archaic) sites in areas that are different physically from 10,000 years ago (Simon 1991). Recent landscape changes, such as drainage impoundments for highways and railroads, the creation of artificial wetlands to replace wetlands affected by construction, or wetlands drained for agricultural use, can make it difficult to assess an area's original configuration and current archaeological potential (Hasenstab 1991:57).

Beyond predicting where sites are located, archaeologists attempt to associate cultural and temporal groups with changes in the environmental settings of sites. Changes in the way pre-contact Native Americans used the landscape can be investigated through formal multivariates such as site location, intensity of land use, and specificity of land use (Nicholas 1991:76). However, distinguishing the difference between repeated short-term, roughly contemporaneous occupations and long-term settlements is difficult, and can make interpreting land use patterns and their evolution problematic (Nicholas 1991:86).

Contact Period Archaeological Sensitivity

The Contact Period in New England dates from about A.D. 1500 to 1650 and predates most of the permanent Euro-American settlements in the region. This period encompasses a time when Native and non-Native groups interacted with one another through trade, exploration of the coastal region, and sometimes conflict. While Contact Period sites are usually associated with Native American activity, they can also include sites such as trading posts used by Native and non-Native groups.

Native settlement patterns during the Contact Period are generally thought to follow Late Woodland traditions, but with an increased tendency toward the fortification of village settlements. Larger village settlements frequently occurred along coastal and riverine settings, often at confluences. Inland villages were focused near swamp systems, which were exploited both as resource areas and as places of refuge in the event of attack. Such sites would likely contain material remnants reflecting the dynamics of daily life, trade, and defense preparedness.

The identification of Contact Period deposits is most frequently tied to the types of artifacts located within archaeological sites. Unfortunately, the majority of the archaeological data for this period in southern New England come from the analysis of grave goods within identified Native American burial grounds, rather than from habitation sites and/or activity areas (Gibson 1980; Robinson et al. 1985; Simmons 1970). The available data suggest that sites dating to this period often contain traditionally pre-contact features and artifacts (e.g., storage pits and chipped-stone tools) and non-Native trade goods and objects (e.g., glass beads, iron kettles, and hoes) (Bragdon 1996). The earliest Contact Period sites are often located at or near the coast and estuarine margin, since Europeans travelled to New England by ship. Non-Native artifacts passed from the coastal region to the interior through trade and/or seasonal travel.

Post-Contact Period Archaeological Sensitivity

The landscape of a given area is used to predict the types of post-contact archaeological sites likely to be present. Major locational attributes differ according to site type. Domestic and agrarian sites (houses and farms) are characteristically located near water sources, arable lands, and transportation networks. Industrial sites (e.g., mills, tanneries, forges, and blacksmith shops) established before the late nineteenth century are typically located close to waterpower sources and transportation networks. Commercial, public, and institutional sites (e.g., stores, taverns, inns, schools, and churches) are usually near settlement concentrations with access to local and regional road systems (Ritchie et al. 1988).

Written and cartographic documents aid in determining post-contact archaeological sensitivity. Historical maps are particularly useful for locating sites in a given area, determining a period of occupation,

establishing the names of past owners, and providing indications of past use(s) of the property. Town histories often provide information, including previous functions, ownership, local socioeconomic conditions, and political evolution, which is used to develop a historic context and to assess the relative significance of a post-contact site.

The written historic record, however, tends to be biased toward the representation of Euro-American cultural practices and resources, particularly those of prominent individuals and families. Archival materials generally are less sensitive to the depiction of cultural resources and activities associated with socioeconomically or politically "marginalized" communities (McGuire and Paynter 1991; Scott 1994), including, but not limited to, Native Americans, African Americans, and "middling" farming or working-class Euro-Americans. Several archaeological studies conducted throughout New England have demonstrated the methodological pitfalls of relying exclusively on documentary and cartographic materials to identify potential site locations associated with these types of communities. A large-scale archaeological study by King (1988) showed that in rural areas, only 63 percent of the sites discovered were identifiable through documentary research. This suggests that approximately one-third of New England's rural Euro-American archaeological sites may not appear on historical maps or in town and regional histories.

Other archaeological and ethnohistoric studies in the region have focused on identifying other historically "invisible" communities, notably post-contact Native American communities. Several townwide surveys in southeastern Massachusetts have compiled archaeological and historical data about eighteenth- and nineteenth-century Native American and African American communities that are poorly represented or are altogether absent in written town histories (Herbster and Cox 2002; Herbster and Heitert 2004). In central Massachusetts, active and influential Native Americans have been identified through archival research, despite the recorded "disappearance" of this group in the early eighteenth century (Doughton 1997, 1999). The cultural continuity of groups such as the Aquinnah Wampanoag is more thoroughly documented in archival sources, but until recently, archaeologists focused their attention on pre-contact archaeological deposits. More recent studies include predictive models for distinctly Native American post-contact sites and interpretations of eighteenth- through twentieth-century archaeological sites (Cherau 2001; Herbster and Cherau 2002).

Other archaeological investigations have focused on worker housing and landscape organization within mixed cultural mining communities in northern New England (Cherau et al. 2003); the social and spatial organization of a mixed racial community in western Connecticut (Feder 1994); and material culture and architectural patterns among nineteenth-century mixed African American and Native American households in central Massachusetts (Baron et al. 1996).

Information about post-contact land use within a given area can also be collected through written and oral histories passed through family members and descendant communities. These types of information sources can often fill gaps in the documentary record and provide details unavailable through more conventional archival sources. Although informants, other oral sources, and the documentary record can contradict each other, this type of information can also provide important data for identifying and interpreting archaeological sites. However, the sole use of and reliance on the written and oral historical records during archival research can underestimate the full range of post-contact sites in any given region. Therefore, walkover surveys and subsurface testing, in conjunction with the critical evaluation of available documentary and cartographic resources, are required to locate and identify underdocumented post-contact sites.

Archaeological Sensitivity Ranking

The WPCF project area was ranked according to the potential for the presence of archaeological resources based on information collected during the archival research and walkover survey. Subsurface testing was

planned for areas assigned high and moderate sensitivity where project impacts will occur. Table 2-1 is a summary of the factors used to develop the archaeological sensitivity rankings.

Table 2-1. Archaeological Sensitivity Rankings Used for the Water Pollution Control Facility Project Area.

Presence of Sites		Proximity to Favorable Cultural/ Environmental Characteristics			Degree of Disturbance			Sensitivity Ranking
Known	Unknown	< 150 m	≥ 150 ≤ 500 m	> 500 m	None/Minimal	Moderate	Extensive	
•		•			•			High
•		•				•		High
•		•					•	Low
•			•		•			High
•			•			•		High
•			•				•	Low
•				•	•			High
•				•		•		High
•				•			•	Low
	•	•			•			High
	•	•				•		Moderate
	•	•					•	Low
	•		•		•			Moderate
	•		•			•		Moderate
	•		•				•	Low
	•			•	•			Moderate
	•			•		•		Low
	•			•			•	Low

Subsurface Testing

Subsurface testing was conducted in project impact areas with high and moderate archaeological sensitivity to locate and identify any archaeological resources. A total of 95, 50-x-50-centimeter (cm) test pits were excavated within the WPCF project area within 3, 30-x-30-m sampling blocks and along four judgmental linear transects. Seven judgmental test pits (JTP-01 to JTP-07) were also placed in specific archaeologically sensitive locations. Seven array patterns with 50-x-50-cm test pits were placed at 2.5-m or 5-m intervals in the cardinal directions were used to investigate find spots of pre-contact cultural material.

Each 30-x-30-m block each contained 13 test pits arranged in a 7.5-m grid pattern (Figure 2-1). Sampling blocks of this size have a 50 percent likelihood of intercepting pre-contact sites that are less than 7.5 m in diameter and have a 100 percent likelihood of intercepting sites that are at least 7.5 m in diameter. *EVALSTP* and *PLACESTP* (Kintigh 1987) statistical computer programs were used in this evaluation. Linear transects, with 50-x-50-cm test pits located at 10-m intervals, were used in areas too small or narrow for block testing.

All test pits were excavated by shovel in 10-cm levels to a maximum depth of 80 cm below surface (cmbs) or to C-horizon subsoils, whichever came first. Excavated soil was hand-screened through ¼-inch hardware cloth. All cultural materials remaining in the screen were bagged and tagged by level within each test pit, and the count and type of all recovered cultural materials were noted on standard PAL Test Pit Profile forms. Soil profiles, including depths of soil horizons, colors, and textures, were recorded for each test pit. All test pits were filled and the ground surface was restored to its original contour following excavation. Digital photographs were taken to document the general project area, representative test pit profiles, and any significant features. A record of digital images was maintained on standard PAL Photograph Log forms. A daily record of observations and procedures was maintained by the project archaeologist.

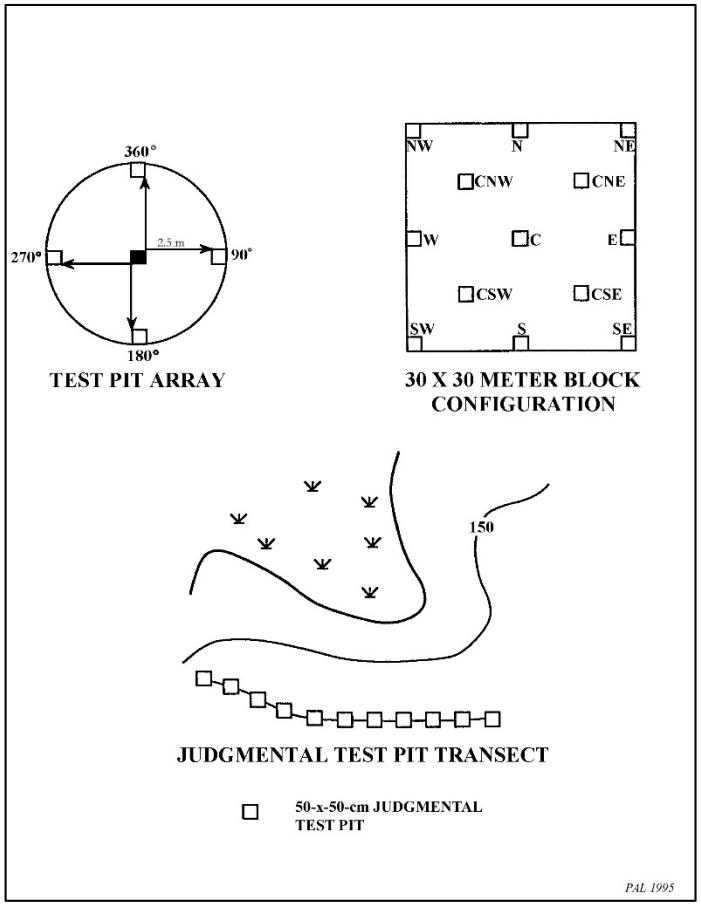

Figure 2-.1 Subsurface testing strategies used in the intensive survey of the Water Pollution Control Facility project area.

Field Mapping

PAL staff recorded the locations of all subsurface testing within sampling blocks, along judgmentally placed transects and in array patterns. A Trimble GeoXT Global Positioning System (GPS) handheld receiver was used to map test pits excavated within the project area and some existing objects such as monitoring wells and the post-contact earth fill and stone dam feature in the northwestern corner of the WPCF project area.

Laboratory Processing and Analyses

Processing

All cultural materials recovered from the WPCF project area during the archaeological investigations were organized by site and provenience, recorded, and checked in on a daily basis. Cultural materials were sorted by type and either dry brushed or cleaned with tap water depending on the material or artifact type and condition.

Cataloging and Analyses

All cultural materials were cataloged using a customized computer program designed in Microsoft Access 2000. The program is a relational database, which provides the flexibility that is needed when cataloging archaeological collections that often contain disparate cultural materials such as stone, ceramics, and/or glass. Artifacts with similar morphological attributes are grouped into lots, which allows for faster and more efficient cataloging. The artifacts are stored in 2-millimeter-thick polyethylene resealable bags with

acid-free tags containing provenience identification information. The artifacts were placed in acid-free boxes that are labeled and stored in PAL's curatorial facility in accordance with current NPS standards.

Culturally modified lithic materials, such as stone tools and chipping debris, were identified in terms of material, size (0–1 cm, 1–3 cm, 3–5 cm, etc.), and color. A lithic-type collection, maintained at PAL and containing materials from various source areas in New England and nearby regions such as New York and Pennsylvania, was utilized in the identification of all lithic materials. Chipping debris was classified as either flakes or shatter. Pieces of debitage showing evidence of a striking platform, bulbs of percussion, or identifiable dorsal or ventral surfaces were called flakes. Debitage without these attributes, and exhibiting angular or blocky forms, were classified as shatter. Lithic debris was examined for edges that had been modified by use wear or intentional retouch. Non-lithic artifacts were cataloged by material and functional categories.

Curation

Following laboratory processing and cataloging activities, all recovered cultural materials were placed in acid-free Hollinger boxes with box content lists and labels printed on acid-free paper. The cataloged artifacts and associated project documentation are stored at PAL, 26 Main Street, Pawtucket, Rhode Island, in accordance with state and federal curation guidelines until such time as a permanent repository is designated.

CHAPTER THREE

ENVIRONMENTAL CONTEXT

Geomorphology

The Water Pollution Control Facility (WPCF) project area is in the town of Norton in southern Bristol County, Massachusetts. At a regional scale, the project area is situated within the Seaboard Lowland physiographic zone of the New England province (Fenneman 1938) (Figure 3-1).

The town of Norton is within the northern portion of Narragansett Basin, a topographic feature within southeastern Massachusetts and Rhode Island characterized by low elevations and a complex network of rivers, streams ponds, and wetlands that drain into the Taunton River and parts of Narragansett Bay.

Topography in and around the project area has low relief with elevations ranging from 70 feet above sea level (asl) in wetlands near the Conrail railroad easement to a maximum of 102 feet asl on the crest of the knoll forming the proposed location for infiltration basins.

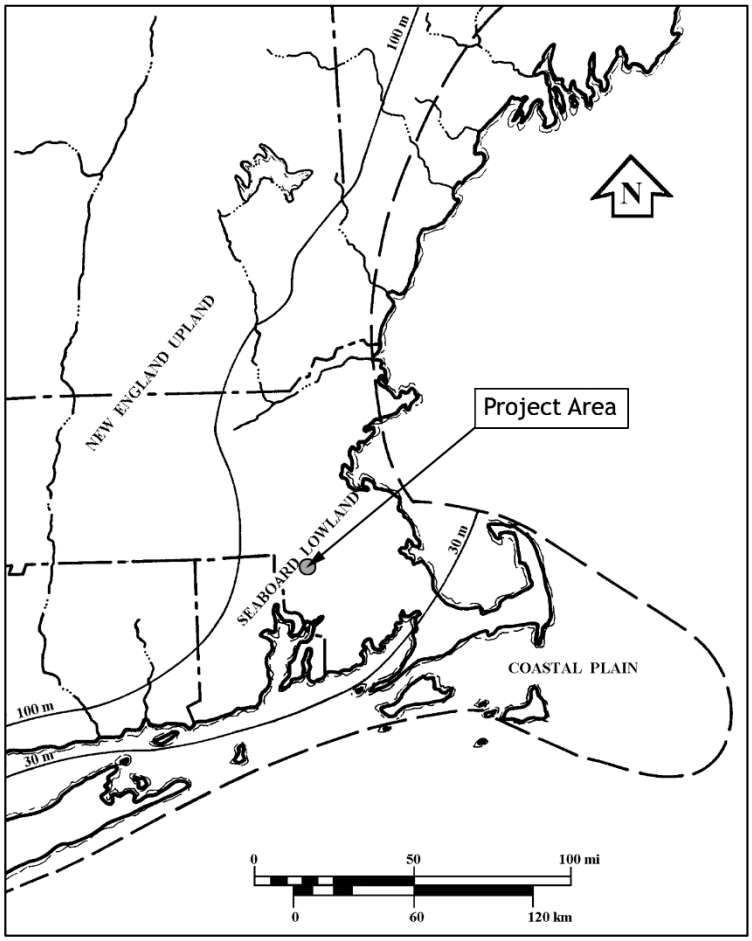

Figure 3-1. Map of the physiographic regions of New England showing the location of the Water Pollution Control Facility project area (source: Fenneman 1938).

Bedrock Geology

The WPCF project area is within the Narragansett Basin, which is underlain by sedimentary bedrock associated with the Rhode Island formation. This formation consists primarily of shale, arkose, sandstone and conglomerate with small deposits of coal. Rhyolite flows associated with the Wamsutta formation are located along the western boundary of the basin in Attleborough (Williams 1973; Zen et al 1983). This rhyolite was an important lithic material for Native American groups in the Taunton basin area who used it to manufacture chipped-stone tools throughout the Pre-Contact Period. There are no bedrock outcrops in or near the project area.

Surficial Geology and Soils

The WPCF project area is located within the upper Taunton River drainage basin, an area characterized by low hills of glacial till and ground moraine and extensive sand/gravel glacial outwash deposits. The retreat of the Wisconsin glacier approximately 14,000 years ago resulted in the formation of a large lake that covered most of the upper Taunton River drainage basin. Upon drainage of this lake, large quantities of sediment were transported across the low-lying sections of the Taunton basin. During the post-glacial period, wind action redeposited fine sediments that eventually covered many topographic features. This wind-blown mantle reaches a maximum thickness of 180 cm below surface and constitutes current soil horizons in much of the Taunton basin (Hartshorn 1967).

The surficial deposits within and around the WPCF project area consist of outwash plains and more elevated kames bounded by steep ice contact slopes. The knoll forming the project area has features typical of kames and kame terraces such as a flat to nearly level upper surface and steeply sloping sides that are ice contact slopes. The upper surface also has some shallow depressions or channels related to deposition of the outwash by glacial meltwater. The soils within the project area have been classified as the Windsor series. They are deep, nearly level to moderately steep excessively drained soils that formed on glacial outwash. Slopes within areas having Windsor series soils may range from 0 to 25 percent (USDA 1978).

Hydrology and Drainage Patterns

The project area is along the Wading/Three Mile River drainage and within 1 mile of the adjacent Rumford, Canoe, and Snake river drainages and associated wetland environments. These rivers are primary tributaries that flow in a generally northwest to southeast direction toward the main stem of the Taunton River (Figure 3- 2).

The confluence of the Rumford and Wading rivers is in wetlands about 0.5 mile west of the project area. From this confluence, the Three Mile River flows south toward the Taunton River. A prominent bend in the Three Mile River is directly south of the project area and Pine Street. Several small streams and wetlands along the north side of Pine Street were impounded in the Post-Contact Period to form ponds used as sources of waterpower for mills.

Surface drainage within the project area is into wooded wetlands located to the west, north and south. A small unnamed stream near the extreme northwest corner of the WPCF project area flows west and south to one of the ponds on the north side of Pine Street, outside the project area.

Existing Conditions

The current landscape in the WPCF project area is primarily wooded and undeveloped. There are several unpaved cart paths or wood roads, including one that enters the project area from Pine Street to the south. An abandoned railroad easement extends along the eastern boundary of the project area and is bordered on the north and west by steep natural slopes above wooded wetlands containing a small stream. Other natural slopes adjacent to wooded wetlands bound the project area on the south and southeast. The current vegetation in the project area is a second growth forest of primarily white pine and oak with some red maple trees and shrub undergrowth (Figure 3-3).

There was minimal evidence of previous disturbance in the project area. An open clearing near the center of the project area had evidence of recent disturbance from site engineering studies. A monitoring well and boring hole were surrounded by a pad of crushed rock and a larger zone of exposed subsoils (Figure 3-4). Some logging of white pine trees has also created narrow openings in the forest cover within the project area.

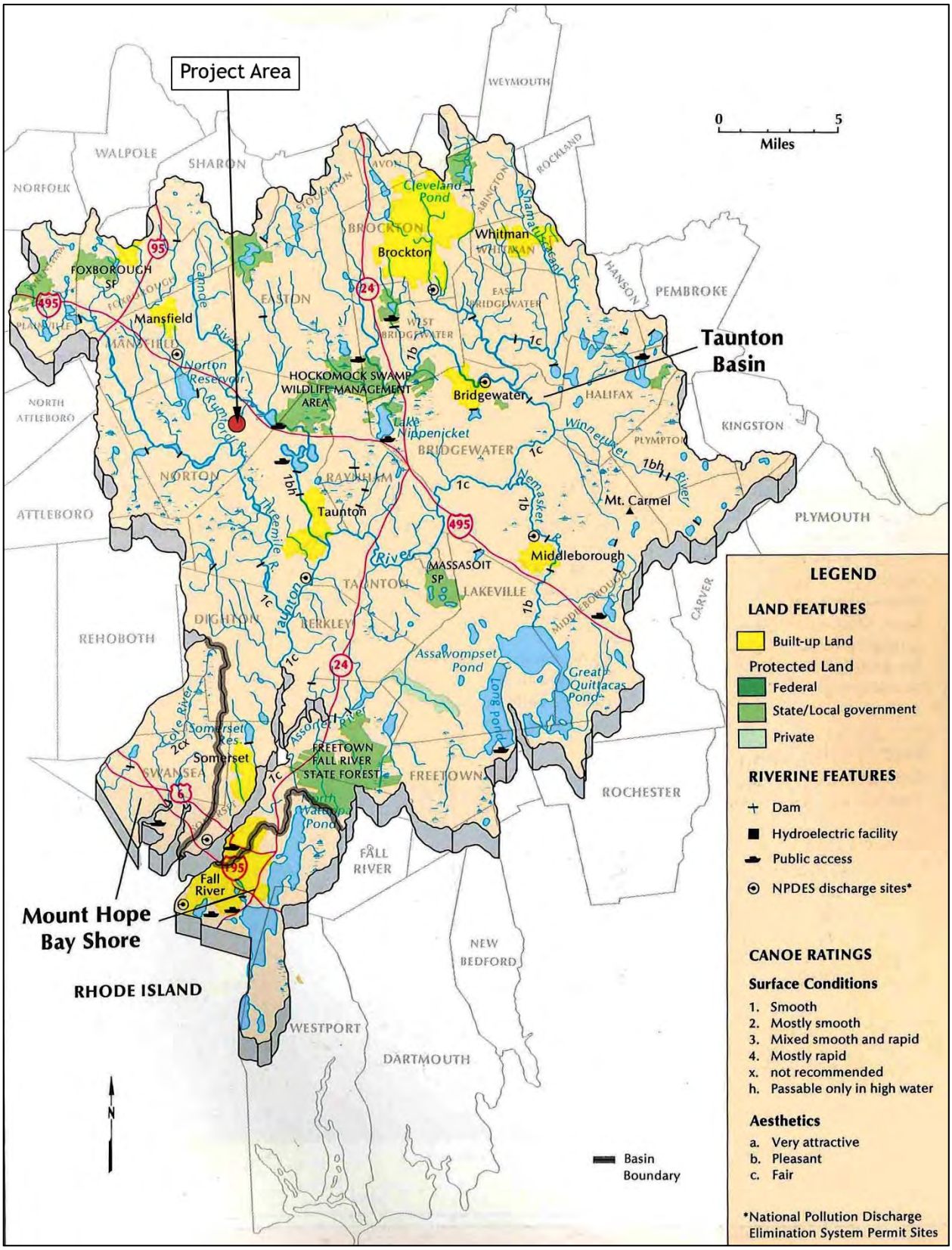

Figure 3-2. Taunton River drainage basin with the location of the Water Pollution Control Facility project area.

Figure 3-3. Existing conditions within the Water Pollution Control Facility project area, view to northwest.

Figure 3-4. Zone of previous disturbance around monitoring wells and boring near the center of the Water Pollution Control Facility project area, view to west.

CHAPTER FOUR

CULTURAL CONTEXT

The pre-contact Native American occupation of the upper Taunton River drainage basin has been studied by historians and by avocational and professional archaeologists for more than 100 years. By the mid-to-late nineteenth century, local historians described pre-contact sites where artifacts had been exposed by farming and other land use (Clark 1859:52). Some large collections of artifacts were made by local avocational archaeologists. For example, the Richardson collection that was assembled in the late nineteenth and early part of the twentieth century contained artifacts from many sites in the towns of Attleboro, Norton, Mansfield, and Taunton, Massachusetts. Most of these sites were along or near the primary Taunton basin tributary streams such as the Rumford, Wading, Three Mile and Canoe rivers.

Many of the known pre-contact sites were initially recorded by members of the Massachusetts Archaeological Society (MAS). Most of the Native American sites recorded within the boundaries of the Mansfield and Norton USGS quadrangles were first investigated by members of the Cohannet Chapter of the MAS. Since 1976, cultural resource management (CRM) surveys conducted by professional archaeologists have also identified Native American sites in all the towns within the upper and middle portion of the Taunton drainage basin. The inventory of known sites contains locations occupied during every temporal subdivision of the Pre-Contact Period, from PaleoIndian (e.g., Mansfield Airport Site) to Late Woodland (e.g., Titicut Site in Taunton).

Pre-Contact Period Contact

PaleoIndian Period (12,000–10,000 B.P. before present [B.P.]).

The Taunton drainage basin was first occupied during the PaleoIndian Period and sites are a small base camp in Middleborough and isolated find spots of diagnostic fluted and unfluted projectile points. A large and comprehensive assemblage with fluted projectile points and gravers, scrapers, channel flakes, and associated chert, jasper, rhyolite and quartz debitage was recovered at Loci 6 and 8 of the Wapanucket Site (19-PL-203) on the shores of Assawompsett Pond in Middleborough (Robbins 1980; Robbins and Agogino 1964). This site probably formed as a series of small temporary camps used as a base for hunting and foraging resources near a post-glacial lake basin.

The other evidence of PaleoIndian activity are a series of find spots such as a single fluted, Clovis-like projectile point recovered by members of the MAS during excavations at the Mineral Springs Park Site (19-BR-1) in Mansfield. A late PaleoIndian projectile point with short thinning or fluting flake scars on its base was found along the Three Mile River in Taunton in the early twentieth century by an avocational archaeologist. Made of a light gray, weathered rhyolite this point is stylistically similar to the Holcombe type fluted points found on the Cormier and Nicholas sites in Maine. In New England, Holcombe points appear to date to about 11,000 years ago based on radiocarbon dates obtained at these two sites.

A possible late PaleoIndian component containing narrow, lanceolate projectile points, sandstone choppers and semi-lunar knife forms was found on the Plymouth Street Site at the confluence of the Matfield and Taunton rivers in Bridgewater (Hallaren 1988). Several examples of unfluted, lanceolate, late PaleoIndian projectile points have been found on the surface of large multicomponent Archaic and Woodland sites near the Taunton River in the Titicut district of Middleborough. These points are made of eastern Massachusetts

rhyolites and have carefully thinned bases with evidence of grinding extending up the lower portion of their lateral edges. These lanceolate points appear to be part of a technological tradition during the late PaleoIndian Period about 9,000 to 9,600 years ago (Bradley and Boudreau 2006).

Early Archaic Period (10,000–7500 B.P.)

The known inventory of Early Archaic sites in the Taunton basin of southeastern Massachusetts illustrates an expanding settlement pattern with a wider range of site locations compared to PaleoIndian Period. Most of the known find spots of diagnostic bifurcate-base projectile points are along the Taunton River corridor and major tributary streams or wetlands. The available information suggests that settlement in this early period was characterized by low population densities, with small groups of hunter-gatherers practicing high seasonal mobility. Subsistence activities were concentrated in environmental settings with the greatest variety of natural resources within a mixed hardwood forest type that had become established, replacing an earlier pine dominant post-glacial forest (Gaudreau and Webb 1985).

Evidence of Early Archaic activity consists mostly of isolated recoveries of diagnostic bifurcate-base points without associated tool assemblages, features or activity areas. There is a concentration of about 70 bifurcate-base point find spots in the upper Taunton River area in the Titicut district in Middleborough and Bridgewater. This is the largest known concentration of Early Archaic activity in southern New England. Thirteen diagnostic bifurcate-base projectile points were recovered at the Titicut Site (19-PL-161) in Bridgewater. Other nearby sites in the Titicut district with bifurcate-base point find spots are the Seaver Farm (19-PL-162) and Taylor Farm sites (Taylor 1976).

Three bifurcate-base projectile points were also recovered during data recovery excavations at the Riverside 3 Site (19-PL-702) along the Nemasket River in Lakeville (Begley and Davin 1996). The Plymouth Street Site in Bridgewater yielded at least seven bifurcate base points, some flake tools, and end scrapers of quartz. A pit feature on the site was radiocarbon dated to 7980 ± 200 years B.P. (Halloran 1988).

Near Nippenicket Pond and the Hockomock and Titicut swamps, a small group of sites have Early Archaic components. The Nunkatusset Site in West Bridgewater and the Rozenas I in Raynham sites yielded single bifurcate-base points (Engstrom 1951; Thorbahn 1982c). The Double P Site (19-PL-343), found during archaeological investigations within the Bridgewater section of the I-495 highway corridor, contained a more complex Early Archaic component with stone tools, activity areas, and features. This component on the margin of Titicut Swamp contained a bifurcate-base point, an assemblage of bifacial tool blades, flake tools and chipping debris mostly of non-local rhyolites. A deep pit feature was radiocarbon dated to 8555 ± 200 B.P., the earliest chronological reference for bifurcate-base projectile points in southeastern Massachusetts (Simon 1991).

Radiocarbon dates of 8480 ± 140 B.P. (Beta-33410) and 8430 ± 170 B.P. (Beta-35400) were obtained on charcoal from a pit feature on the Bassett Knoll Site (19-PL-323). This large multicomponent site was located at the headwaters of a tributary to the Taunton River in Raynham, Massachusetts (Harrison and McCormack 1990).

Middle Archaic Period (7500–5000 B.P.)

Middle Archaic sites are well documented in the Taunton River basin and likely reflect an expansion of the settlement/subsistence related activities into a range of environmental settings or a general increase in population. The settlement pattern is like that known from other parts of southern New England, with a strong orientation to riverine, open water, and wetland environmental settings. Middle Archaic components vary in size and complexity, with the largest depositions occurring on sites near major wetlands such as the

Hockomock and Titicut swamps, marshes bordering the Taunton River, and the primary tributary streams. Settlement in upland settings farther from rivers, streams, and wetlands is not well known.

Typical Middle Archaic assemblages contain diagnostic Neville and Stark projectile points, bifacial tool blades, scrapers, drills made on reworked Neville points, flake tools, and ground-stone tools such as gouges, semi-lunar knives, and atlatl weights. The lithic technology used to manufacture chipped-stone tools was based on local and non-local materials. The locally available materials are primarily argillite or shale and Attleboro red rhyolite (Wamsutta volcanic complex) from sources in the Taunton basin. Rhyolites from the Blue Hills and Mattapan volcanic complexes in the southern Boston basin area were also important materials. In the eastern Taunton basin, glacially transported cobbles of dark gray Lynn volcanic rhyolite collected from outwash deposits appear to have been a source of lithic raw material. The quartzite occasionally used to make Neville and Stark points may be from northern Rhode Island or a section of the Westborough Quartzite formation in southern Worcester County. Large steep-edged scrapers made of quartz have also appeared in some Middle Archaic tool assemblages. Ground-stone tools such as gouges and semi-lunar knives were made of Braintree Slate/hornfels from the Blue Hills and some local shale.

CRM surveys at the Lane Farm/Norton Elementary School Site on the Wading River and G. B. Crane Site along the Three Mile River in Norton identified significant Middle Archaic artifact assemblages with Neville and Stark points of argillite and non-local rhyolite (Ritchie 1976; Thorbahn et al. 1983). Along the the I-495 highway corridor in the northwest and central part of the Taunton basin, Middle Archaic components were found on large multicomponent sites on the Rumford, Canoe, and Snake rivers and the margins of the Hockomock and Titicut swamps: the Treatment Plant Site (19-BR-187) in Mansfield; Canoe River West Site (19-BR-40) in Norton; Bay Street I Site (19-BR-56) on the Snake River in Taunton; Rozenas I Site in Raynham; and Double P Site in Bridgewater. The small Middle Archaic components were Neville and Stark points, bifacial tool blades, drills, scrapers of rhyolite, argillite, and quartzite, and lithic workshop loci. At the Treatment Plant Site, a large, deep pit feature radiocarbon dated to 5,600 years ago contained a Neville-like projectile point of quartz and dense deposits of Attleboro red felsite chipping debris (Thorbahn 1982c). A Stark-like projectile point of gray rhyolite was evidence for a Middle Archaic component within the recently identified Canoe River WTP Site on the Canoe River north of Winneconnet Pond (Mair 2014).

A cluster of sites around Nippenicket Pond in Raynham and Bridgewater varies from isolated find spots of Neville points to small depositions with points, bifaces, scrapers and chipping debris within larger multicomponent sites. They indicate this area between the Hockomock and Titicut swamps was a localized core area of Middle Archaic settlement and resource collecting activity (Ritchie and Graves 2006).

On the Taunton River, Middle Archaic components are known from diagnostic projectile points and ground-stone tools surface collected and excavated by avocational archaeologists at sites in the Titicut district, an area that was a focus of Early Archaic activity: the Titicut, Taylor Farm, and Seaver Farm sites in Middleborough and Bridgewater. Avocational archaeologist William Seamans collected Middle Archaic projectile points from a group of sites near the confluence of the Winnetuxet and Taunton rivers and at Robbins Pond in Bridgewater and Halifax (Mahlstedt 1985).

Late Archaic Period (5000–3000 B.P.) L3

Sites occupied by Native American people affiliated with the three Late Archaic cultural traditions (Laurentian, Small Stemmed, and Susquehanna) are well represented in the upper and middle Taunton basin. As in other parts of southeastern New England, sites affiliated with this temporal period are common in the extant inventory of pre-contact Native American cultural resources and are widely distributed through various environmental settings. The larger multicomponent sites known from this area were used by people of all three traditions. Radiocarbon-dated features on these sites cluster between about 4,400 and 3,000 years ago, indicating repeated episodes of use, primarily by Small Stemmed tradition groups. The majority

of sites investigated along the I-495 highway corridor near the Rumford, Canoe, and Snake rivers contained evidence of occupation or use during the Late Archaic Period. These sites varied in size and internal complexity.

Laurentian tradition activity is usually represented by a few Otter Creek-like, Vosburg, or Brewerton series projectile points. Very few sites have more than a few of these points and are not frequent in the large artifact collections from sites in the upper and middle Taunton basin (Mahlstedt 1985). Brewerton points from this area were frequently made of Attleboro red felsite, Boston basin rhyolites (Blue Hills, Mattapan), quartzite, or local argillite and shale.

Along the I-495 corridor, the Canoe River West (Norton) and Bay Street I (Taunton) sites had small Laurentian tradition components of Brewerton projectile points and earth, pit, and lithic workshop features. The Laurentian component on the Canoe River West Site contained complete and unfinished Brewerton-like and Squibnocket Triangle points associated with a large pit feature radiocarbon dated to 4835 ± 250 B.P. (GX 7085). A small lithic workshop where Brewerton series points were made of Attleboro red rhyolite and other materials was found on the Snake River West site in Taunton (Thorbahn 1982c).

Large base camps such as the Bay Street I and Canoe River West sites near extensive wetlands and areas well suited for fishing or collecting other natural resources contained dense deposits of Late Archaic features and cultural material. Radiocarbon dates from burnt rock pavements, fire pit/hearth, and pit features indicate the sites were recurrently used between about 4,200 and 3,000 years ago. Most of the features appear to be associated with Small Stemmed tradition settlement. Other evidence of intensive use was demonstrated by the Small Stemmed and Squibnocket Triangle projectile point types that dominate the artifact assemblages from these sites. For example, more than 100 small stemmed points were collected from the Bay Street I site during archaeological data recovery investigations (Thorbahn 1982a). Typical lithic assemblages from Small Stemmed components include Squibnocket Triangle and small stemmed points, point preforms, bifacial tool blades, and scrapers. Although quartz was the primary lithic material for chipped-stone tools, local argillite or shale, Boston basin rhyolites, and quartzite were also used. Most of the quartz used in the Taunton basin was obtained from glacial cobbles found in outwash deposits. Arkose local to the Taunton basin was also used to make large oval or rectangular scrapers and chopper-like tools. Ground-stone tools include small gouges or adzes, pestles, and atlatl weights. Analysis of the assemblage of small stemmed points from radiocarbon-dated contexts about 4,000 to 3,250 years ago on various sites in the I-495 highway corridor suggested that the stylistic attributes of this point type changed through the Late Archaic to Transitional Archaic periods (Ritchie 1982)

Use of a wide range of locations for settlement and resource collection or processing tasks is shown by the number of sites ranging from very small temporary activity loci to larger camps in the upper and middle Taunton basin with Small Stemmed and Squibnocket Triangle components. Small Stemmed lithic assemblages and associated features were the dominant components on the Newcomb Street (19-BR-188), G. B. Crane, and White Crow sites in Norton and Taunton. The Faulkner Springs Site, near Winnecunnet Pond in Taunton, reportedly contained a Small Stemmed point assemblage (Robbins 1980). The Late Archaic component on the G. B. Crane Site in Norton contained a large burnt rock feature likely used to process some type of resource. Radiocarbon dates of 4135 ± 300 B.P., 3740 ± 280 B.P. and 3425 ± 265 B.P. were obtained on charcoal samples from this feature and others. One or more of these radiocarbon dates is associated with the Small Stemmed component on this site (Thorbahn et al. 1983).

In the upper and middle part of the Taunton basin, the Susquehanna tradition settlement pattern is represented mostly by the distribution of diagnostic point types (Atlantic, Wayland Notched, and Coburn) and bifacial tool blades on multicomponent sites. These points usually appeared in low numbers, and few distinct Susquehanna tradition components are known. Along the Wading, Canoe, and Snake River drainages, sites with Susquehanna components include the Bay Street I Site in Taunton, and the Lane Farm/Norton

Elementary School, Canoe River West, and Hawk sites in Norton. A number of radiocarbon dates obtained from features on the Bay Street I Site fall within the time span of the Susquehanna tradition, circa (ca.) 3700 to 3200 B.P., but most likely relate to the Small Stemmed Point component on this site (Thorbahn 1982b, 1982c).

The lithic technology used by Susquehanna tradition groups relied on rhyolites from a number of source areas within the Wamsutta (Attleboro red rhyolite), Blue Hills, and Mattapan volcanic complexes. Some rhyolite may have been derived from beach cobbles collected in the South Shore area between Boston Harbor and Cape Cod. Other lithic materials used to make Atlantic, Mansion Inn and Coburn type bifacial tool blades, projectile points, drills, and scrapers were argillite from sources in the Taunton basin or Narragansett Bay area and quartzite and cherts likely from sources in eastern New York. Ground-stone tools include full grooved axes, gouges, adzes and cylindrical pestles. Susquehanna tradition groups occupying the Taunton basin also made cooking vessels of steatite (soapstone) obtained from quarries in northern Rhode Island and central Massachusetts.

Atlantic and Wayland Notched points and Mansion Inn type bifaces of rhyolite and chert collected in two archaeological investigations at the G. B. Crane Site indicate this site on the Three Mile River had a Susquehanna tradition component (Thorbahn et al. 1983; Goodby 1991). Several groups of cremation burials have been discovered at the Seaver Farm and Titicut sites in Middleborough (Dodge 1962; Robbins 1967). The Seaver Farm cremation features were a group of five deep pits. Two of them had deposits of charcoal-stained sand and red ochre containing fragments of calcined human remains. Two large Mansion Inn bifaces and a single Wayland Notched point of rhyolite were in two of the other ochre deposits (Taylor 1970).

Transitional Archaic Period (3000–2500 B.P.)

Some Small Stemmed components on sites in the upper to middle portion of the Taunton basin have been radiocarbon dated to about 3,000 years ago, suggesting that this tradition persisted into the Transitional Archaic Period. The Coburn phase, a final expression of the Susquehanna tradition in southeastern New England is known mostly from diagnostic projectile points and one burial site in the upper and middle Taunton basin. Transitional Archaic activity on sites is usually indicated by Orient Fishtail like projectile points and to a lesser extent by Coburn points. These points are frequently made of various rhyolites from the Boston basin area, local argillite or shale and some quartz or quartzite. Orient and Coburn-like points made of jasper and cherts from sources outside southern New England have also been found on sites in the Taunton basin. Fragments of the steatite cooking vessels used by Transitional Archaic populations in this area also appear on sites in the Taunton basin. Orient and Coburn points have been found in low numbers on some large multicomponent sites in the upper and middle Taunton basin that frequently have evidence of continued use into the succeeding Woodland period, a pattern seen throughout southeastern New England.

At the Canoe River West site in Norton, Orient fishtail-like points were found on this multicomponent Archaic site on a small fall line where catching and processing anadromous fish was most likely an important activity. Some of the large burnt rock platforms on the site could be associated with Transitional Archaic activity; a radiocarbon date of 2565 ± 150 (GX 7470) was obtained from one of these features (Thorbahn 1982b). Fragments of fishtail points were collected from the surface of the G. B. Crane Site on the Three Mile River in Norton (Goodby 1991).

Several Orient fishtail-like points were found on the Bassett Knoll Site in Raynham (19-PL-323), a multicomponent site with substantial Woodland components near a large wooded wetland and stream corridor (Harrison and McCormack 1990). This is one of the few upland site locations in the upper Taunton basin with Transitional Archaic and Woodland components. The Raymond Seamans collection contains a few fishtail points from the Halifax Spring, Robbins Pond, Robbins Pond Outlet and Cajewaters sites in Halifax and Bridgewater (Mahlstedt 1985).

Early Woodland Period (2500–1650 B.P.)

Evidence of Early Woodland occupation on known sites in the upper and middle Taunton basin is not widespread and has usually been identified from Rossville and Meadowood type projectile points in artifact collections made by avocational archaeologists. The few components in the area appear on large riverine, pond, or wetland zone sites with more complex Archaic and later Woodland depositions. Examples are the few Meadowood points from the Cajewaters Site on the Taunton River and the single Rossville like point from the Robbins Pond Site in Bridgewater (Mahlstedt 1985). The Meadowood and Rossville points traditionally associated with the Early Woodland Period are relatively uncommon on sites in the interior of southeastern New England. Based on the results of archaeological investigations, particularly cultural resource management studies, these point types are probably not the best indicators of Early Woodland activity on sites.

Radiocarbon dates from about 2,500 to 1,600 years ago from several sites in the I-495 highway corridor suggest an extended use of small stemmed points, usually associated with the Late/Transitional Archaic Period, into the Early Woodland Period. At the Bay Street I Site in Taunton, small stemmed points were recovered in association with thick, cord-marked ceramic sherds similar to the Vinette I type. The nearby Johnson II Site contained a feature radiocarbon dated to 2320 ± 190 B.P. and the small stemmed points found on the site may be related to an Early Woodland component. Some of the small stemmed points and a Rossville-like point excavated from the Bassett Knoll Site in Raynham are probably associated with an Early Woodland component radiocarbon dated to 1980 ± 150 B.P. (Harrison and McCormack 1990).

The introduction of ceramic technology into southeastern New England probably occurred by about 2,500 years ago near the beginning of the Early Woodland Period. Thick, cord-marked and grit-tempered ceramic sherds were found in an Early Woodland component on the Canoe River West Site in Norton radiocarbon dated to 2310 ± 110 years B.P. and 2180 ± 130 B.P. Another assemblage of ceramic sherds found on the Snake River West Site in Taunton appears to be associated with an episode of activity radiocarbon dated to 1885 ± 125 (Thorbahn 1982c).

Middle Woodland Period (1650–1000 B.P.)

Sites with evidence of use during the Middle Woodland Period are more numerous in comparison to the preceding Early Woodland Period. Middle Woodland components at sites in the portion of the upper Taunton basin drained by the Canoe, Snake, Rumford, and Three Mile rivers are typically small depositions or activity areas centered on fire pit/hearth features with diagnostic projectile point and biface forms, chipping debris, and ceramic sherds. The most common projectile points are lanceolate Fox Creek and Greene-like forms. Jack's Reef Corner-Notched and Pentagonal types are less common and tend to be made of hornfels, chert or jasper. Untyped side and corner-notched points also appear in Middle Woodland contexts throughout eastern and southeastern Massachusetts. Bifacial tool blades range from large, lanceolate Fox Creek-like forms to smaller leaf or ovate shapes made of hornfels, chert, jasper, and rhyolite. Middle Woodland ceramics from the Taunton basin were tempered with crushed burnt rock and shell. Common decorations on exterior surfaces are dentate or rocker stamping and small holes or punctates.

Middle Woodland lithic technology was based on local and non-local materials. Local materials were red rhyolite from the Wamsutta volcanic complex (Attleboro red felsite) and some argillite. The primary non-local materials were hornfels or rhyolite from sources in the Boston basin. Hornfels from the Massachusetts Hill source area in the Blue Hills was transported over a wide area within eastern, southern, and central Massachusetts and Rhode Island during the Middle and Late Woodland periods (Ritchie and Gould 1985). Middle Woodland populations in southeastern New England also participated in long-range exchange or trade networks that brought jasper from southeastern Pennsylvania and cherts from eastern and central New York.

At the Newcomb Street Site along the Canoe River in Norton, Fox Creek projectile points, a scraper, and numerous pieces of chipping debris all of hornfels were found in a small deposition overlying an older Late Archaic Small Stemmed point component. Other small Middle Woodland components were present on the Canoe River West and Bay Street I sites. A radiocarbon date of 1670 ± 125 years B.P. was obtained from a pit feature in a small activity area containing ceramic sherds on the Bay Street I Site. (Thorbahn 1982b).

A lithic workshop feature with hornfels and chert debitage, a Jack's Reef Corner-Notched point and grit-tempered ceramic sherds were associated with a Middle Woodland component on the G. B. Crane Site, which site was also used by Middle Woodland people to store a cache of five large Fox Creek bifacial preforms made of hornfels. This cache was found on a sloping embankment above the Three Mile River (Thorbahn et al. 1983). Another archaeological investigation at this site identified a second locus of Middle Woodland activity with a Fox Creek point, ovate biface or preform of hornfels, and incised, burnt rock-tempered ceramic sherds (Goodby 1991). A small activity area with hornfels chipping debris found on the Canoe River WTP Find Spot 2 Site north of Winneconnet Pond likely represents an episode of stone toolmaking during this period (Mair 2014).

On the Seaver Farm Site in the Titicut section of the Taunton River, soil stripping for residential development exposed a Middle Woodland burial pit feature containing human remains and a set of grave goods placed within a deposit of red ochre. The grave goods consisted of two platform style smoking pipes made of steatite, a large leaf-shaped biface of exotic tan chert, an abrading stone, a whelk shell cup, and a modified scallop shell. Another nearby burial pit feature of likely Middle Wooodland affiliation contained human remains and two large leaf-shaped bifaces of rhyolite, four shark teeth, and a flake knife as grave goods (Taylor 1970).

Late Woodland Period (1000–450 B.P.)

In the interior, non-coastal sections of the Taunton basin, Late Woodland settlement patterns appear similar to the preceding period. Sites along the primary tributary streams such as the Canoe, Snake, Three Mile, and Rumford rivers occupied in the Archaic Period were occasionally used for temporary camps by Late Woodland hunter-gatherer groups. No large archaeological components like those on sites in or near the Titicut district (Titicut and Bassett Knoll) along the upper Taunton and Nemasket rivers are known for this area.

Late Woodland depositions have been identified in Mansfield at the Mineral Springs Park and Rumford River sites. The Rumford River Site contained a component probably dating to the Middle/Late Woodland Period boundary about 1,300 years ago. It appeared to be a temporary hunting and/or fishing camp based on the presence of a large burnt rock feature and an assemblage of Levanna points made of rhyolite (Simon 1982).

During a data recovery program at the Newcomb Street Site in Norton, a small Late Woodland component was found in an area separate from Late Archaic and Middle Woodland depositions. More than 1,625 grit-tempered ceramic sherds and 3 diagnostic Levanna points were found in what appeared to be the remains of a very small temporary camp. Charcoal from a shallow hearth feature returned a radiocarbon date of 435 ± 115 (UGa-2919) (Thorbahn 1982c). The G. B. Crane Site appears to have had a small Late Woodland component composed of two spatially distinct activity areas. A feature on the site was radiocarbon dated to 850 ± 205 B.P., and some shell-tempered ceramic sherds are probably associated with Late Woodland activity (Thorbahn et al. 1983). Subsequent investigation of this site revealed a second small Late Woodland activity area in the northern part of the site with a hearth feature radiocarbon dated to 1060 ± 60 BP (Beta 45968), a few ceramic sherds, and calcined mammal bone fragments (Goodby 1991:34). During a CRM survey for residential development in Norton, the remains of a Late Woodland site were identified along the Wading River. Most of the Sousa Farm Site (19-BR-320) was destroyed by previous development (Doucette and Glover 1989).

Near Nippenicket Pond in Raynham, the Rozenas II Site had a significant Late Woodland component with possible house floors and lithic workshop loci. The site may date to the end of the Middle Woodland Period based on a few Jack's Reef Pentagonal projectile points found during a data recovery program for the I-495 highway project. Most of the points in the tool assemblage are variations of the Levanna type, and triangular preforms for these points were found in the lithic workshops. Some of the rhyolite used for toolmaking had beach coble cortex, evidence that the groups using this site had territories extending to the coastal zone, possibly in the Plymouth area. The few ceramic sherds were from thin-walled vessels made of light brown-gray, grit-tempered ware. The Rozenas II Site was interpreted as a small hunting camp used by groups hunting and collecting other resources (cedar bark?) in Titicut Swamp (Thorbahn 1982c).

A localized core area of Late Woodland settlement in the southeast part of the Taunton basin was confirmed through recent archaeological investigations. The Riverside district is within a zone of high natural resource potential along the Nemasket River that includes anadromous fish runs, wetland plant and animal species, and soil suitable for maize horticulture. The Riverside 4 Site in Lakeville had a substantial Late Woodland component containing Levanna points of quartz and rhyolite and ceramic vessel sherds with floral and faunal remains. Some of the calcined bone fragments were identified as deer and other mammals. Floral remains such as carbonized hickory nutshell, acorns, and maize kernels could be associated with either Late Woodland or later Contact Period activity. Features within this component included storage pits and hearths. A few small fragments of copper that may have been tubular beads were found in a feature radiocarbon dated to 630 ± 50 B.P. The Riverside 11 site appears to have been used primarily for large storage pit and burial features, with one cremation deposit radiocarbon dated to 950 ± 40 B.P. (Waller 2009).

Contact and Post-Contact Periods

Contact Period (A.D. 1500–1620)

This period was characterized by complex political, social, and economic organizations just before the arrival of European settlers and the decimating diseases they brought with them. Land use, settlement, and subsistence patterns in the area during this period have primarily been derived from ethnohistoric sources and the distribution of late pre-contact sites. During the early seventeenth century, the Pokanoket, or Wampanoag, inhabited southeastern Massachusetts. Available evidence suggests there were five major centers of activity or core areas. One core close to the project area was in the Nemasket River drainage and Titicut section of the upper Taunton River in what is now Middleboro, Lakeville, and Bridgewater, Massachusetts.

Another core area was farther south in Mount Hope/Upper Narragansett bays, traditionally considered the center of Wampanoag territory. The area now in Norton and Taunton may have been in the northern part of this core, at least in the areas along the Snake, Wading, and Three Mile rivers. A primary Native American trail crossed the Norton area along the approximate alignment of Bay Street (Bay Path), near Winneconnet, Watson, and Sabbatia ponds (MHC 1981:2, 3).

By the time of European contact with Native American populations, core areas of settlement were on major river drainages where activity was dictated primarily by the seasonal availability of food and other resources. Various bands of Wampanoag people occupied the lower Taunton River drainage and estuary where there are clusters of known settlements and burials from the Contact Period. As in other areas of southern New England, native people probably divided their time between coastal fishing stations during the warmer summer months and interior campsites during the cold winter months (Snow 1980).

Plantation Period (1620–1675)

The lands constituting present-day Norton were originally part of a large tract purchased by settlers from Plymouth Colony in 1637 during the Plantation Period. This “Tetiquet Purchase” also included parts of the towns of Mansfield, Raynham, Berkley, and Taunton. The land was incorporated as the town of Taunton (Cohannet) two years later. In 1668, the area was enlarged with the Taunton North Purchase, which included present-day Easton, Mansfield, and the western part of Norton (Clark 1859).

The first European settlement in the Norton area occurred in 1669 on the eastern side of Winnecunnet Pond along present-day Bay Road. This early settlement, begun by William Witherell, consisted mainly of isolated farms located along the area's ponds, streams, and margins of cleared fields (Barber 1839; MHC 1981:3). Most of the area's early colonial homesteads were destroyed during King Philip's War in 1675–1676. Following the war, there was an upsurge in interior settlement north of the Taunton River regional core.

A skirmish or brief battle between Native Americans and English militia took place during King Philip’s War at a location in Norton historically known as Lockety Neck. In August 1676, following an attack on Taunton, a group of Native Americans took refuge at Lockety Neck. The battle occurred when they were pursued and found by English militia. The battle site is near the confluence of the Rumford and Wading rivers, about 0.5 mile southwest of the project area. (Clark 1859).

Colonial Period (1675–1775)

By 1708, the North Precinct of Taunton was formed to include Norton, Mansfield, and Easton. Three years later, this Precinct was incorporated as the township of Norton (MHC 1982a). Norton's development during the Colonial Period was similar to that of other inland towns of southeastern New England. The principal economic activity was centered on agricultural produce, and local forests provided lumber and wood products. The soil and landscape were not well suited to arable cultivation and most subsistence activities were associated with animal husbandry and pastoral land use. By the 1770s, significant amounts of cider and hay were produced, reflecting orchard and cleared pasture land use rather than intensive cultivation (Clark 1859).

Early industries in Norton focused on the processing of local grain, timber, and bog iron. As early as 1695, an iron forge had been established by the Leonard family at Chartley Brook (Clark 1859). Between 1700 and 1730, a sawmill, gristmill, combined forge and sawmill, and combined grist/sawmills were put into operation on streams and rivers within the town. By the mid-eighteenth century, Norton was recognized as an important interior sub-regional core of economic activity, relying on a strong agricultural and industrial base (MHC 1982a). Iron production from local bog ore at various forges and iron works was the primary industrial activity,

Dispersed agricultural neighborhoods characterized settlement in the Norton area throughout most of the eighteenth century, although villages such as Chartley and Barrowsville (at Chartley Pond and Barrowsville Pond) developed around industrial loci of mills and iron works. Most of these villages lacked their own civic and religious facilities. Norton Center, at the junction of present-day Routes 140 and 123, provided these services. The town’s first meetinghouse and adjoining cemetery, as well as school, post office, and hotel, were erected at this junction in proximity to the Three Mile River. One of the small villages to the northeast along Furnace Pond had successfully developed its own civic and religious facilities, as well as iron-producing mills, and was granted incorporation as the township of Easton in 1725 (MHC 1981).

Federal Period (1775–1830)

By the beginning of the Federal Period, the numerous small-scale industrial complexes had been firmly established as village clusters dotting the Norton landscape. These production centers included several mill facilities on local streams such as the Rumford and Wading rivers that produced a variety of local and exportable goods and ancillary structures and dwellings occupied by mill employees. These centers formed population clusters among the dispersed farmsteads within the town (Gallagher 1982). A village center with a meetinghouse had been established at the intersection of two primary roads running in north-south and east -west orientations that correspond to present-day Routes 140 and 123. These two roads connected Norton with the adjacent towns of Mansfield, Attleborough, Easton and Taunton (Figure 4-1).

Early Industrial Period (1830–1870)

This period marked the height of industrial development in Norton and included cotton, boot, and shoe manufacturing, as well as iron and copper production. A rolling mill likely used for copper had already been established on the lower part of the Wading River in what would later be known as the Copper Works area. Just north of the Norton/Taunton town line, an iron furnace and shingle mill were both situated on the lower part of Meadow Brook, a tributary to the Three Mile River (Figure 4-2).

Other artisans and small industries were basket makers, millers, harness makers, carpenters, merchants, painters, butchers, and blacksmiths (Clark 1859). Agricultural activities also remained viable through the mid-nineteenth century, indicating the continuance of the traditional diversity in Norton's historical land use and settlement patterns (Gallagher 1982).

The stability of Norton's industrial activities was ensured with the completion of the Taunton branch of the Boston and Providence Railroad in 1836, which established a station just east of Norton Center. The cotton mill villages, such as the Norton Cotton Mill Company and the Norton Centennial Cotton Mill Company, enjoyed a short-lived boom during this period, aided by the export of their goods via the railroad system. The pattern of village mill clusters continued in medium-density settings along the town's rural roadways. Norton Center remained the site of the town's civic, commercial, and religious facilities, although a medium-density cluster at Barrowsville to the southwest had been firmly established by the 1850s. Interspersed among these industrial/residential village clusters were large areas of wooded farmsteads separated by the extensive network of wetlands, rivers and ponds (MHC 1981).

Late Industrial Period (1870–1915)

With the decline of the area's cotton industry during the Late Industrial Period, Norton relied on its older, local market system. The processing of local timber and grain in the mill complexes built before 1850 re-emerged as the town's largest industries. Timber was processed into lumber used locally and also exported to support the construction of structures and ships in southeastern Massachusetts.

In the early 1870s, several small concentrations of settlement continued to develop outside the town center. Barrowsville was located along the Wading River in the western part of Norton. Downstream from Barrowsville, the Copper Works village consisted of the Crocker Brothers Company and houses along both sides of the present Taunton Avenue (Route 140). Another cluster of houses was along the Bay Road at Winneconnet Village, just north of the pond with that same name (Figure 4-3).

The copper works on the Wading River in the southern part of the town remained active and a small hamlet with a cluster of houses and a store surrounded it. By 1895, this metal working industry was owned by the Taunton Copper Company. Norton Furnace, a small industrial node first established in the early nineteenth century on Meadow Brook north of the Norton/Taunton town line also remained active in the 1890s.

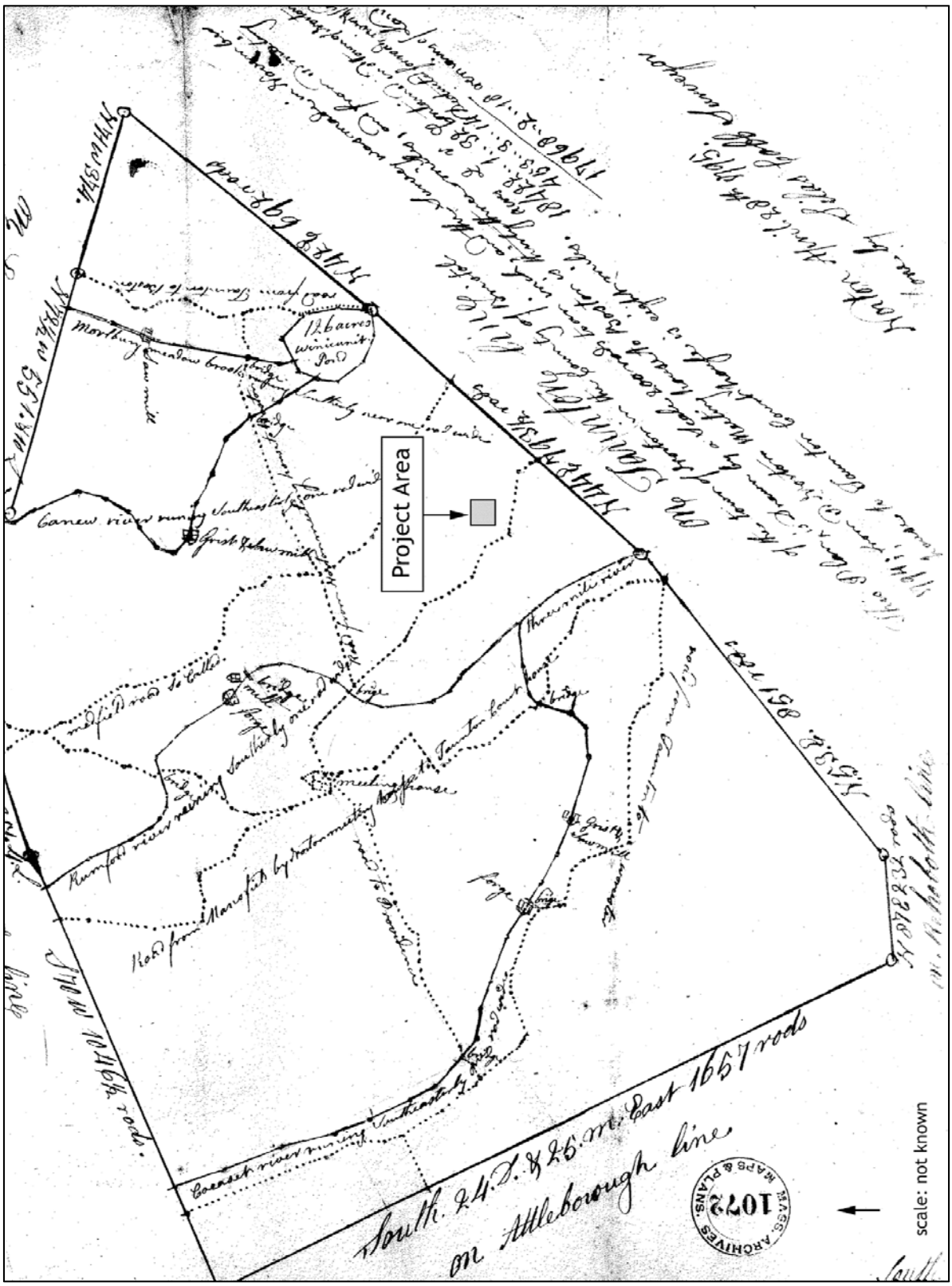

Figure 4-1. 1795 map of Norton showing the approximate location of the Water Pollution Control Facility project area (source: Cobb 1795).

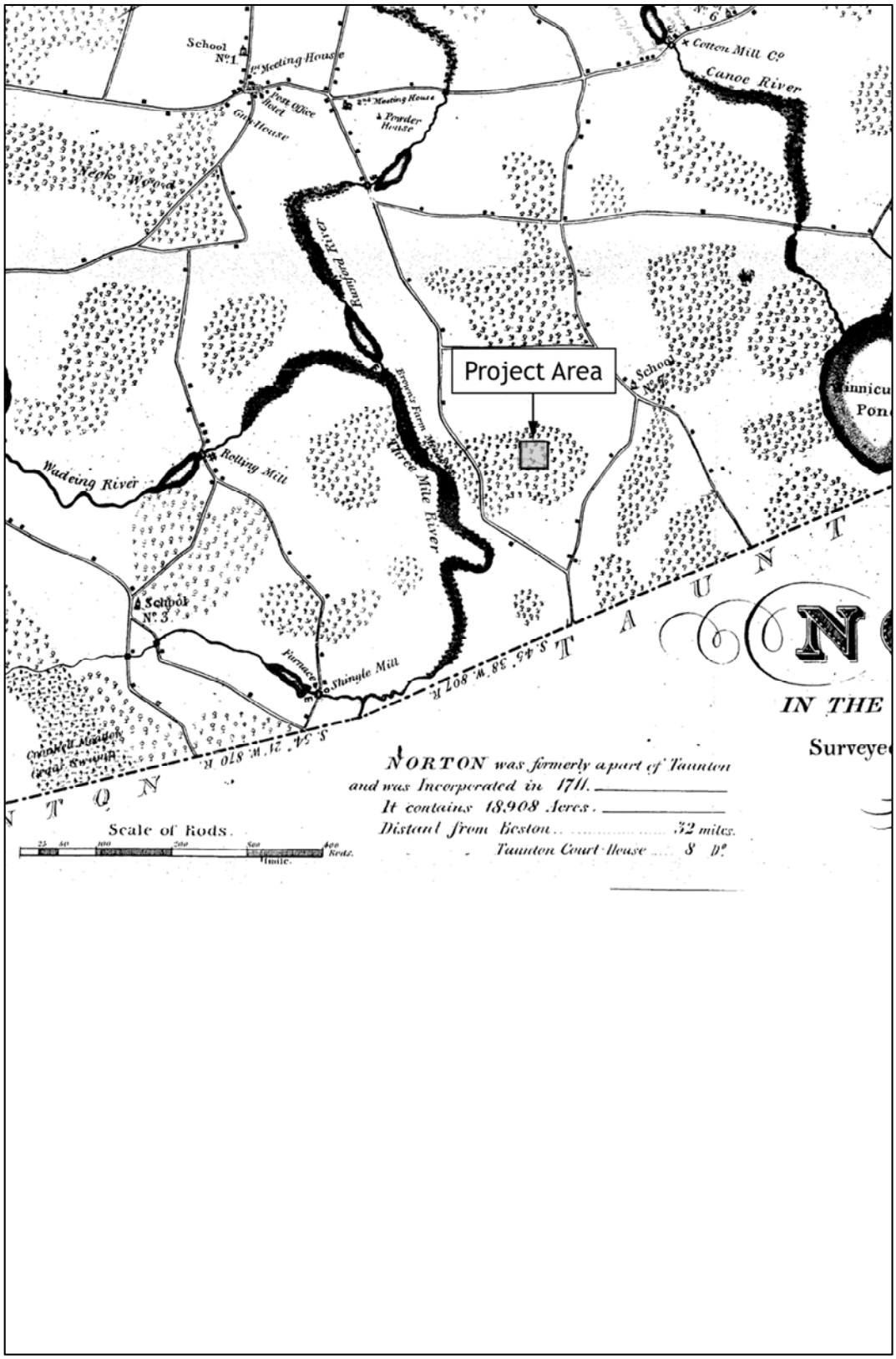

Figure 4-2. 1830 map of Norton showing the approximate location of the Water Pollution Control Facility project area (source: Leonard and Lincoln 1830).

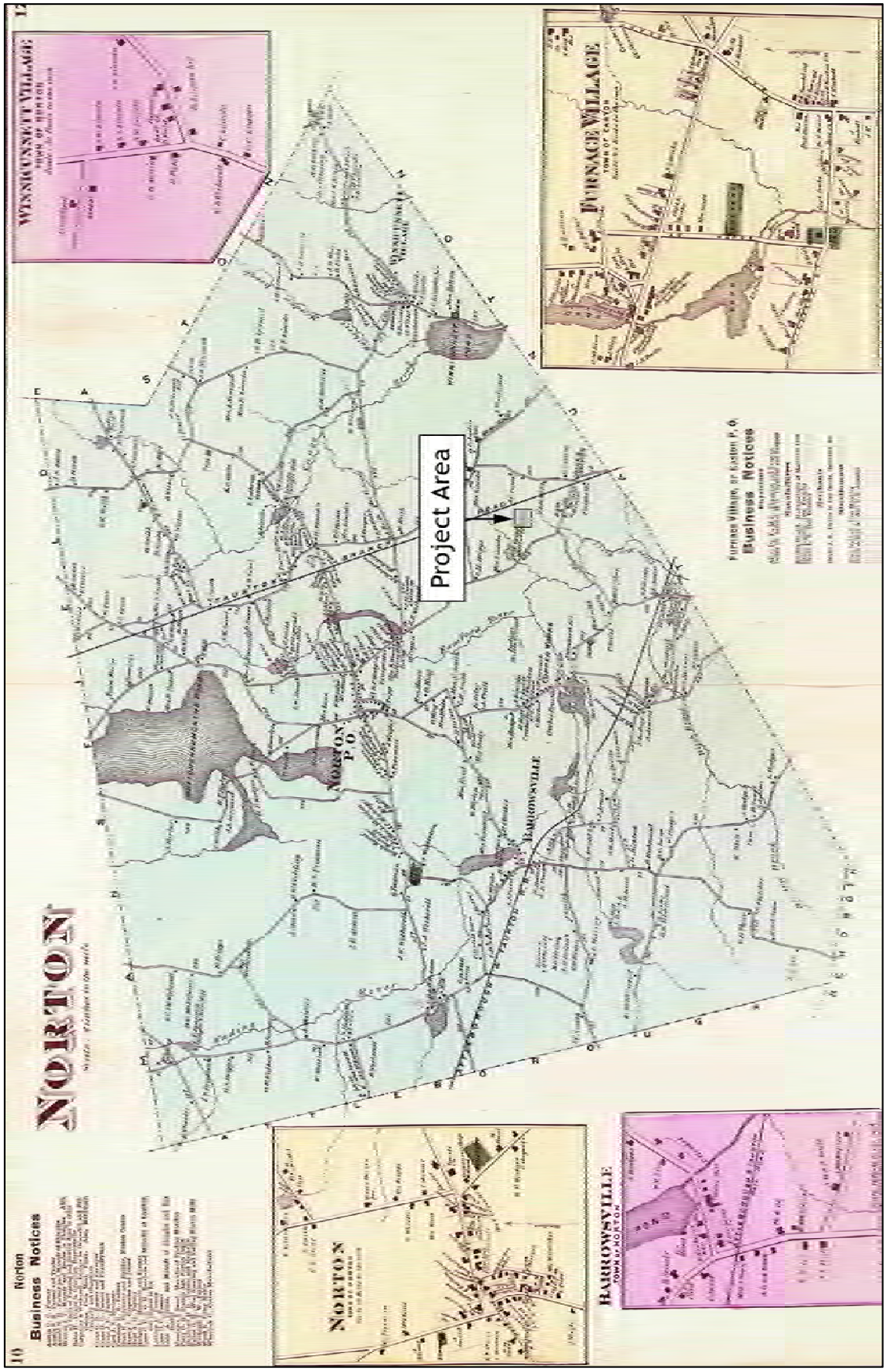

Figure 4-3. 1871 map of Norton showing the approximate location of the Water Pollution Control Facility project area (source: Beers 1871).

To the east of the WPCF project area, where Crane Street crossed the New York, New Haven and Hartford Old Colony System railroad, there was a small village known as Crane's, which consisted of a rail station and freight house, residences, and two small cemeteries. The general vicinity of the project area along Hill and Pine streets contained a few widely dispersed residences or farmsteads (Figure 4- 4). In the 1890s, a local street railway system constructed through Norton provided access to the local industrial core area in Mansfield and to the nearest urban center in Taunton. By this time, a popular recreational/resort community for regional city dwellers had begun to develop along the Norton Reservoir at Norton Grove (MHC 1981).

Modern Period (1915–Present)

The agricultural base for the local economy remained largely intact into the Modern Period, before pressure for increased suburban development related to expansion outside the urban centers of Providence and Boston. Since the 1960s, family farms have given way to residential single- and multi-family developments to accommodate the influx of new residents in Norton. Suburbanization increased significantly following the construction of Interstate Route 495 through the eastern part of the town in the late 1970s. This highway, along with Routes 123 and 140, has made Norton an accessible community for people employed in Providence and Boston. Commercial development expanded along these roadways, as well as within and adjacent to the nineteenth-century village cluster areas.

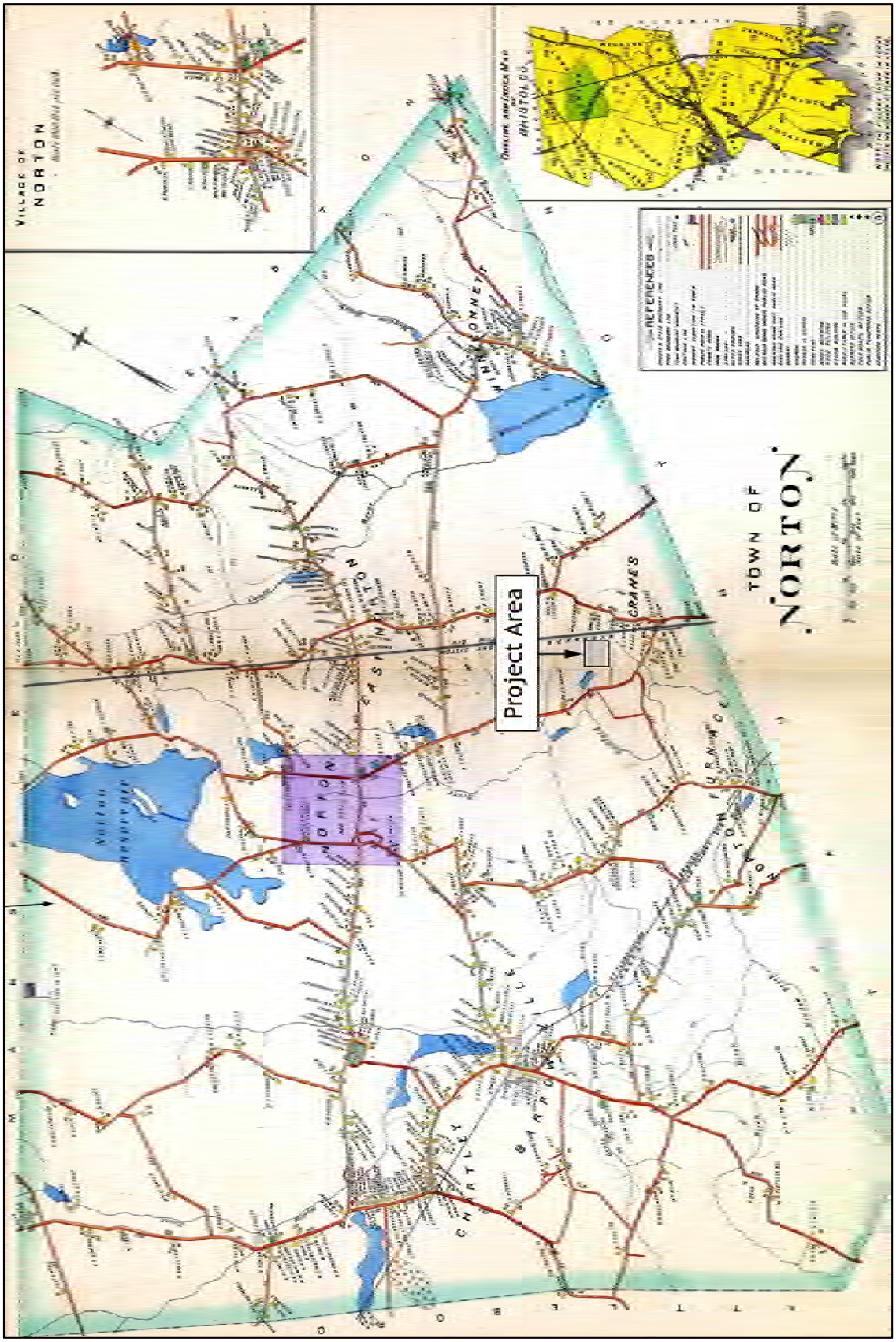

Figure 4-4. 1895 map of Norton showing the approximate location of the Water Pollution Control Facility project area (source: Everts and Richards 1895).

CHAPTER FIVE

RESULTS AND RECOMMENDATIONS

Archival Research

The sensitivity of the Water Pollution Control Facility (WPCF) project area for pre-contact Native American archaeological resources is defined primarily by its location near a network of wetlands and tributary streams within the Wading/Three Mile River drainage. The project area is also in the vicinity of the combined Canoe/Snake River drainage and Winneconnet Pond, another zone of intensive Native American settlement and resource collection activity.

Previous cultural resource management (CRM) investigations and other studies have identified a cluster of pre-contact Native American archaeological sites in the general vicinity of the project area. A CRM survey conducted before construction of the MFN Regional Wastewater District identified two pre-contact sites: the White Crow (19-BR-213) and G. B. Crane (19-BR-214) sites near the Three Mile River (Leveillee 1980; Leveillee and Goldsmith 1979). Subsequent site examinations at both sites and a data recovery program at the G. B. Crane Site (Goodby 1993; Leveillee 1980, 1981; Thorbahn et al. 1983) indicated the Three Mile River corridor was intensively utilized from the Middle Archaic to Late Woodland periods, with small temporary encampments to larger base camps.

Recorded pre-contact Native American sites within a 0.5-mile radius of the project area include the White Crow Site (19-BR-213), listed in the National Register of Historic Places (National Register). The G. B. Crane Site (19-BR-214), adjacent to the proposed Pine Street infiltration basin effluent disposal site, was an extensive multicomponent site used by Native American groups over 6,000 years from the Middle Archaic to Middle Woodland periods. Site 19-BR-51 is about 1 mile east of the project area near the intersection of Bassett and Crane streets. Other sites in the vicinity around Winneconnet Pond are the Winneconnet (19-BR-42), Faulkner Spring (19-BR-43), East Norton (19-BR-49), and unnamed 19-BR-46, 19-BR-47, 19-BR-48, and 19-BR-50 sites that were used throughout the Archaic and Woodland periods (Table 5-1).

A recent PAL survey (Mair 2014) identified a group of six pre-contact sites along the Canoe River upstream from Winneconnet Pond, demonstrating the intensity of Native American settlement and land use in this area. The Canoe River WTP Find Spots 1, 2, and 3, and the Canoe River WTP Sand Bed, Canoe River WTP, and King Philip Road sites yielded ceramic sherds, projectile points, bifacial tool blades and chipping debris representing episodes of resource processing or cooking, stone tool manufacture and/or maintenance from the Middle Archaic to Middle Woodland periods.

A review of data from other archaeological investigations showed that undisturbed portions of the WPCF project area could contain pre-contact Native American cultural materials associated with undocumented sites. These sites could range from find spots of isolated chipped-stone tools (projectile points, bifacial tool blades, etc) or pieces of chipping debris to small (approximately 50–300 square meters [sq m)]) and moderate-sized (approximately 400–750 sq m) deposits of cultural material (stone tools, chipping debris, and burnt rock fragments) in activity areas with features (hearth/fire pit, refuse pit, lithic workshops, etc.). Any pre-contact sites identified in the project area could be affiliated with temporal divisions from the Early (10,000–7500 B.P.), Middle (7500–5000 B.P.) and Late Archaic (5000–3000 B.P.) periods to the Late Woodland (1000–450 B.P.) Period.

Table 5-1. Pre-Contact Native American Archaeological Sites within One Mile of the Water Pollution Control Facility Project Area (Source: MACRIS 2014).

Site Name	Site #	Site Type(s)	Time Period(s)
Plain Street Site	19-BR-39	Unknown	Unknown
Canoe River West Site	19-BR-40	Large multicomponent site	Middle Archaic, Late Archaic, Transitional Archaic
Winneconnet Site	19-BR-42	Habitation site	Unknown
Faulkner Spring Site	19-BR-43	Large multicomponent site	Middle (?) Archaic, Late to Transitional Archaic
Unnamed Site	19-BR-46	Unknown	Archaic, Woodland (?)
Unnamed Site	19-BR-47	Unknown	Archaic, Woodland (?)
Unnamed Site	19-BR-48	Campsite	Contact and Colonial Period Historical Mention
East Norton Site	19-BR-49	Habitation Site	Unknown
Unnamed Site	19-BR-50	Unknown	Unknown
Unnamed Site	19-BR-51	Unknown	Unknown
Bay Street II Site	19-BR-185	Moderate-sized, multicomponent site	Late Archaic to Early Woodland
Ivy Site	19-BR-195	Small encampment	Middle Archaic, Late Archaic
White Crow Site	19-BR-213	Small encampment	Middle Woodland (?)
G. B. Crane Site	19-BR-214	Large multicomponent site	Middle Archaic, Late Archaic, Transitional Archaic, Early Woodland, Middle Woodland, Late Woodland
Myles Standish Find Spot 2 Site	19-BR-680	Small activity locus (quartz chipping debris)	Unknown
Myles Standish-Watson Pond Site	19-BR-681	Find spot of two small stemmed projectile points	Late Archaic (?)

Post-Contact Period

Some evidence for Native American settlement in the Contact Period (A.D. 1500–1620) and the rest of the seventeenth century was found at a rockshelter (King Phillips Cave) and other sites in the Winneconnet Pond area (MHC 1981:3). The location of a documented King Philip's War (1675–1676) battle or skirmish at Lockety Neck is about 0.5 mile southwest of the project area at the confluence of the Wading and Rumford rivers.

The sensitivity of the WPCF project area for post-contact Euro-American archaeological resources was defined by its proximity to a local network of roads formed by Pine, Crane, and Hill streets. Zones of settlement developed along these roads as land and water sources were developed for various uses. The Crane Farm agricultural landscape (NRT.J), directly south of the WPCF project area on Crane Street, is a cultural resource in the MHC inventory considered eligible for listing in the National Register. The WPCF project area includes land that was formerly used as agricultural fields for the Crane Farm in the eighteenth and nineteenth centuries.

Historical maps of Norton from the late eighteenth and nineteenth centuries show the vicinity of the project area as undeveloped open land that was most likely used as woodlots, agricultural fields, and pasture for surrounding farms (Cobb 1795). Wetlands in and adjacent to the project area appear to have been impounded to form small ponds. One pond west of the project area along the north side of Pine Street was used as a source of waterpower for a wheelwright shop in the last quarter of the nineteenth century. Some minor residential and transportation-related development (Crane's Station and freight house) occurred after the mid-nineteenth century along the railroad line (Taunton Branch) bounding the project area to the northeast (Beers 1871).

Any Post-Contact and Modern Period cultural resources within the WPCF project area were expected to reflect past agricultural activities on nearby residences and farmsteads along Pine, Crane, and Hill streets. Evidence of these activities was likely to include stone walls, cart paths, and low-density deposits of household refuse (brick, nails, ceramics, bottle glass, animal bone, etc.) in former pastures or farmland. There was also some potential for evidence of landscape modifications (grading, filling, refuse disposal, etc.) and structural features (foundations and walls) from late nineteenth-century to Modern Period residential development.

Walkover Survey and Surface Inspection

A walkover survey and surface inspection confirmed that most of the WPCF project area is wooded and in good condition. A majority of the project area was considered to have high sensitivity for pre-contact and post-contact archaeological resources. A small, localized zone of high archaeological sensitivity for post-contact resources was identified in the northwest corner of the project area, where a small stream runs through wooded wetlands. An earth fill dam with fieldstone facing and associated borrow pit were found on this stream at the base of a steep slope. Zones of low archaeological sensitivity in the project area were primarily natural features such as steep slopes on the east, north, and west of the proposed infiltration basin sites, and poorly drained wooded wetlands at the base of these slopes (Figure 5-1).

Although existing monitoring wells are located throughout the proposed project area, only one location had evidence of significant previous alteration or disturbance. A soil boring placed within the location of an infiltration basin in the northeast portion of the project area was surrounded by an irregularly shaped zone of disturbed soils and extended for approximately 25 m in an east–west direction and for 20 m in a north–south direction (see Figure 5-1). A pad of crushed rock or ballast was next to the boring location surrounded by exposed A and B (subsoil) horizon soils that contained no pre-contact or post-contact cultural materials.

Subsurface Testing

Subsurface testing of archaeologically sensitive portions of the project area was done with a total of 95, 50-x-50-cm test pits placed within 3, 30-x-30-m sampling block, on 4 judgmentally placed transects and in 7 close interval (2.5-m) array patterns. Seven judgmentally placed test pits (JTP-01 to JTP-07) were placed to sample specific archaeologically sensitive locations (Figure 5-2).

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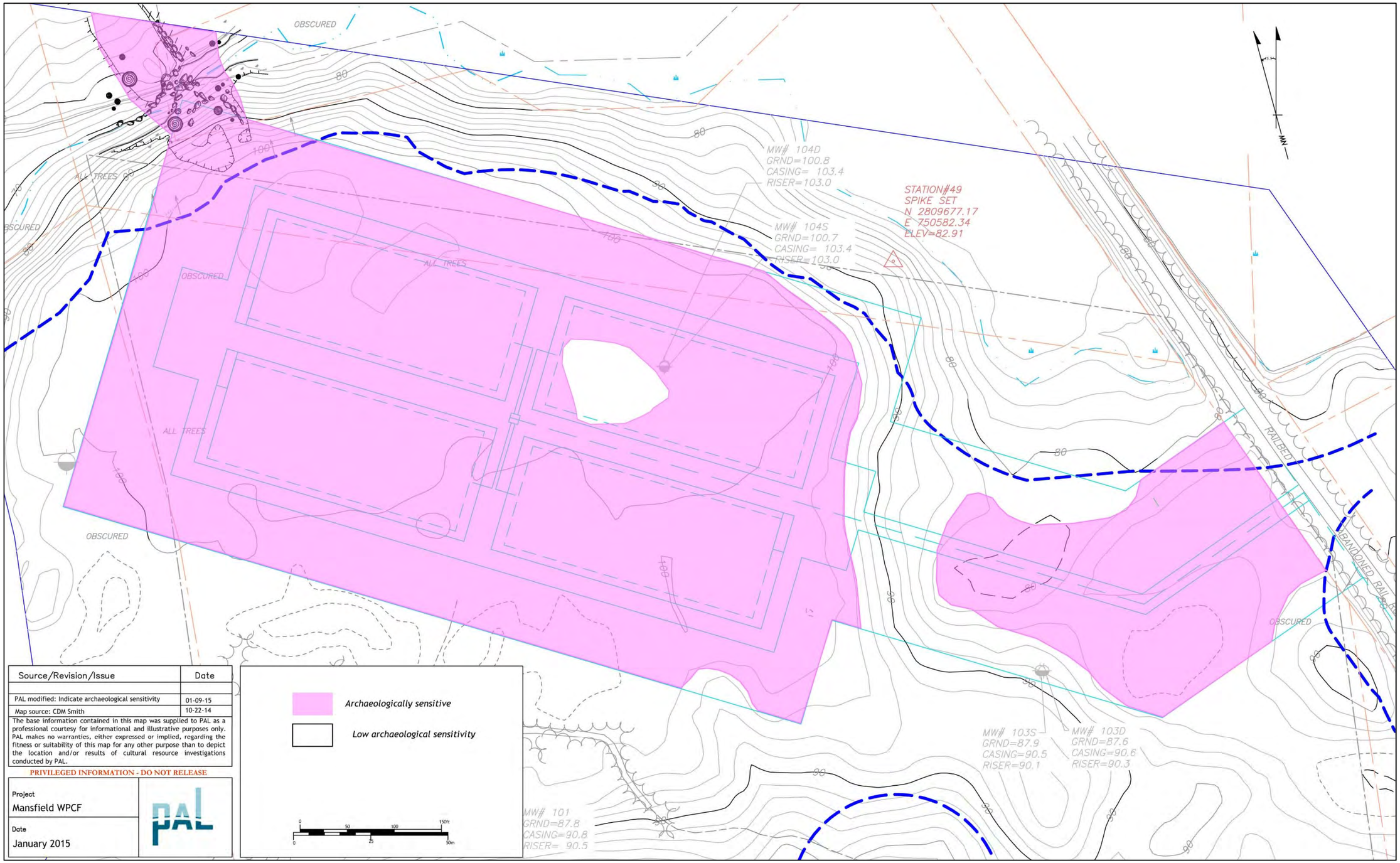

Figure 5-1. Plan of the Water Pollution Control Facility project area with zones of archaeological sensitivity.

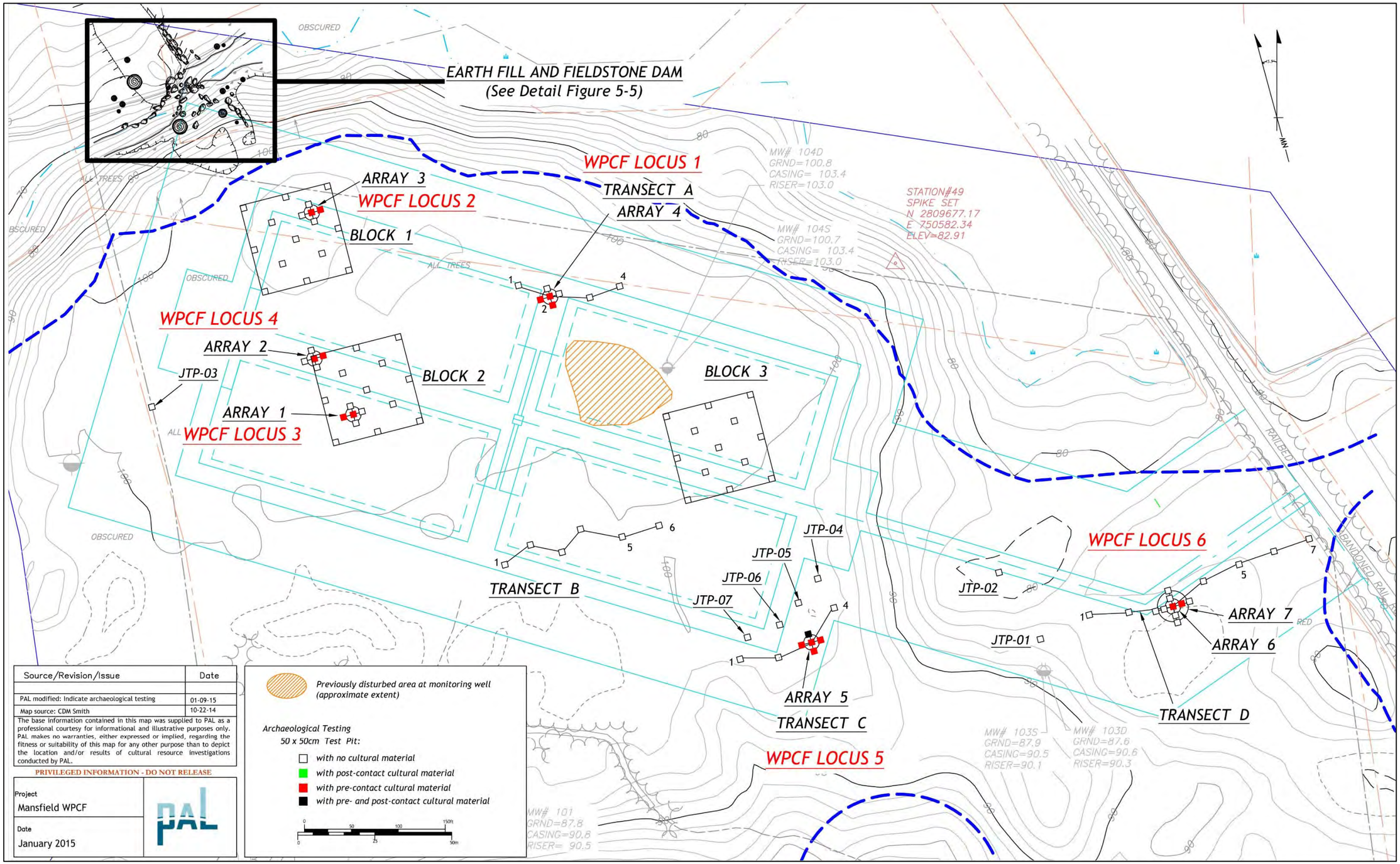

Figure 5-2. Location of subsurface testing within the Water Pollution Control Facility project area.

The three sampling blocks (Blocks 01, 02, and 03) were used to investigate the level upper surface of the knoll containing the proposed location of the infiltration basin and a surrounding buffer zone. Transect A was placed along the northern edge of this knoll overlooking a wooded wetland and stream environmental setting and four test pits were used to sample an area between Block 01 and Block 03. Six test pits were placed along Transect B on the southern edge of the project area within a proposed infiltration basin.

A slightly projecting terrace on the southeast corner of the project area is bounded by slopes to the east and south. Wooded wetlands are outside the project area about 60 m south of the terrace, which was investigated along Transect C with four test pits placed across the southeast corner of a proposed infiltration basin and an adjacent buffer zone. The archaeologically sensitive section of the proposed access road and sewer force main route extending west from the abandoned railroad (Conrail) easement was investigated with Transect D using seven tests pits placed on the crest of a low knoll.

The array patterns were placed around isolated find spots of pre-contact cultural material found in test pits on transects or in 30-x-30-m sampling blocks. Arrays 01, 02, and 03 were placed around test pits in Block 01 (BK01-CNE) and Block 02 (BK02-CSW, BK02-NW). Arrays 04 and 05 were used to investigate find spots in test pits along Transects A and C. Arrays 06 and 07 were placed at intervals of 2.5 m and 5 m around a find spot in a test pit along Transect D.

Two judgmental test pits (JTP-01 and JTP-02) were used to investigate a location within the proposed access road and force main route. These JTPs were placed within a shallow, sheltered swale with some potential to contain a small pre-contact archaeological site. A terrace in the southwestern corner of the project area overlooking a wooded wetland and stream environmental setting was investigated with JTP-03. The four other judgmental test pits were used to delineate the extent of a find spot of pre-contact cultural materials (WPCF Locus 5) found in the southeast corner of the proposed infiltration basin site. JTPs -04, -05, -06 and -07 were placed 5 m northwest of test pit TC-03 and Array 06 (see Figure 5-2).

The soil profiles exposed in test pits within the project area were generally similar with little variation in soil texture and color. Under a thin forest duff layer (A_o) less than 5 cm thick was a leached podzol (A_e) zone of very dark, gray brown (10YR 3/2) silty sand to about 10 cmbs. The A_1 horizon was a shallow, dark brown (10YR 3/3) silty sand that reached a maximum depth of about 20 cmbs. This A_1 horizon may have been created by plowing and agricultural land use in the past, but was thinner than a typical plowzone. The B_1 subsoil horizon was a dark yellow brown (10YR 4/6) silty, medium sand usually found from about 20 to 35 centimeters below surface (cmbs). The underlying B_2 subsoil horizon was a yellow brown (10YR 5/6, 6/6) silty medium sand from about 35 to 55 cmbs. Below this to a depth of more than 70 cmbs was a C subsoil horizon of light olive brown (2.5Y 5/3), medium to coarse sand with varying amounts of gravel (Figures 5-3a and 5-3b).

Identified Cultural Resources

Pre-Contact Period Archaeological Sites

Six small find spots or loci (designated WPCF Loci 1–6) of pre-contact cultural material were found within the proposed location of the four infiltration basins, the access road and force main route, and surrounding buffer zone.

WPCF Locus 1

This locus was found near the northern edge of the project area about 15 m from a steep slope overlooking wooded wetlands and a small stream. It was identified from a single flake of dark gray rhyolite found in test pit TA-03 at a depth of 10–20 cmbs in the A_1 soil horizon. Close interval subsurface testing around

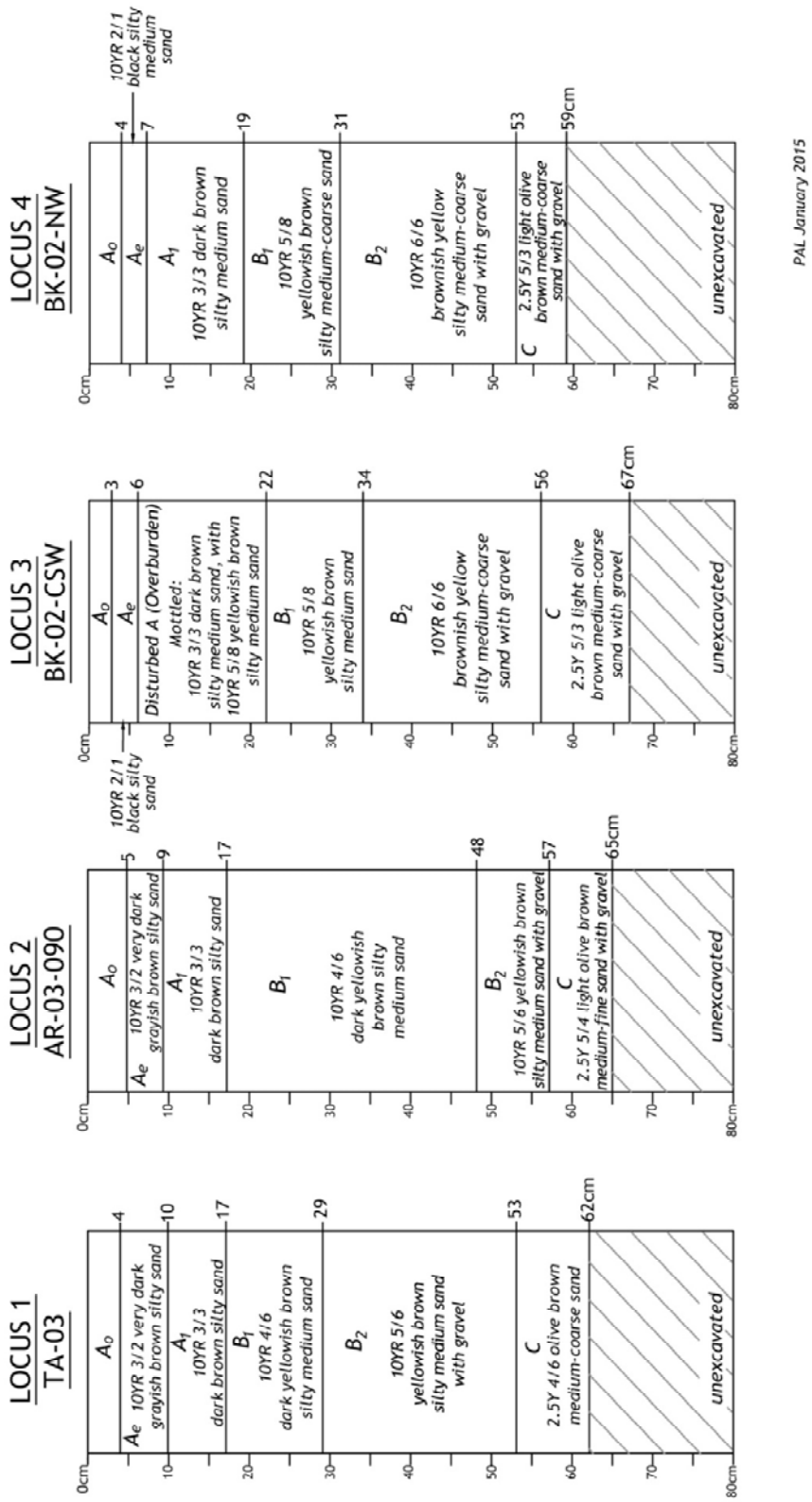

Figure 5-3a. Representative soil profiles from test pits excavated within the Water Pollution Control Facility project area.

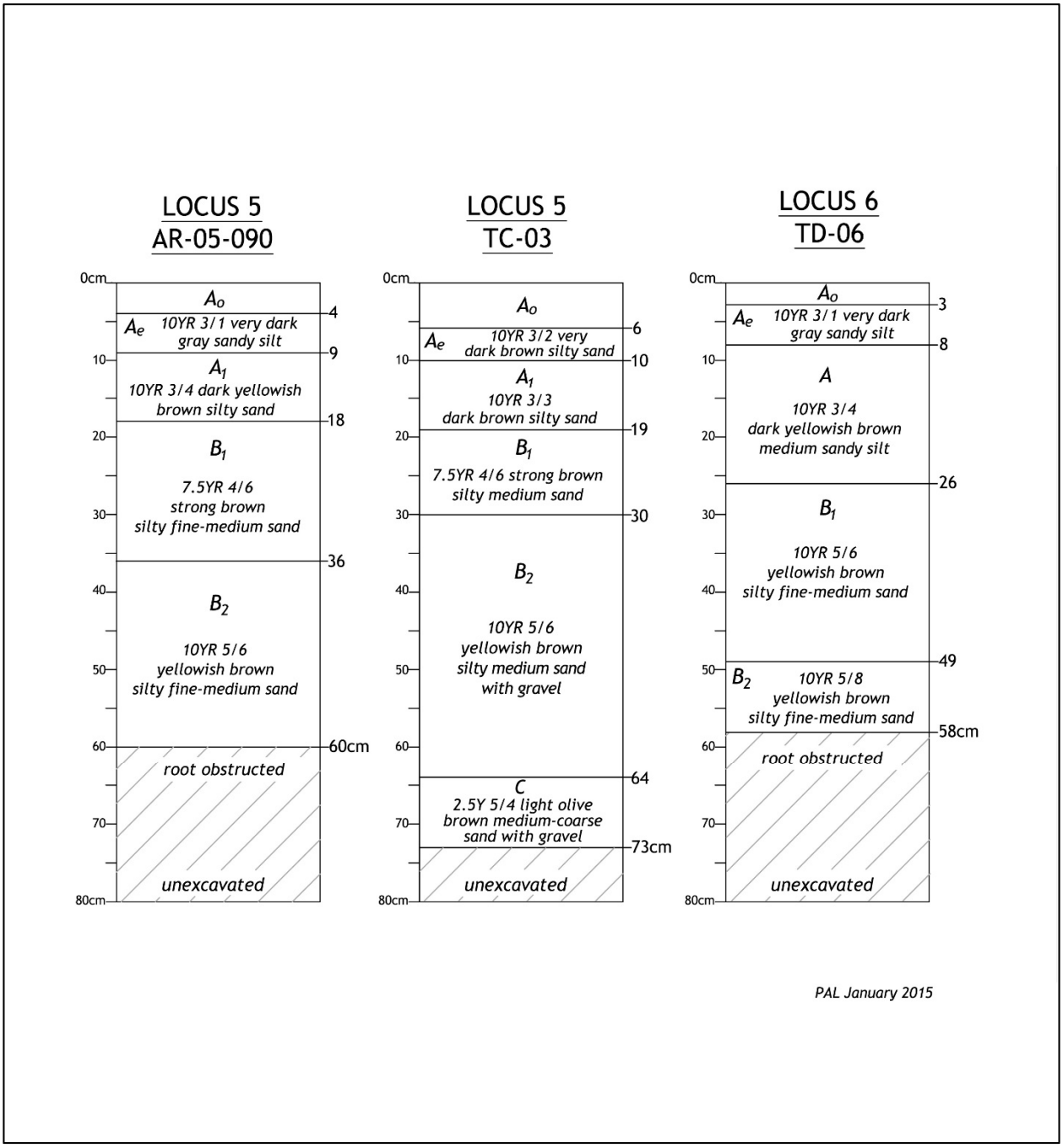

Figure 5-3b. Representative soil profiles from test pits excavated within the Water Pollution Control Facility project area.

TA-03 was done with Array 04. Two test pits (AR04-180 and AR04-270) yielded single flakes of the same dark gray rhyolite from the A_1 (10–20 cmbs) and B_1 (20–30 cmbs) subsoil horizons (see Figures 5-2, 5-3a). All the rhyolite is likely derived from the Blue Hills source area based on color and other characteristics (Appendix A).

WPCF Locus 2

This locus of pre-contact cultural material was found in the northwest corner of the project area about 10 m from the top of the steep slope bordering wooded wetlands and a stream. WPCF Locus 2 was identified from a single, small flake of gray/tan argillite found in a test pit (BK01-CNE) within Block 01. Close interval testing with an array pattern (Array 03) yielded an additional piece of argillite chipping debris in test pit AR03-90. Both of the argillite flakes in this locus were found within the B_1 subsoil horizon at a depth of 20–30 cmbs (see Figures 5-2, 5-3a, and Appendix A).

WPCF Locus 3

WPCF Locus 3 was identified from two pieces of tan rhyolite chipping debris found in test pit BK02-CSW in the southwest corner of Block 02, which was placed across the proposed locations of two infiltration basins in the western end of the project area. Both pieces of chipping debris were in a disturbed A horizon at 10–20 cmbs. Additional close interval testing with Array 01 yielded three additional small pieces of gray to tan rhyolite in test pit AR01-270 at 10–20 cmbs in the A_1 horizon and at 20–30 cmbs in the underlying B_1 subsoil horizon. The other test pits in Array 01 were sterile (see Figures 5-2, 5-3a, and Appendix A).

WPCF Locus 4

This small locus or find spot of pre-contact cultural material was in the northwest corner of Block 02 about 25 m north of WPCF Locus 3. A small flake of translucent, light gray chalcedony was found in test pit BK02-NW at 0–10 cmbs in the A_1 horizon. Additional testing with Array 02) yielded a flake of quartz in test pit AR02-90 at 30–40 cmbs in the B_2 subsoil horizon (see Figures 5-2, 5-3a, and Appendix A).

WPCF Locus 5

This locus was identified from a small concentration of cultural material in a test pit along Transect C in the southeast corner of the project area (see Figure 5-2). Test pit TC-03 yielded one piece of gray/tan argillite, seven pieces of Attleboro red felsite chipping debris, four pieces of calcined mammal bone, and two pieces of burned rock in the A_1 horizon and B_1 subsoil horizon at 10–20 cmbs. The B_1 subsoil horizon from 19 to 30 cmbs appeared to be slightly oxidized, was strong brown (7.5YR 4/6), and contained charcoal fragments. However, no distinct feature could be identified in this test pit (see Figure 5-3b).

Close interval testing around test pit TC-03 was done with Array 05; all four test pits yielded additional pre-contact cultural materials. Six fragments of burned rock and a piece of gray rhyolite chipping debris were in the A horizon (10–20 cmbs) in test pit AR05-90. Another three fragments of burned rock and a flake of gray argillite were found in test pit AR05-180 at 0–10 cmbs in a podzol (A_e) and at 10–20 cmbs in the A_1 horizon. Test pit AR05-270 yielded three pieces of gray rhyolite and eight fragments of burned rock from the podzol (A_e) (0–10 cmbs); A_1 horizon (10–20 cmbs); and B_1 subsoil horizon (20–30 cmbs).

Within test pit AR05-360, two pieces of Attleboro red felsite, one piece of gray rhyolite chipping debris and eight burned rock fragments were recovered from the A_1 horizon (10–20 cmbs) and B_1 subsoil horizon (20–30 cmbs). A small fragment of clear glass was found in test pit AR05-360 at 10–20 cmbs in the A_1 horizon (see Figure 5-2 and Appendix A).

Additional subsurface testing done to delineate the extent of this locus consisted of four judgmental test pits (JTP-04, -05, -06, and -07) placed 5 m northwest of Transect C and Array 05 in the southeast corner of a proposed infiltration basin and an adjacent buffer zone. The JTPs were sterile, confirming that WPCF Locus 5 is confined to a small area (approximately 25 sq m) within the buffer zone and does not extend into the proposed location of an infiltration basin in the southeast corner of the project area. (see Figure 5-2).

WPCF Locus 6

This locus was identified from a unifacial tool in test pit TD-06 at 40–50 cmbs within the B_1 subsoil horizon (see Figure 5-3b; Appendix A) along the centerline of a proposed access road and sewer force main route entering the project area from the abandoned railroad (Conrail) easement (see Figure 5-2). WPCF Locus 6 is on the western end of a slight knoll bounded on the north and northwest by a swale and to the west and south by gradual slopes.

This unifacial tool was made from a 5.0-cm-long and 3.5-cm-wide pebble of deeply weathered, light tan/gray rhyolite with a natural split or fracture plane forming a flat surface on one side. This pebble was most likely from local glacial outwash sand/gravel deposits that formed the subsoils in the general vicinity of the project area. The straight edge formed by the juncture of the outside or cortex of this pebble and the flat fracture plane was modified by a series of small flake removals. These flake scars could have been created by use of the pebble tool as a scraper on hard material such as wood or bone or intentional retouch and sharpening (Figure 5-4).

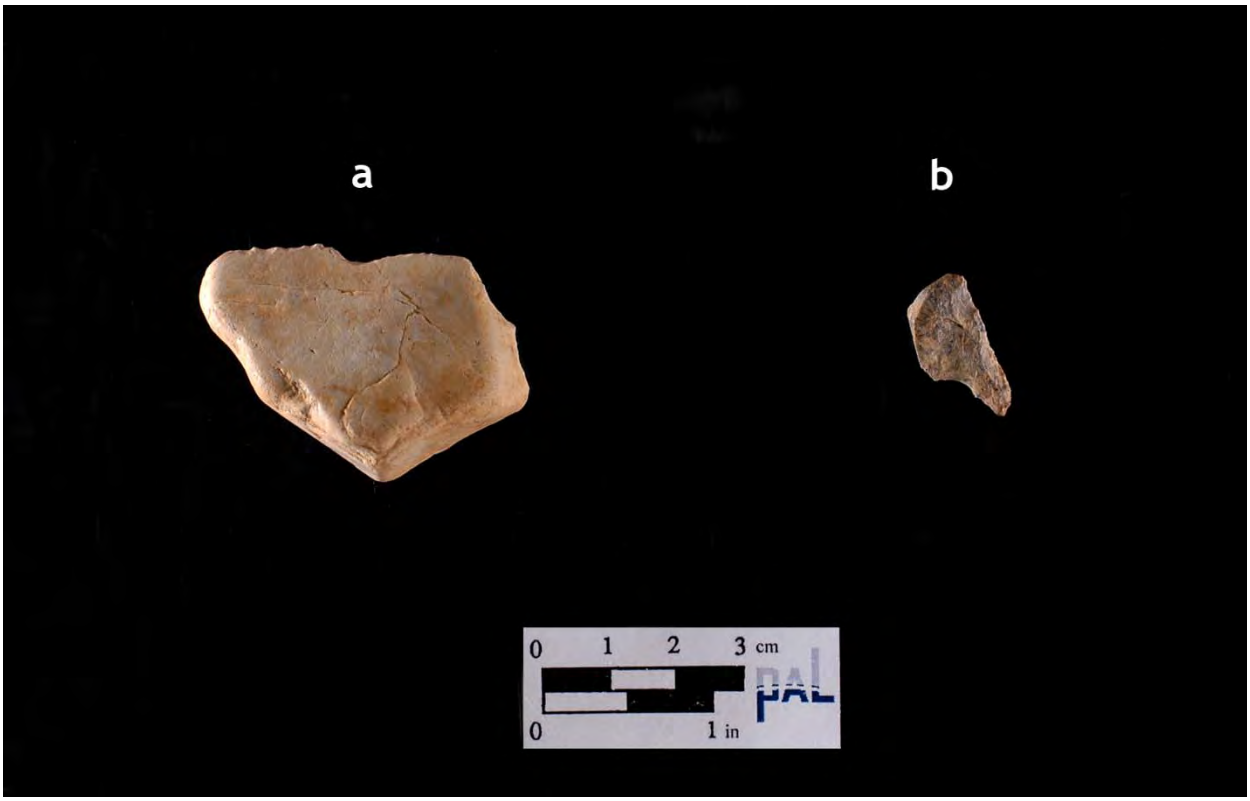

Figure 5-4. Chipped-stone tools from WPCF Locus 6: a) Rhyolite pebble with unifacial retouch (test pit TD-06; 40–50 cmbs) and b) projectile point fragment of gray rhyolite (test pit A06-90; 10–20 cmbs).

Close interval subsurface testing around this find spot yielded another chipped-stone tool—a small shoulder barb fragment of a projectileF point made of dark gray rhyolite in test pit AR06-90 at 10–20 cmbs in the A_1 horizon. This point fragment was 2.2 cm long, 1.1 cm wide, and 0.45 cm thick. Its narrow outline, sharply pointed termination, and remnant shoulder to stem angle are similar to those found on Early Archaic bifurcate-base projectile points (see Figure 5-4). Test pit AR06-270 yielded a 0–1 cm flake of white quartz at a depth of 10–20 cmbs in the A_1 horizon (see Appendix A).

Additional close interval subsurface testing to delineate the extent of WPCF Locus 6 used an array pattern (Array 07) with test pits placed at a 5-m interval from the original find spot of the rhyolite pebble unifacial tool in test pit TD-06. The test pits in Array 07 were also located at a 2.5-m interval from those in Array 06. Arrays 06 and 07 formed two concentric rings of test pits around the original find spot. None of the test pits in Array 07 yielded any cultural materials.

Post-Contact Period Archaeological Site

One post-contact archaeological resource was identified within the WPCF project area. Although not within the Area of Potential Effects for direct effects (APE-DE), it was found within the larger parcel of land controlled by the Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD).

Dam Structure and Borrow Pit

During the walkover survey and surface inspection, a small earth fill dam with fieldstone rubble was found along the small stream at the base of steep slopes in the northwest corner of the project area. On the southeast embankment of the stream is a short section of the dam about 7 m in long and about 4.5 m wide. A borrow pit about 4.5 m long on a north/south axis and 6 m wide from east to west is at the base of a steep slope on the south side of the stream and had been excavated to provide fill material for construction of the dam. A section of the dam on the northwest side of the stream is about 20 m long and 6 m in maximum width extends outside the property to an unpaved roadway or cart path.

Pieces of exposed fieldstone on the surface of the upstream and downstream sides of the dam appear to be remnants of a protective facing. The more intact facing on the upstream side of the dam is two to three courses in height above the wetland surface. The stream currently flows through an opening about 2 m wide, and fieldstone rubble in the stream bed may be the remains of masonry that originally supported a gate or water control structure (Figure 5-5). Access to this dam was by the unpaved wood road or cart path noted outside the boundary of the property area on the north/northwest side of wetlands.

The dam does not appear large enough to have supported a mill structure, and there was no evidence of a foundation or footing that could have supported an aboveground, wood frame mill building. It was probably built in the mid-nineteenth century to impound and store water for a small mill site (the Briggs Wheelwright Shop) downstream near Pine Street shown on a late nineteenth-century map of Norton (Beers 1871) (see Figure 4-3).

Summary and Management Recommendations

Five (WPCF Loci 1–5) of the six pre-contact archaeological resources identified in the intensive survey of the proposed WPCF project area yielded pieces of non-diagnostic chipping debris or burned rock and cannot be placed within any specific temporal period or cultural context. The small, low-density assemblages of chipping debris were created by episodes of chipped-stone tool manufacture or maintenance by Native American individuals or small groups while carrying out subsistence-related activities such as

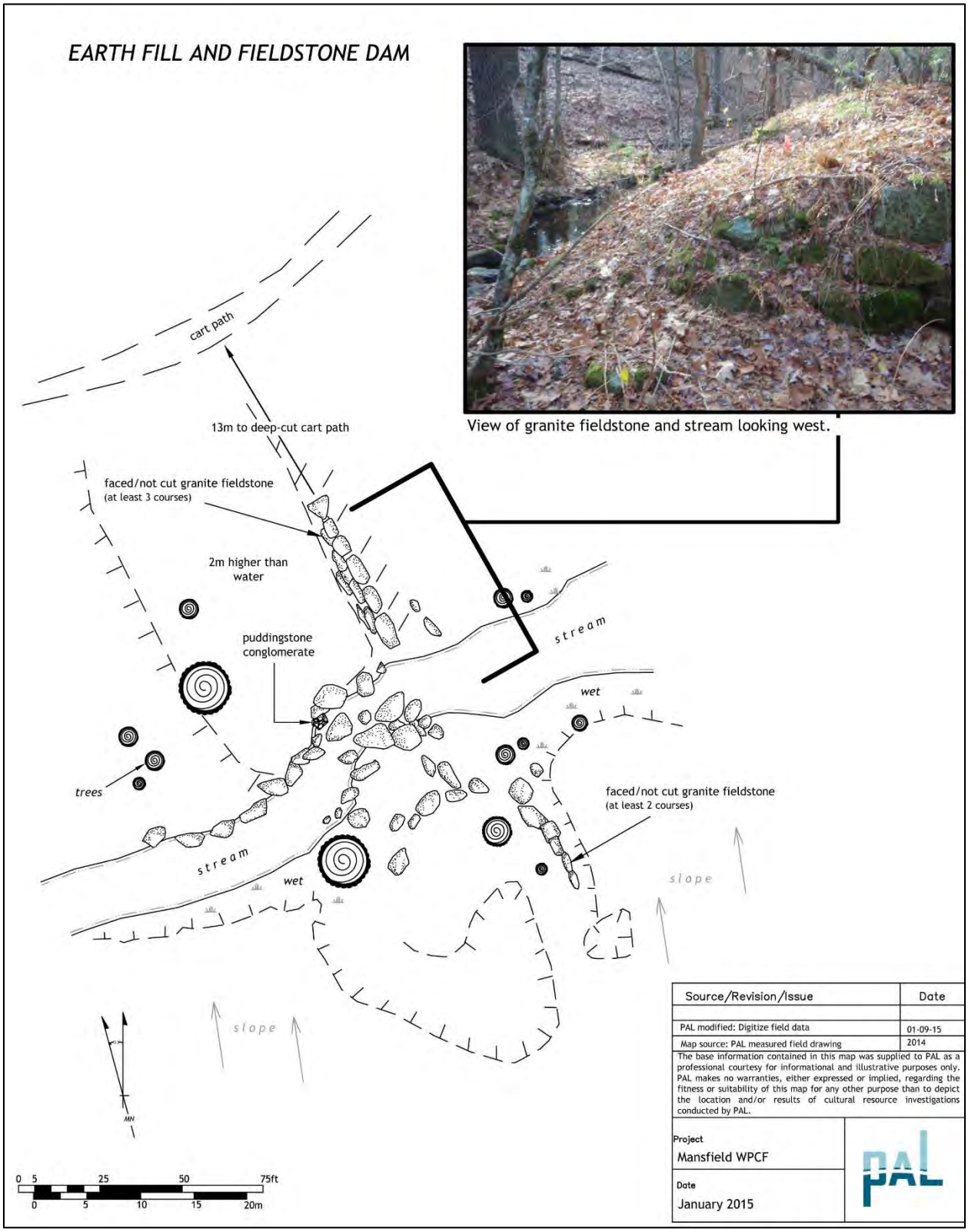

Figure 5-5. Scaled plan and photograph of earth fill and fieldstone dam in northwest corner of the Water Pollution Control facility project area.

hunting, trapping, or collecting plant materials. Although the five loci contribute to current knowledge of pre-contact Native American settlement and resource use in the Three Mile River and upper Taunton drainage basins, they are not considered potentially significant resources due to their low information content and lack of temporal/cultural affiliation.

WPCF Locus 6 yielded two chipped-stone tools: a unifacial pebble tool and what may be a shoulder barb from an Early Archaic bifurcate-base projectile point. Close interval subsurface testing of this find spot yielded one piece of chipping debris. WPCF Locus 6 is not considered potentially significant and additional archaeological investigation is unlikely to yield more information.

The post-contact dam and associated borrow pit are within a wetland and buffer zone outside the WPCF project's Area of Potential Effects for direct effects (APE-DE) but are within the larger parcel of land controlled by the Mansfield/Foxborough/Norton Regional Wastewater District. PAL recommends that dam and borrow pit site be avoided during any construction-related project activities. No additional archaeological investigation of the WPCF project area is recommended.

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APPENDIX A

CATALOG OF CULTURAL MATERIAL

Appendix A. Catalog of Cultural Materials, Water Pollution Control Facility, Intensive Survey.

Provenience	Material	Object	Size	Attributes	Color(s)	Count
WPCF Locus 1						
AR-04-180 20-30, B1	Rhyolite Blue Hills Rhyolite	Chipping Debris Flake	1-3cm	Complete	Gray	1
AR-04-270 10-20, A1	Rhyolite Blue Hills Rhyolite	Chipping Debris Flake	1-3cm	Complete	Gray	1
TA-03 10-20, A1	Rhyolite Blue Hills Rhyolite	Chipping Debris Flake	3-5cm	Complete	Gray	1
WPCF Locus 2						
AR-03-090 20-30, B1	Argillite	Chipping Debris Flake	1-3cm	Complete	Gray, Tan	1
BK-01-CNE 20-30, B1	Argillite	Chipping Debris Flake	1-3cm	Complete	Gray, Tan	1
WPCF Locus 3						
AR-01-270 10-20, A1	Rhyolite	Chipping Debris Flake	1-3cm	Complete	Gray, Tan	2
AR-01-270 20-30, B1	Rhyolite	Chipping Debris Flake		Complete	Gray, Tan	1
BK-02-CSW 10-20, Disturbed A	Rhyolite	Chipping Debris Flake	1-3cm	Complete	Tan	2
WPCF Locus 4						
AR-02-090 30-40, B1	Quartz	Chipping Debris Flake	1-3cm	Complete Cortex	Colorless, Tan	1
BK-02-NW 0-10, A1	Chalcedony	Chipping Debris Flake	1-3cm	Complete	Transluscent	1
WPCF Locus 5						
AR-05-090 10-20, A	Granitic	Burnt Rock		Complete Cortex	Maroon, Tan	6
	Rhyolite	Chipping Debris Flake	1-3cm	Complete	Gray	1
AR-05-180 0-10, Ae	Argillite	Chipping Debris Flake	1-3cm	Complete	Gray	1
	Unid. Metamorphic	Burnt Rock		Complete	Gray, Tan	1
AR-05-180 10-20, A1	Unid. Metamorphic	Chipping Debris Flake	1-3cm	Complete	Tan	1
	Unid. Metamorphic	Chipping Debris Flake	0-1cm	Complete	Tan	1
AR-05-270 0-10, Ae	Rhyolite	Chipping Debris Flake	1-3cm	Complete	Gray	1
AR-05-270 10-20, A1	Rhyolite	Chipping Debris Flake	1-3cm	Complete	Lt Gray	1
	Unid. Metamorphic	Burnt Rock		Complete	Maroon, Tan	3
AR-05-270 20-30, B1	Rhyolite	Chipping Debris Flake	1-3cm	Complete	Gray	1
	Unid. Igneous	Burnt Rock		Complete	Tan	1
	Unid. Metamorphic	Burnt Rock		Complete	Maroon, Tan	4
AR-05-360 10-20, A1	Felsite Attleboro Red Felsite	Chipping Debris Flake	1-3cm	Complete	Maroon	2
	Glass	Curved Glass		Fragment	Colorless	1
	Unid. Metamorphic	Burnt Rock		Complete	Maroon, Tan	4
AR-05-360 20-30, B1	Rhyolite	Chipping Debris Flake	1-3cm		Gray	1
TC-03 10-20, A1/B1	Argillite	Chipping Debris Flake	1-3cm	Complete	Gray, Tan	1

Appendix A. Catalog of Cultural Materials, Water Pollution Control Facility, Intensive Survey.

Provenience	Material	Object	Size	Attributes	Color(s)	Count
WPCF Locus 5						
TC-03 10-20, A1/B1	Calcined Bone	Mammal		Fragment		4
	Charcoal	Charcoal		Complete		1
	Felsite Attleboro Red Felsite	Chipping Debris Shatter	3-5cm	Complete	Maroon	1
	Felsite Attleboro Red Felsite	Chipping Debris Flake	1-3cm	Complete	Maroon	6
	Unid. Metamorphic	Burnt Rock		Complete	Tan	2
WPCF Locus 6						
AR-06-090 10-20, A1	Rhyolite	Projectile Point Untyped	2.2x1.1x0.45	Base	Tan	1
AR-06-270 10-20, A1	Quartz	Chipping Debris Flake	0-1cm	Complete	White	1
TD-06 40-50, B1?	Rhyolite	Uniface	5.05x3.51x1.95	Complete Cortex-Cobble	Tan	1
					Total:	**60**

APPENDIX B

PROJECT CORRESPONDENCE

Public Archaeology Laboratory

October 17, 2014

Brona Simon
State Archaeologist
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125

Re: Mansfield Water Pollution Control Facility; Norton, Massachusetts
Intensive (Locational) Archaeological Survey
MHC # RC.49493/35618

Dear Ms. Simon:

Enclosed please find an application for a permit to conduct an intensive (locational) archaeological survey within the proposed Mansfield Water Pollution Control Facility development area at 74 Hill Street in Norton, Massachusetts. The project area is located on the Norton USGS quadrangle. We would like to begin investigations as soon as possible. Thank you in advance for your time and attention to this matter.

If you have any questions or concerns, please do not hesitate to contact Duncan Ritchie, Principal Investigator, at your convenience.

Sincerely,

Deborah Cox

Deborah Cox, RPA
President

Enclosures

cc: Edward Sanderson, CDM Smith Inc. (w/encl.)

26 Main Street Pawtucket, RI 02860 | 401.728.8780 Main | 401.728.8784 Fax
palinc.com

Public Archaeology Laboratory

October 28, 2014

Brona Simon
State Archaeologist
State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125

Re: Mansfield Water Pollution Control Facility, Norton, Massachusetts
Intensive (Locational) Archaeological Survey
PAL #3038; MHC # RC.49493/35618

Dear Ms. Simon:

PAL recently submitted a permit application to MHC for an intensive (locational) archaeological survey of this proposed waste water treatment facility. However, due to recent changes in the size of the project area PAL is requesting a change in the scope of the intensive (locational) archaeological survey that will be conducted there.

The project area for the proposed facility that will require subsurface testing has been expanded from approximately 2.4 acres to a total of 10 acres. This 10 acre project area includes the proposed filtration basins, an access road and a surrounding buffer zone. The buffer zone around the proposed filtration basins and access road is 100 feet in width. A scaled plan showing this project design is enclosed.

The technical proposal and permit application submitted by PAL originally proposed the excavation of a range of 40 to 50, 50-x-50cm test pits within the project area. We are now proposing that subsurface testing in the project area be increased to a range of 60 to 70, 50-x-50cm test pits.

Thank you in advance for your time and attention to this matter. If you have any questions or concerns, please do not hesitate to contact Deborah Cox, President, or me, at your convenience.

Sincerely,

Duncan Ritchie

Duncan Ritchie, RPA
Senior Archaeologist

Enclosure

cc: Edward Sanderson, CDM Smith (w/encl.)

26 Main Street Pawtucket, RI 02860 | 401.728.8780 Main | 401.728.8784 Fax
palinc.com

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

PERMIT TO CONDUCT ARCHAEOLOGICAL FIELD INVESTIGATION

Permit Number 3504 Date of Issue November 4, 2014

Expiration Date November 4, 2015

PAL is hereby authorized to conduct an archaeological field investigation pursuant to Section 27C of Chapter 9 of General Laws and according to the regulations outlined in 950 CMR 70.00.

Mansfield Water Pollution Control Wastewater Management Plan Phase 2, Pine Street Effluent Recharge Basins Project, Norton

Project Location

Brona Simon

Brona Simon, State Archaeologist
Massachusetts Historical Commission

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

November 7, 2014

Bettina Washington
Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head/Aquinnah
20 Black Brook Road
Aquinnah, Massachusetts 02535-9701

Re: Mansfield Water Pollution Control Facility (MWPCF), Norton, MA.
Intensive (Locational) Archaeological Survey
PAL #3038; MHC #RC.49493/35618

Dear Ms. Washington:

The towns of Mansfield and Norton are currently planning improvements including upgrades to existing systems and construction of new structures at the Mansfield Water Pollution Control Facility (MWPCF) located at 74 Hill Street in Norton (Figure 1). The proposed project will utilize federal funding through the State Revolving Fund administered by the Massachusetts Department of Environmental Protection (DEP). The Massachusetts Historical Commission (MHC) will review the project under Section 106 of the National Historic Preservation Act of 1966, as amended.

The proposed new facility will be located at a site north of Pine Street and west of an abandoned railroad easement. Proposed construction within an approximately 10 acre area will be one effluent disposal site, including a force main and new infiltration basins with pipelines, sand drying beds, access road improvements and storm water infrastructure (Figure 2).

CDM Smith has retained PAL to conduct this intensive survey to determine the presence/absence of archaeological sites relating to Native American use of the area that may be affected by the proposed undertaking. By this letter we are informing you of this survey and requesting any information regarding the project area you would be willing to share. PAL will notify your office by phone or email of the schedule for fieldwork.

Thank you for your attention to this matter. If you have any questions or require additional information, please do not hesitate to contact Deborah Cox, President, or me, at your convenience.

Sincerely,

Duncan Ritchie, RPA
Senior Archaeologist

Enclosures

cc: Edward Sanderson, CDM Smith (w/o encl.)

November 7, 2014

Ramona Peters
Tribal Historic Preservation Officer
Mashpee Wampanoag Tribe
766 Falmouth Road, Madaket Place, Office A3
Mashpee, Massachusetts 02649

Re: Mansfield Water Pollution Control Facility (MWPCF), Norton, MA.
Intensive (Locational) Archaeological Survey
PAL #3038; MHC #RC.49493/35618

Dear Ms. Peters:

The towns of Mansfield and Norton are currently planning improvements including upgrades to existing systems and construction of new structures at the Mansfield Water Pollution Control Facility (MWPCF) located at 74 Hill Street in Norton (Figure 1). The proposed project will utilize federal funding through the State Revolving Fund administered by the Massachusetts Department of Environmental Protection (DEP). The Massachusetts Historical Commission (MHC) will review the project under Section 106 of the National Historic Preservation Act of 1966, as amended.

The proposed new facility will be located at a site north of Pine Street and west of an abandoned railroad easement. Proposed construction within an approximately 10 acre area will be one effluent disposal site, including a force main and new infiltration basins with pipelines, sand drying beds, access road improvements and storm water infrastructure (Figure 2).

CDM Smith has retained PAL to conduct this intensive survey to determine the presence/absence of archaeological sites relating to Native American use of the area that may be affected by the proposed undertaking. By this letter we are informing you of this survey and requesting any information regarding the project area you would be willing to share. PAL will notify your office by phone or email of the schedule for fieldwork.

Thank you for your attention to this matter. If you have any questions or require additional information, please do not hesitate to contact Deborah Cox, President, or me, at your convenience.

Sincerely,

Duncan Ritchie, RPA
Senior Archaeologist

Enclosures

cc: Edward Sanderson, CDM Smith (w/o encl.)

APPENDIX C

MHC ARCHAEOLOGICAL SITE FORMS

FORM D ARCHAEOLOGICAL SURVEY
PREHISTORIC ARCHAEOLOGICAL SITES

Massachusetts Historical Commission
Office of the Secretary
State House, Boston

FOR MHC OFFICE USE ONLY

Town
UTM
QUAD

MHC NO.

NR ☐ ACT ☐ ELIG. ☐ NO DISTRICT ☐ YES ☐ NO

IDENTIFICATION

1. SITE NAME(S) WPCF Locus 1 — MAS NO. — OTHER NO.

2. TOWN/CITY Norton — COUNTY Bristol

3. STREET AND NUMBER (IF NOT AVAILABLE, GIVE DETAILED DESCRIPTION OF HOW TO REACH SITE)
located about 400m north of Pine Street and 120 m west of railroad easement

4. OWNER(S) AND ADDRESS(ES) Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD); Mansfield Town Hall, Six Park Row, Mansfield, MA 02048 ☐ Public ☑ Private

5. SITE LOCATED BY
☑ CRM Survey ☐ Avocational Collector ☐ Field School ☐ Other (Specify)
Describe Sampling Strategy used to Locate Site 50 x 50 cm test pits on judgmental transect and in 2.5m diameter array

DESCRIPTION

6a. PERIOD(S) (Check all applicable boxes
☐ Paleo ☐ Early Woodland ☐ Contact
☐ Early Archaic ☐ Middle Woodland ☑ Unknown
☐ Middle Archaic ☐ Late Woodland ☐ Other (Specify)
☐ Late Archaic

☐ Single Component ☐ Multi-Component
Specify All Components
unknown

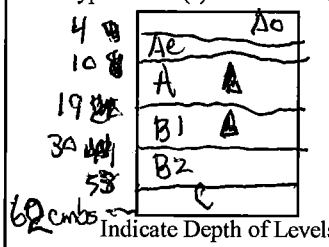
6b. Estimated Occupation Range unknown

7. DATING METHODS
C-14 ☐ Intuition ☐ Other (specify)
Comparative Materials

8. DESCRIBE SITE TYPE / FUNCTION small activity area or locus of stone tool manufacture, maintenance.

9. DESCRIBE SIZE AND HORIZONTAL AND VERTICAL BOUNDARIES
Horizontal extent is about 25 sq m. Vertical extent is from about 10 to 30cm below surface.

10. GENERALIZED SITE PROFILE
Type of Soil(s) Cultural Material



▲ = cultural material

ENVIRONMENT

11. SOIL
USDA Soil Serie: Windsor
Contour Elevation: 100 ft above sea level
% Slope of Ground: ☑ 0 - 5 ☐ 5 - 15 ☐ 15 - 25 ☐ Over 25
Acidity: 1 —— 7 —— 14 (Acid) (Base) 5.0

12. TOPOGRAPHY
☑ Flat ☐ Gentle undulation ☐ Other
☐ Rolling Hill ☐ Mountains

13. WATER
NEAREST WATER SOURCE: unnamed stream and wetlands
SIZE AND SPEED: small, slow
DISTANCE FROM SITE: ca 40 m
SEASONAL AVAILABILITY: year round

14. VEGETATION
PRESENT: second growth white pine, oak
PAST: open field/pasture in 19th century ?

CONDITION

15. SITE INTEGRITY
☐ Undisturbed ☑ Good ☐ Fair ☐ Destroyed
IF DISTURBED, DESCRIBE DISTURBANCE

16. SURROUNDING ENVIRONMENT
☑ Open Land ☑ Woodland ☐ Eroded Soils ☐ Residential ☐ Scattered Buildings Visible from Site
☐ Commercial ☐ Industrial ☑ Rural
☐ Coastal ☑ Isolated

17. ANY THREATS TO SITE ☑ Yes ☐ No
DESCRIBE POTENTIAL THREATS
proposed construction of wastewater treatment facility

18. ACCESSIBILITY TO PUBLIC
☐ Free Access ☑ Need Owner Permission ☐ Restricted ☐ No Access

RESEARCH STATUS

19. PREVIOUS WORK		
☐ Surface Collecte	By Whom / Affiliation	Date
☐ "Pot hunted"	By Whom / Affiliation	Date
☑ Tested	By Whom / Affiliation PAL staff	Date Nov 2014
☐ Excavation	By Whom / Affiliation	Date

20. PRESENT LOCATION OF MATERIALS (INCLUDE ADDRESS)
PAL Inc 26 Main Street Pawtucket , RI 02860

21. REFERENCES / REPORTS Ritchie, Duncan 2015 Intensive Archaeological Survey of the Wastewater Pollution Control Facility, Norton, Massachusetts.PAL report 3038. submitted to CDM Smith, Inc, Boston, MA. and MFN Regional Wastewater District, Mansfield ,MA.

SIGNIFICANCE

22. RECOVERED DATA (identify in DETAIL, including features, pits, burials, faunal material, etc.)
Three flakes of gray rhyolite

23. ARCHAEOLOGICAL OR HISTORICAL SIGNIFICANCE
Not considered to be potentially significant due to lack of temporal /.cultural affiliation and low information content.

SITE PLAN

24. ATTACH PORTION OF USGS QUAD WITH SITE AREA MARKED TO THIS FORM

25. SKETCH PLAN OF SITE

See Attached Map

Scale:

26. PHOTOS: Attach if available
Label each with: Date of photo, photographer, view shown, name of site

REPORTED BY:	NAME D Ritchie	ADDRESS 26 Main Street,Pawtucket, RI 02806	
	ORGANIZATION PAL Inc		DATE 1/12/2015

FOR OFFICE USE ONLY

FIELD EVALUATION

COMMENTS

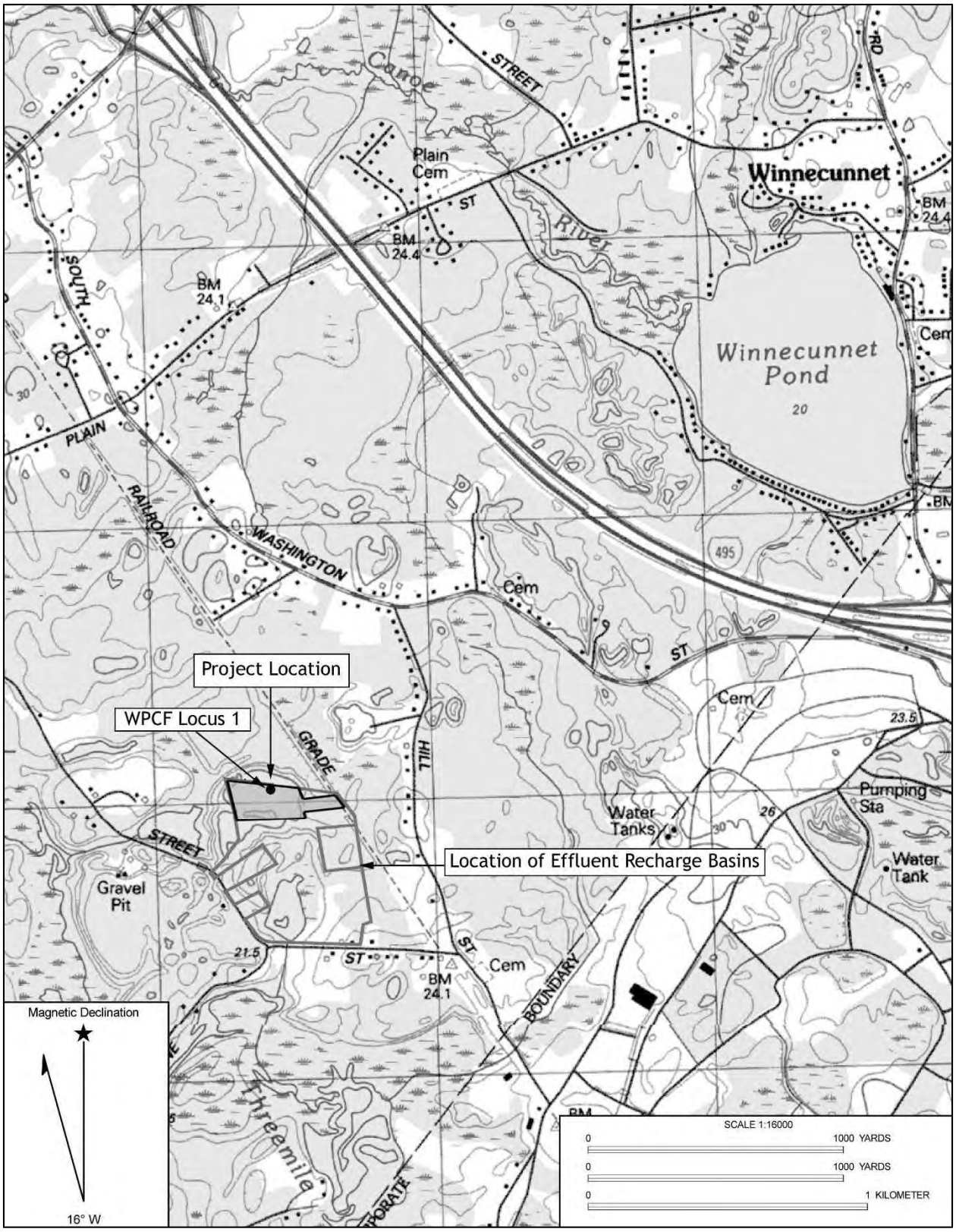


Figure 1. Location of WPCF Locus 1 within the Water Pollution Control Facility project area on the Norton, Massachusetts, 7.5 minute USGS topographic quadrangle.

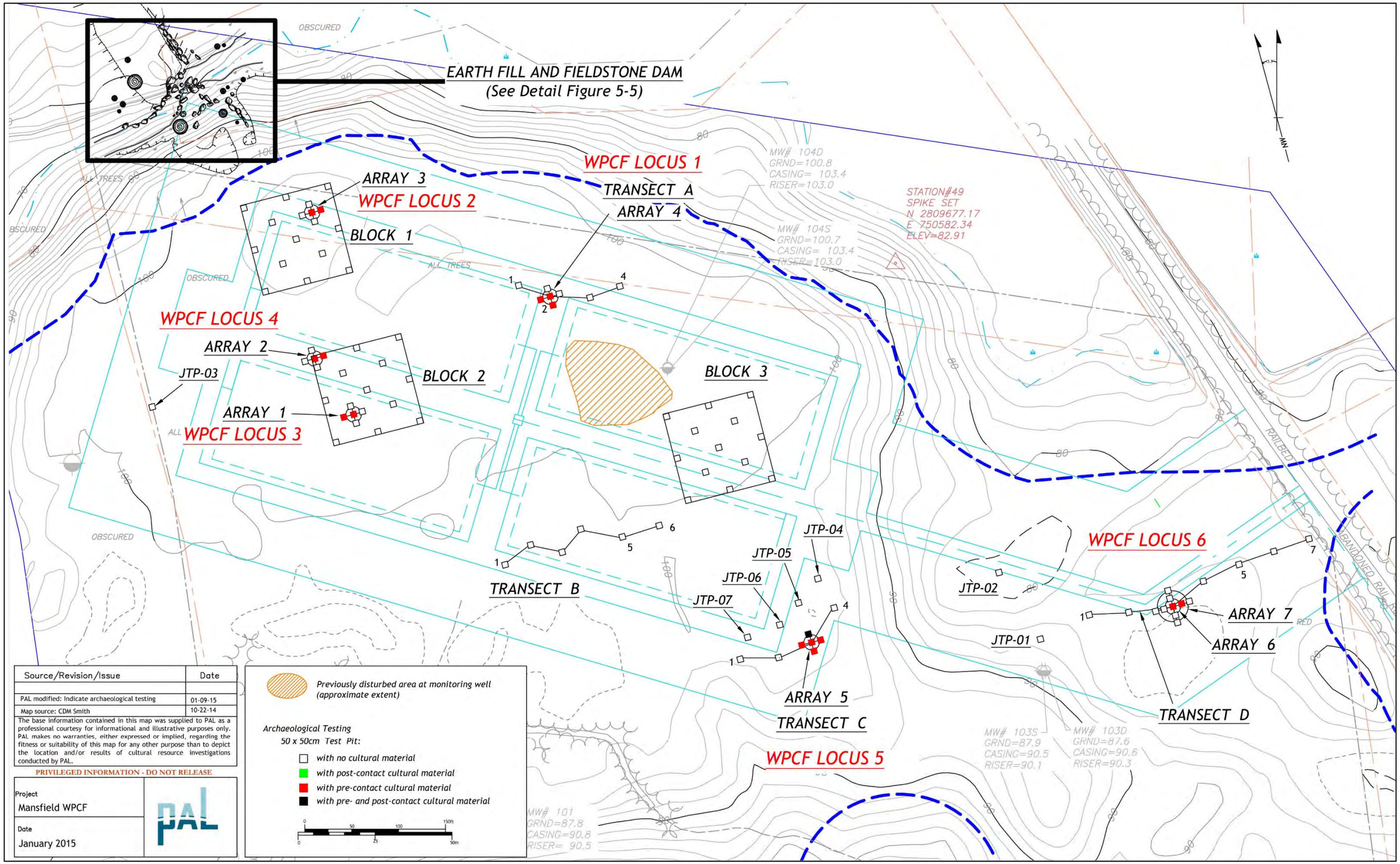


Figure 2. Location of sites within the Water Pollution Control Facility project area.

FORM D ARCHAEOLOGICAL SURVEY
PREHISTORIC ARCHAEOLOGICAL SITES

Massachusetts Historical Commission
Office of the Secretary
State House, Boston

FOR MHC OFFICE USE ONLY

Town / UTM / QUAD

MHC NO. _____

NR ☐ ACT ☐ ELIG. ☐ NO DISTRICT ☐ YES ☐ NO

IDENTIFICATION

1. SITE NAME(S) WPCF Locus 2 — MAS NO. — OTHER NO.

2. TOWN/CITY Norton — COUNTY Bristol

3. STREET AND NUMBER (IF NOT AVAILABLE, GIVE DETAILED DESCRIPTION OF HOW TO REACH SITE)
located about 450m north of Pine Street and 200m west of railroad easement

4. OWNER(S) AND ADDRESS(ES) Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD), Mansfield Town Hall, Six Park Row, Mansfield, MA 02048 ☐ Public ☑ Private

5. SITE LOCATED BY
☑ CRM Survey ☐ Avocational Collector ☐ Field School ☐ Other (Specify) _____
Describe Sampling Strategy used to Locate Site 50x50cm test pits at 7.5m interval within 30x30m sampling block and in 2.5m diameter array.

DESCRIPTION

6a. PERIOD(S) (Check all applicable boxes
☐ Paleo ☐ Early Woodland ☐ Contact
☐ Early Archaic ☐ Middle Woodland ☑ Unknown
☐ Middle Archaic ☐ Late Woodland ☐ Other (Specify)
☐ Late Archaic

☐ Single Component ☐ Multi-Component
Specify All Components
unknown

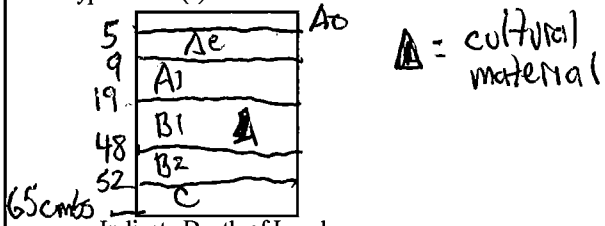
6b. Estimated Occupation Range unknown

7. DATING METHODS
C-14 ☐ Intuition ☐ Other (specify)
Comparative Materials

8. DESCRIBE SITE TYPE / FUNCTION small activity area or locus of stone tool manufacture, maintenance.

9. DESCRIBE SIZE AND HORIZONTAL AND VERTICAL BOUNDARIES
Horizontal extent appears to be less than about 10 sq m. Vertical extent is from about 20-30cm below surface.

10. GENERALIZED SITE PROFILE
Type of Soil(s) Cultural Material



Indicate Depth of Levels

ENVIRONMENT

11. SOIL
USDA Soil Serie: Windsor
Contour Elevation: 100 feet above sea level
% Slope of Ground: ☑ 0 - 5 ☑ 5 - 15 ☐ 15 - 25 ☐ Over 25
Acidity: 1 ——— 7 ——— 14 (Acid) (Base) 5.0

12. TOPOGRAPHY
☑ Flat ☐ Gentle undulation ☐ Other
☐ Rolling Hill ☐ Mountains

13. WATER
NEAREST WATER SOURCE: unnamed stream and wetlands
SIZE AND SPEED: small, slow
DISTANCE FROM SITE: 40m
SEASONAL AVAILABILITY: year round

14. VEGETATION
PRESENT: second growth pine, oak forest
PAST: open fields/pasture in 19th century

CONDITION

15. SITE INTEGRITY
☑ Undisturbed ☐ Good ☐ Fair ☐ Destroyed
IF DISTURBED, DESCRIBE DISTURBANCE

16. SURROUNDING ENVIRONMENT
☑ Open Land ☑ Woodland ☐ Eroded Soils ☐ Residential ☐ Scattered Buildings Visible from Site
☐ Commercial ☐ Industrial ☑ Rural
☐ Coastal ☑ Isolated

17. ANY THREATS TO SITE
☑ Yes ☐ No
DESCRIBE POTENTIAL THREATS
proposed construction of wastewater treatment facility

18. ACCESSIBILITY TO PUBLIC
☐ Free Access ☑ Need Owner Permission ☐ Restricted ☐ No Access

RESEARCH STATUS

19. PREVIOUS WORK		
☐ Surface Collecte	By Whom / Affiliation	Date
☐ "Pot hunted"	By Whom / Affiliation	Date
☑ Tested	By Whom / Affiliation PAL staff	Date 11/2014
☐ Excavation	By Whom / Affiliation	Date

20. PRESENT LOCATION OF MATERIALS (INCLUDE ADDRESS)
PAL Inc, 26 Main Street Pawtucket , RI 02860

21. REFERENCES / REPORTS Ritchie, Duncan 2015 Intensive Archaeological Survey of the Wastewater Pollution Control Facility, Norton, Massachusetts. PAL report 3038. submitted to CDM Smith, Inc, Boston, MA.and MFN Regional Wastewater District, Mansfield, MA.

SIGNIFICANCE

22. RECOVERED DATA (identify in DETAIL, including features, pits, burials, faunal material, etc.)
Two flakes of gray/tan argillite chipping debris.

23. ARCHAEOLOGICAL OR HISTORICAL SIGNIFICANCE
Not considered to be potentially significant due to lack of temporal /.cultural affiliation and low information content.

SITE PLAN

24. ATTACH PORTION OF USGS QUAD WITH SITE AREA MARKED TO THIS FORM

25. SKETCH PLAN OF SITE

See Attached Map

Scale:

26. PHOTOS: Attach if available
Label each with: Date of photo, photographer, view shown, name of site

REPORTED BY:	NAME D Ritchie	ADDRESS 26 Main Street Pawtucket , RI 02860	
	ORGANIZATION PAL Inc.		DATE 1/12/2015

FOR OFFICE USE ONLY

FIELD EVALUATION

COMMENTS

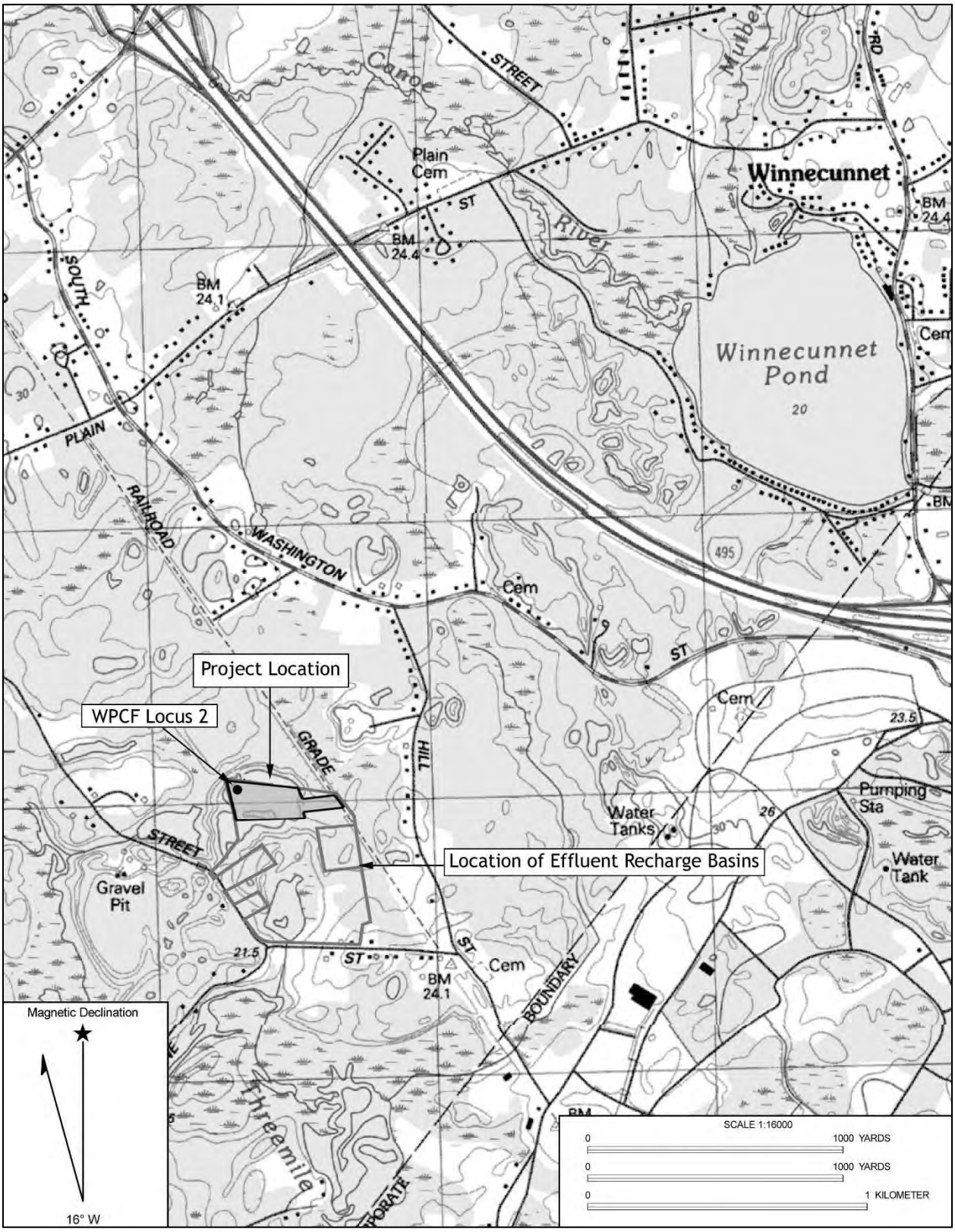


Figure 1. Location of WPCF Locus 2 within the Water Pollution Control Facility project area on the Norton, Massachusetts, 7.5 minute USGS topographic quadrangle.

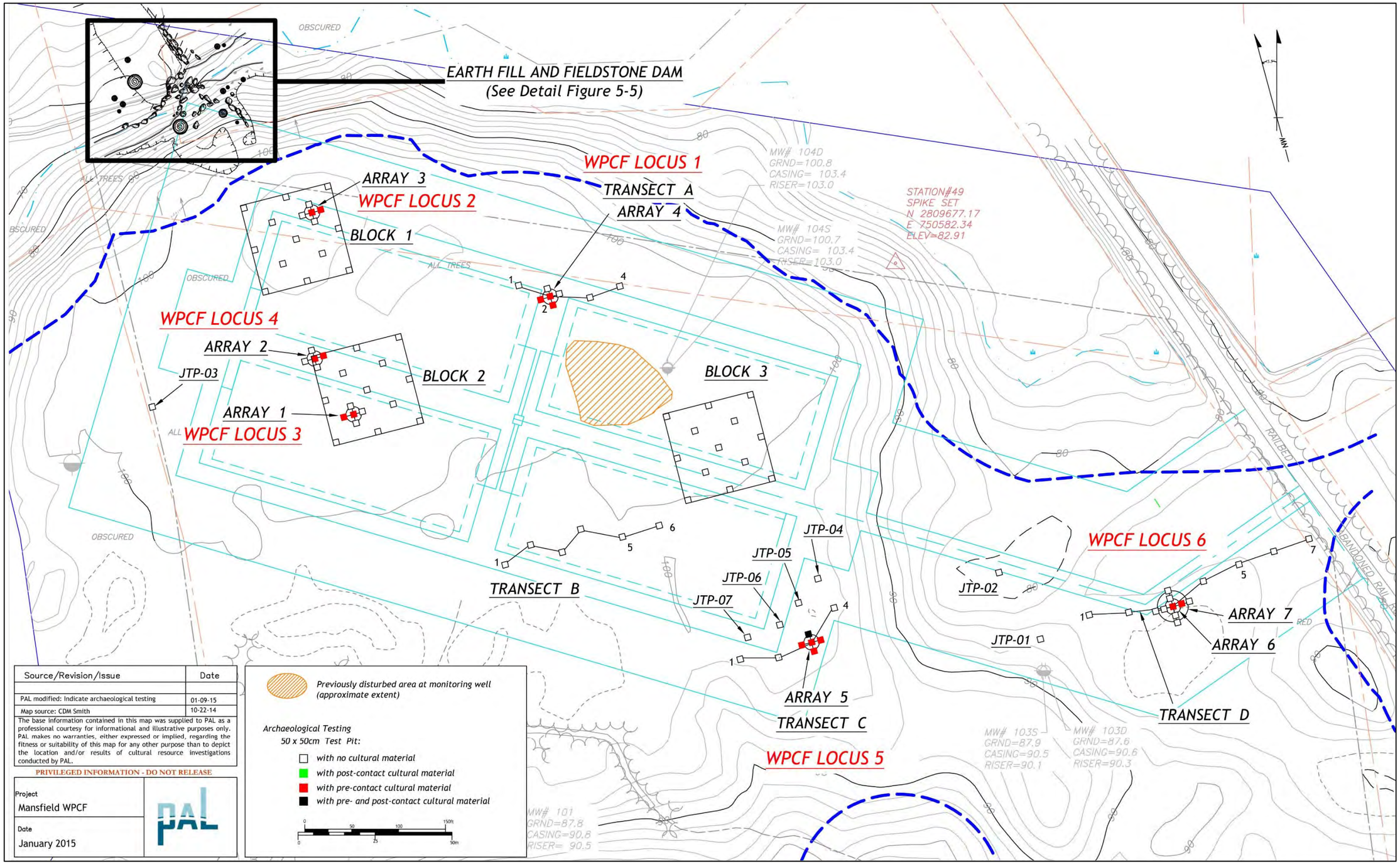


Figure 2. Location of sites within the Water Pollution Control Facility project area.

FORM D ARCHAEOLOGICAL SURVEY
PREHISTORIC ARCHAEOLOGICAL SITES

Massachusetts Historical Commission
Office of the Secretary
State House, Boston

FOR MHC OFFICE USE ONLY

Town
UTM
QUAD
NR ☐ ACT ☐ ELIG. ☐ NO DISTRICT ☐ YES ☐ NO

MHC NO.

IDENTIFICATION

1. SITE NAME(S) WPCF Locus 3 — MAS NO. — OTHER NO.

2. TOWN/CITY Norton — COUNTY Bristol

3. STREET AND NUMBER (IF NOT AVAILABLE, GIVE DETAILED DESCRIPTION OF HOW TO REACH SITE)
located about 350m north of Pine Street and about 225m west of railroad easement.

4. OWNER(S) AND ADDRESS(ES) Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD), Mansfield Town Hall, Six Park Row, Mansfield, MA 02048 ☐ Public ☑ Private

5. SITE LOCATED BY
☑ CRM Survey ☐ Avocational Collector ☐ Field School ☐ Other (Specify)
Describe Sampling Strategy used to Locate Site 50x50 cm test pits at 7.5m interval within 30 x 30m sampling block and in 2.5m diameter array.

DESCRIPTION

6a. PERIOD(S) (Check all applicable boxes
☐ Paleo ☐ Early Woodland ☐ Contact
☐ Early Archaic ☐ Middle Woodland ☑ Unknown
☐ Middle Archaic ☐ Late Woodland ☐ Other (Specify)
☐ Late Archaic

☐ Single Component ☐ Multi-Component
Specify All Components
unknown

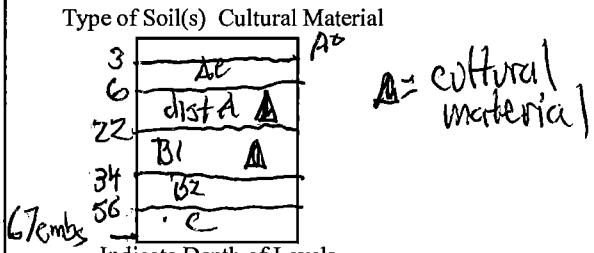
6b. Estimated Occupation Range unknown

7. DATING METHODS
C-14 ☐ Intuition ☐ Other (specify)
Comparative Materials

8. DESCRIBE SITE TYPE / FUNCTION small activity area or locus of stone tool manufacture, maintenance.

9. DESCRIBE SIZE AND HORIZONTAL AND VERTICAL BOUNDARIES
Horizontal extent appears to be less than about 10 sq m. Vwertical extent is from about 10 to 30 cm below surface.

10. GENERALIZED SITE PROFILE
Type of Soil(s) Cultural Material



Indicate Depth of Levels

ENVIRONMENT

11. SOIL
USDA Soil Serie: Windsor
Contour Elevation: 100 feet above sea level
% Slope of Ground: ☑ 0 - 5 ☐ 5 - 15 ☐ 15 - 25 ☐ Over 25
Acidity: 1 —— 7 —— 14 (Acid) (Base) 5.0

12. TOPOGRAPHY
☑ Flat ☐ Gentle undulation ☐ Other
☐ Rolling Hill ☐ Mountains

13. WATER
NEAREST WATER SOURCE: small unnamed stream and wetla
SIZE AND SPEED: small, slow
DISTANCE FROM SITE: about 120m
SEASONAL AVAILABILITY: year round

14. VEGETATION
PRESENT: second growth white pine, oak forest
PAST: open fields/pasture in 19th century

CONDITION

15. SITE INTEGRITY
☐ Undisturbed ☑ Good ☐ Fair ☐ Destroyed
IF DISTURBED, DESCRIBE DISTURBANCE

16. SURROUNDING ENVIRONMENT
☑ Open Land ☑ Woodland ☐ Eroded Soils ☐ Residential ☐ Scattered Buildings Visible from Site
☐ Commercial ☐ Industrial ☑ Rural
☐ Coastal ☑ Isolated

17. ANY THREATS TO SITE
☑ Yes ☐ No
DESCRIBE POTENTIAL THREATS
proposed construction of wastewater treatment facility

18. ACCESSIBILITY TO PUBLIC
☐ Free Access ☑ Need Owner Permission ☐ Restricted ☐ No Access

RESEARCH STATUS			
19. PREVIOUS WORK			
☐ Surface Collecte	By Whom / Affiliation		Date
☐ "Pot hunted"	By Whom / Affiliation		Date
☑ Tested	By Whom / Affiliation	PAL staff	Date 11/2014
☐ Excavation	By Whom / Affiliation		Date

20. PRESENT LOCATION OF MATERIALS (INCLUDE ADDRESS)
PAL Inc 26 Main Street Pawtucket , RI 02860

21. REFERENCES / REPORTS Ritchie, Duncan 2015 Intensive Archaeological Survey of the Wastewater Pollution Control Facility, Norton, Massachusetts. PAL report 3038. submitted to CDM Smith, Inc, Boston, MA.and MFN Regional Wastewater District, Mansfield, MA.

SIGNIFICANCE

22. RECOVERED DATA (identify in DETAIL, including features, pits, burials, faunal material, etc.)
Five pieces of gray to tan rhyolite chipping debris (small flakes).

23. ARCHAEOLOGICAL OR HISTORICAL SIGNIFICANCE
Not considered to be potentially significant due to lack of temporal /cultural affiliation and low information content.

SITE PLAN

24. ATTACH PORTION OF USGS QUAD WITH SITE AREA MARKED TO THIS FORM

25. SKETCH PLAN OF SITE

See Attached Map

Scale:

26. PHOTOS: Attach if available
Label each with: Date of photo, photographer, view shown, name of site

REPORTED BY:		
NAME D Ritchie	ADDRESS 26 Main Street ,Pawtucket, RI 02860	
ORGANIZATION PAL Inc.		DATE 1/12/2015

FOR OFFICE USE ONLY

FIELD EVALUATION

COMMENTS

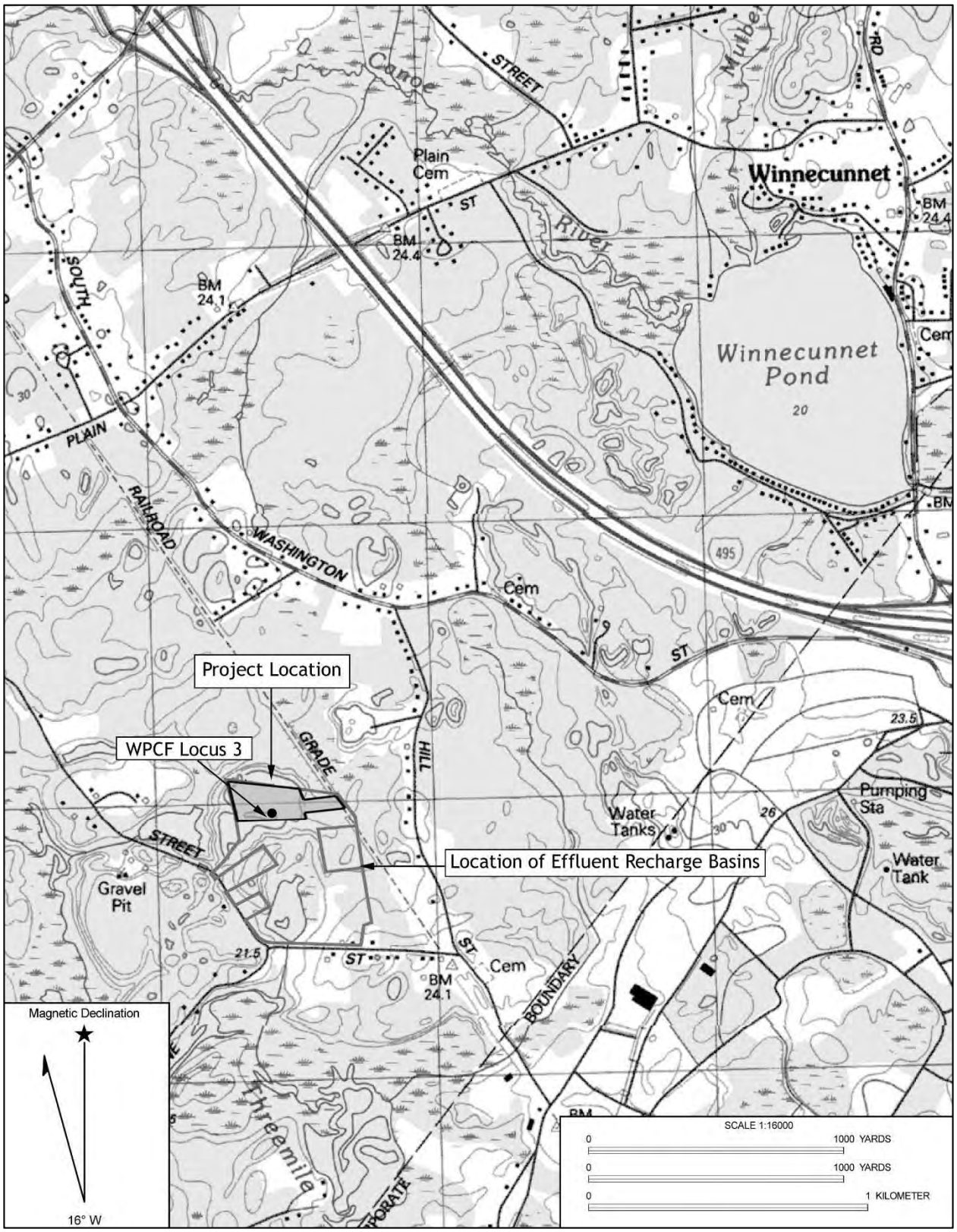


Figure 1. Location of WPCF Locus 3 within the Water Pollution Control Facility project area on the Norton, Massachusetts, 7.5 minute USGS topographic quadrangle.

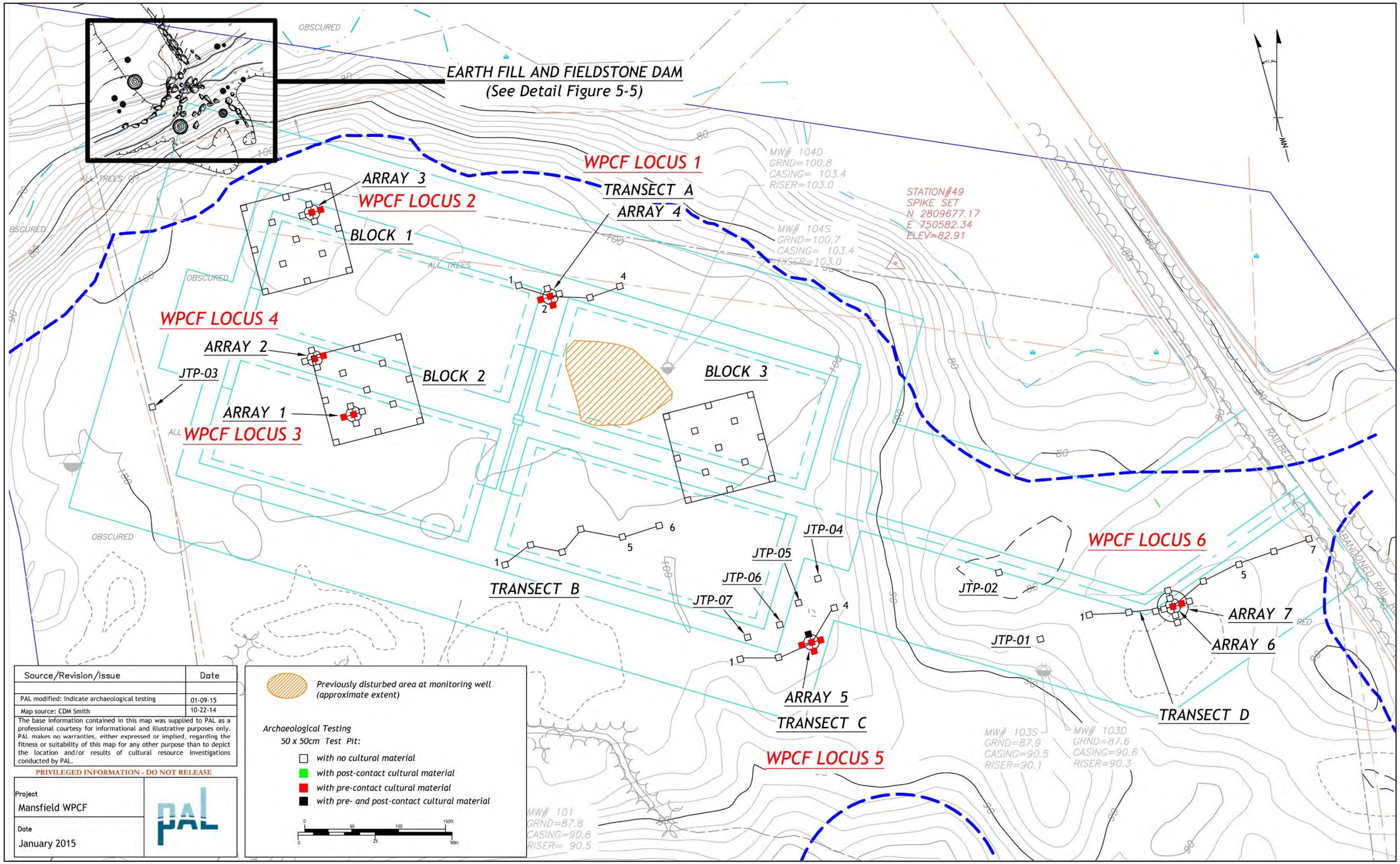


Figure 2. Location of sites within the Water Pollution Control Facility project area.

FORM D ARCHAEOLOGICAL SURVEY
PREHISTORIC ARCHAEOLOGICAL SITES

Massachusetts Historical Commission
Office of the Secretary
State House, Boston

FOR MHC OFFICE USE ONLY

Town
UTM
QUAD

MHC NO.

NR ☐ ACT ☐ ELIG. ☐ NO DISTRICT ☐ YES ☐ NO

IDENTIFICATION

1. SITE NAME(S) WPCF Locus 4 — MAS NO. — OTHER NO.

2. TOWN/CITY Norton — COUNTY Bristol

3. STREET AND NUMBER (IF NOT AVAILABLE, GIVE DETAILED DESCRIPTION OF HOW TO REACH SITE)
located about 375m north of Pine Street and 225m west of railroad easement.

4. OWNER(S) AND ADDRESS(ES) Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD), Mansfield Town Hall, Six Park Row, Mansfield, MA 02048 ☐ Public ☑ Private

5. SITE LOCATED BY
☑ CRM Survey ☐ Avocational Collector ☐ Field School ☐ Other (Specify)
Describe Sampling Strategy used to Locate Site 50x50 cm test pits at 7.5m interval within 30x30m sampling block, and in 2.5m diameter array.

DESCRIPTION

6a. PERIOD(S) (Check all applicable boxes
☐ Paleo ☐ Early Woodland ☐ Contact
☐ Early Archaic ☐ Middle Woodland ☑ Unknown
☐ Middle Archaic ☐ Late Woodland ☐ Other (Specify)
☐ Late Archaic

☐ Single Component ☐ Multi-Component
Specify All Components
unknown

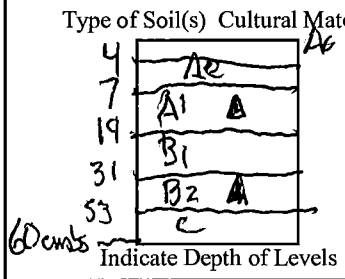
6b. Estimated Occupation Range unknown

7. DATING METHODS
C-14 ☐ Intuition ☐ Other (specify)
Comparative Materials

8. DESCRIBE SITE TYPE / FUNCTION small activity area or locus of stone tool manufacture, maintenance.

9. DESCRIBE SIZE AND HORIZONTAL AND VERTICAL BOUNDARIES
Horizontal extent appears to be less than about 10 sq m. Vertical extent is from about 10 to 40cm below surface.

10. GENERALIZED SITE PROFILE
Type of Soil(s) Cultural Material



A = cultural material

Indicate Depth of Levels

ENVIRONMENT

11. SOIL
USDA Soil Serie: Windsor
Contour Elevation: 100 feet above sea level
% Slope of Ground: ☑ 0 - 5 ☐ 5 - 15 ☐ 15 - 25 ☐ Over 25
Acidity: 1 (Acid) — 7 — 14 (Base) 5.0

12. TOPOGRAPHY
☑ Flat ☐ Gentle undulation ☐ Other
☐ Rolling Hill ☐ Mountains

13. WATER
NEAREST WATER SOURCE: unnamed stream and wetlands
SIZE AND SPEED: small, slow
DISTANCE FROM SITE: about 100m
SEASONAL AVAILABILITY: year round

14. VEGETATION
PRESENT: second growth white pine, oak forest
PAST: open fields/pasture I 19th century

CONDITION

15. SITE INTEGRITY
☐ Undisturbed ☑ Good ☐ Fair ☐ Destroyed

IF DISTURBED, DESCRIBE DISTURBANCE

16. SURROUNDING ENVIRONMENT
☑ Open Land ☑ Woodland ☐ Eroded Soils ☐ Residential ☐ Scattered Buildings Visible from Site
☐ Commercial ☐ Industrial ☑ Rural
☐ Coastal ☑ Isolated

17. ANY THREATS TO SITE
☑ Yes ☐ No

DESCRIBE POTENTIAL THREATS
proposed construction of wastewater treatment facility

18. ACCESSIBILITY TO PUBLIC
☐ Free Access ☑ Need Owner Permission ☐ Restricted ☐ No Access

RESEARCH STATUS

19. PREVIOUS WORK		
☐ Surface Collecte	By Whom / Affiliation	Date
☐ "Pot hunted"	By Whom / Affiliation	Date
☑ Tested	By Whom / Affiliation PAL Inc	Date 11/2014
☐ Excavation	By Whom / Affiliation	Date

20. PRESENT LOCATION OF MATERIALS (INCLUDE ADDRESS)
PAL Inc 26 Main Street Pawtucket , RI 02860

21. REFERENCES / REPORTS Ritchie, Duncan 2015 Intensive Archaeological Survey of the Wastewater Pollution Control Facility, Norton, Massachusetts. PAL report 3038. submitted to CDM Smith, Inc, Boston, MA.and MFN Regional Wastewater District, Mansfield, MA.

SIGNIFICANCE

22. RECOVERED DATA (identify in DETAIL, including features, pits, burials, faunal material, etc.)
One flake of translucent gray chalcedony and one flake of white quartz.

23. ARCHAEOLOGICAL OR HISTORICAL SIGNIFICANCE
Not considered to be potentially significant due to lack of temporal /.cultural affiliation and low information content.

SITE PLAN

24. ATTACH PORTION OF USGS QUAD WITH SITE AREA MARKED TO THIS FORM

25. SKETCH PLAN OF SITE

See Attached Map

Scale:

26. PHOTOS: Attach if available
Label each with: Date of photo, photographer, view shown, name of site

REPORTED BY:	NAME D Ritchie	ADDRESS 26 Main Street,Pawtucket, RI 02860	
	ORGANIZATION PAL Inc		DATE 1/12/2015

FOR OFFICE USE ONLY

FIELD EVALUATION

COMMENTS

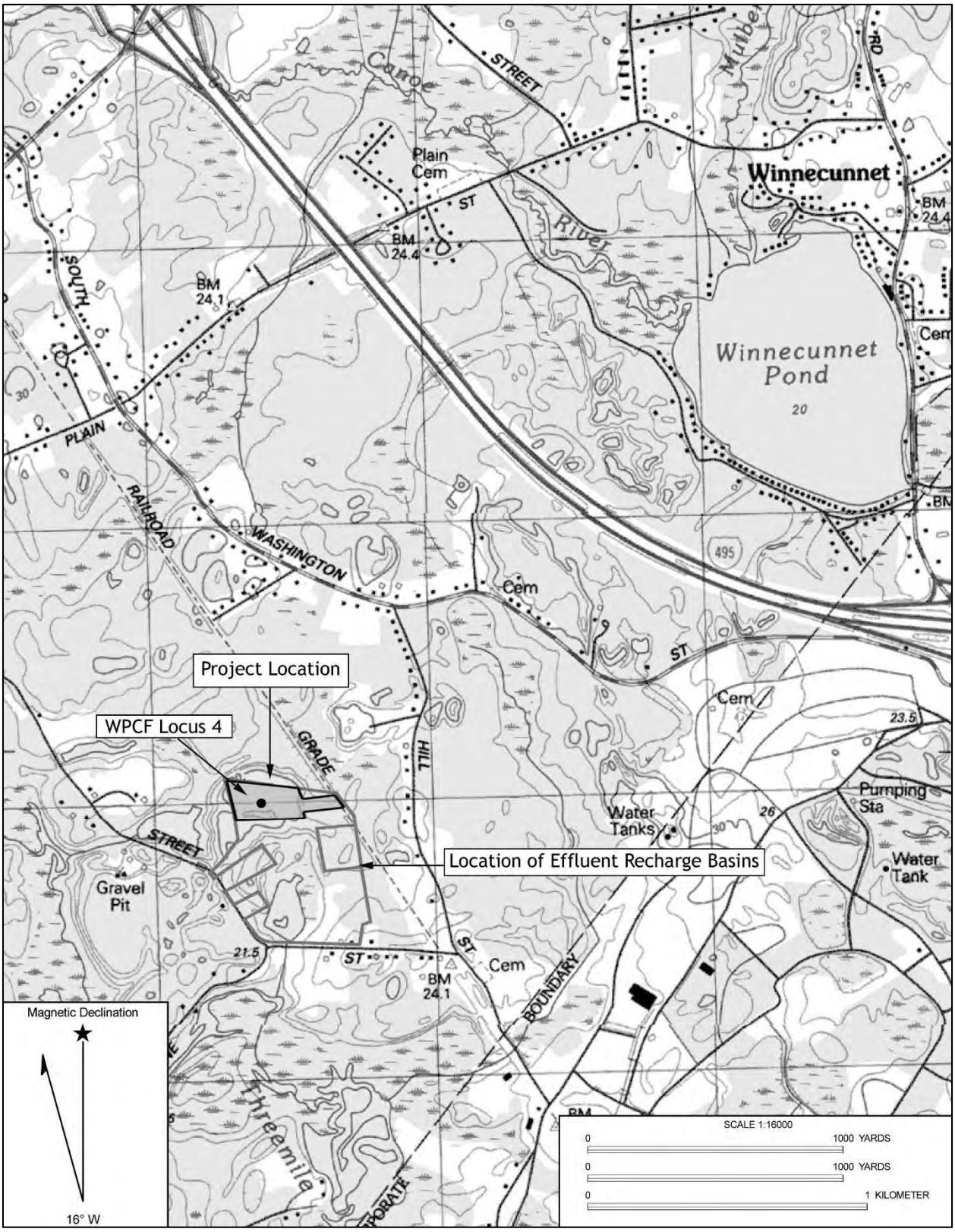


Figure 1. Location of WPCF Locus 4 within the Water Pollution Control Facility project area on the Norton, Massachusetts, 7.5 minute USGS topographic quadrangle.

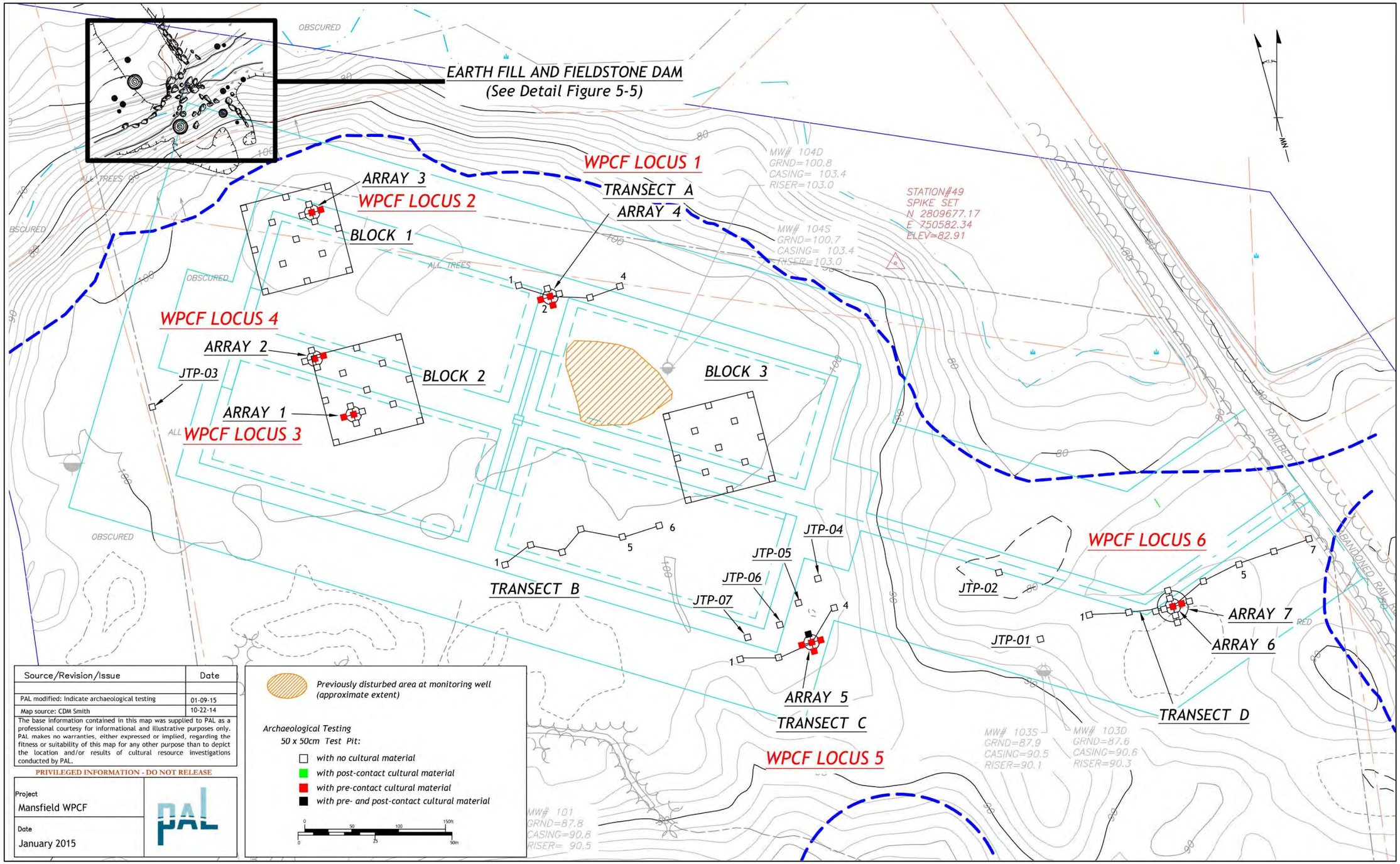


Figure 2. Location of sites within the Water Pollution Control Facility project area.

FORM D ARCHAEOLOGICAL SURVEY
PREHISTORIC ARCHAEOLOGICAL SITES

Massachusetts Historical Commission
Office of the Secretary
State House, Boston

FOR MHC OFFICE USE ONLY

Town
UTM
QUAD
NR ☐ ACT ☐ ELIG. ☐ NO DISTRICT ☐ YES ☐ NO

MHC NO.

IDENTIFICATION

1. SITE NAME(S) WPCF Locus 5 — MAS NO. — OTHER NO.

2. TOWN/CITY Norton — COUNTY Bristol

3. STREET AND NUMBER (IF NOT AVAILABLE, GIVE DETAILED DESCRIPTION OF HOW TO REACH SITE)
located about 330m northeast of Pine Street and about 115 m west of railroad easement.

4. OWNER(S) AND ADDRESS(ES) Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD), Mansfield Town Hall, Six Park Row, Mansfield, MA 02048 ☐ Public ☑ Private

5. SITE LOCATED BY
☑ CRM Survey ☐ Avocational Collector ☐ Field School ☐ Other (Specify)
Describe Sampling Strategy used to Locate Site 50x50 cm test pits at 10m interval along judgmental transect and in 2.5m array pattern. Four judgmentally placed 50x50 cm test pits.

DESCRIPTION

6a. PERIOD(S) (Check all applicable boxes
☐ Paleo ☐ Early Woodland ☐ Contact
☐ Early Archaic ☐ Middle Woodland ☑ Unknown
☐ Middle Archaic ☐ Late Woodland ☐ Other (Specify)
☐ Late Archaic

☐ Single Component ☐ Multi-Component
Specify All Components
unknown

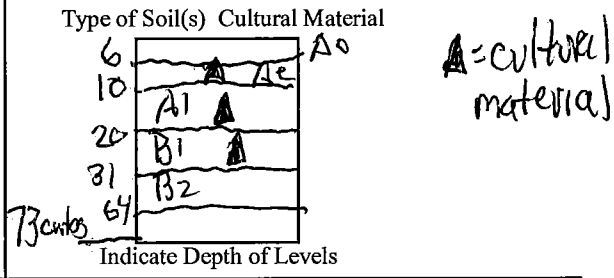
6b. Estimated Occupation Range unknown

7. DATING METHODS
C-14 ☐ Intuition ☐ Other (specify)
Comparative Materials

8. DESCRIBE SITE TYPE / FUNCTION small activity area or locus of stone tool manufacture, maintenance. Burnt rock fragments indicate use of fire for heat, resource processing/cooking ?

9. DESCRIBE SIZE AND HORIZONTAL AND VERTICAL BOUNDARIES
Horizontal extent is approximately 25 sq m. Vertical extent is from about 10 to 30 cm below surface.

10. GENERALIZED SITE PROFILE
Type of Soil(s) Cultural Material



Indicate Depth of Levels

ENVIRONMENT

11. SOIL
USDA Soil Serie: Windsor
Contour Elevation: 96-98 feet abve sea level
% Slope of Ground: ☑ 0 - 5 ☑ 5 - 15 ☐ 15 - 25 ☐ Over 25
Acidity: 1 ——— 7 ——— 14 (Acid) (Base) 5.0

12. TOPOGRAPHY
☑ Flat ☑ Gentle undulation ☐ Other
☐ Rolling Hill ☐ Mountains

13. WATER
NEAREST WATER SOURCE: wooded wetlands
SIZE AND SPEED: N/A
DISTANCE FROM SITE: about 65m
SEASONAL AVAILABILITY: winter, spring, fall ?

14. VEGETATION
PRESENT: second growth white pine,oak forest
PAST: open fields/pasture in 19th century

CONDITION

15. SITE INTEGRITY
☐ Undisturbed ☑ Good ☐ Fair ☐ Destroyed
IF DISTURBED, DESCRIBE DISTURBANCE

16. SURROUNDING ENVIRONMENT
☑ Open Land ☑ Woodland ☐ Eroded Soils ☐ Residential ☐ Scattered Buildings Visible from Site
☐ Commercial ☐ Industrial ☑ Rural
☐ Coastal ☑ Isolated

17. ANY THREATS TO SITE ☑ Yes ☐ No
DESCRIBE POTENTIAL THREATS
proposed construction of wastewater treatment facility

18. ACCESSIBILITY TO PUBLIC
☐ Free Access ☑ Need Owner Permission ☐ Restricted ☐ No Access

RESEARCH STATUS			
19. PREVIOUS WORK			
☐ Surface Collecte	By Whom / Affiliation		Date
☐ "Pot hunted"	By Whom / Affiliation		Date
☑ Tested	By Whom / Affiliation	PAL staff	Date 11/2014
☐ Excavation	By Whom / Affiliation		Date

20. PRESENT LOCATION OF MATERIALS (INCLUDE ADDRESS)
PAL Inc 26 Main Street Pawtucket , RI 02860

21. REFERENCES / REPORTS Ritchie, Duncan 2015 Intensive Archaeological Survey of the Wastewater Pollution Control Facility, Norton, Massachusetts. PAL report 3038. submitted to CDM Smith, Inc, Boston, MA.and MFN Regional Wastewater District, Mansfield, MA.

SIGNIFICANCE

22. RECOVERED DATA (identify in DETAIL, including features, pits, burials, faunal material, etc.)

Sixteen pieces of chipping debris (5 gray rhyolite, 2 gray argillite, 9 Attleboro red felsite); 4 pieces of calcined mammal bone, 27 fragments of burned rock. Oxidized soil anomaly noted within B1 subsoil horizon in one test pit, but no distinct feature was visible.

23. ARCHAEOLOGICAL OR HISTORICAL SIGNIFICANCE

Not considered to be potentially significant due to lack of temporal /.cultural affiliation and low information content.

SITE PLAN

24. ATTACH PORTION OF USGS QUAD WITH SITE AREA MARKED TO THIS FORM

25. SKETCH PLAN OF SITE

See Attached Map

Scale:

26. PHOTOS: Attach if available
Label each with: Date of photo, photographer, view shown, name of site

REPORTED BY:		
NAME D Ritchie	ADDRESS 26 Main Street, Pawtucket,RI 02860	
ORGANIZATION PAL Inc		DATE 1/12/2015

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FIELD EVALUATION

COMMENTS

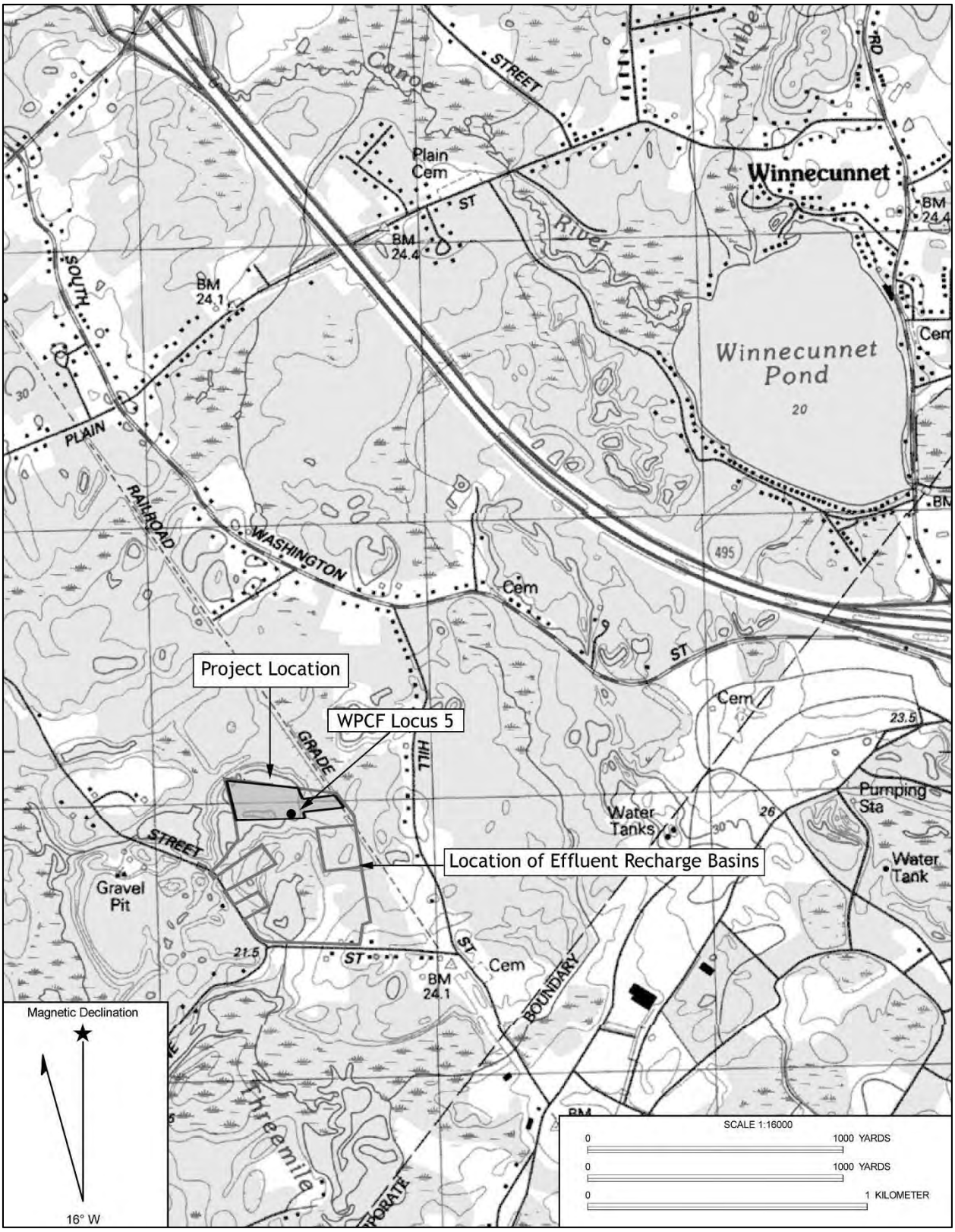


Figure 1. Location of WPCF Locus 5 within the Water Pollution Control Facility project area on the Norton, Massachusetts, 7.5 minute USGS topographic quadrangle.

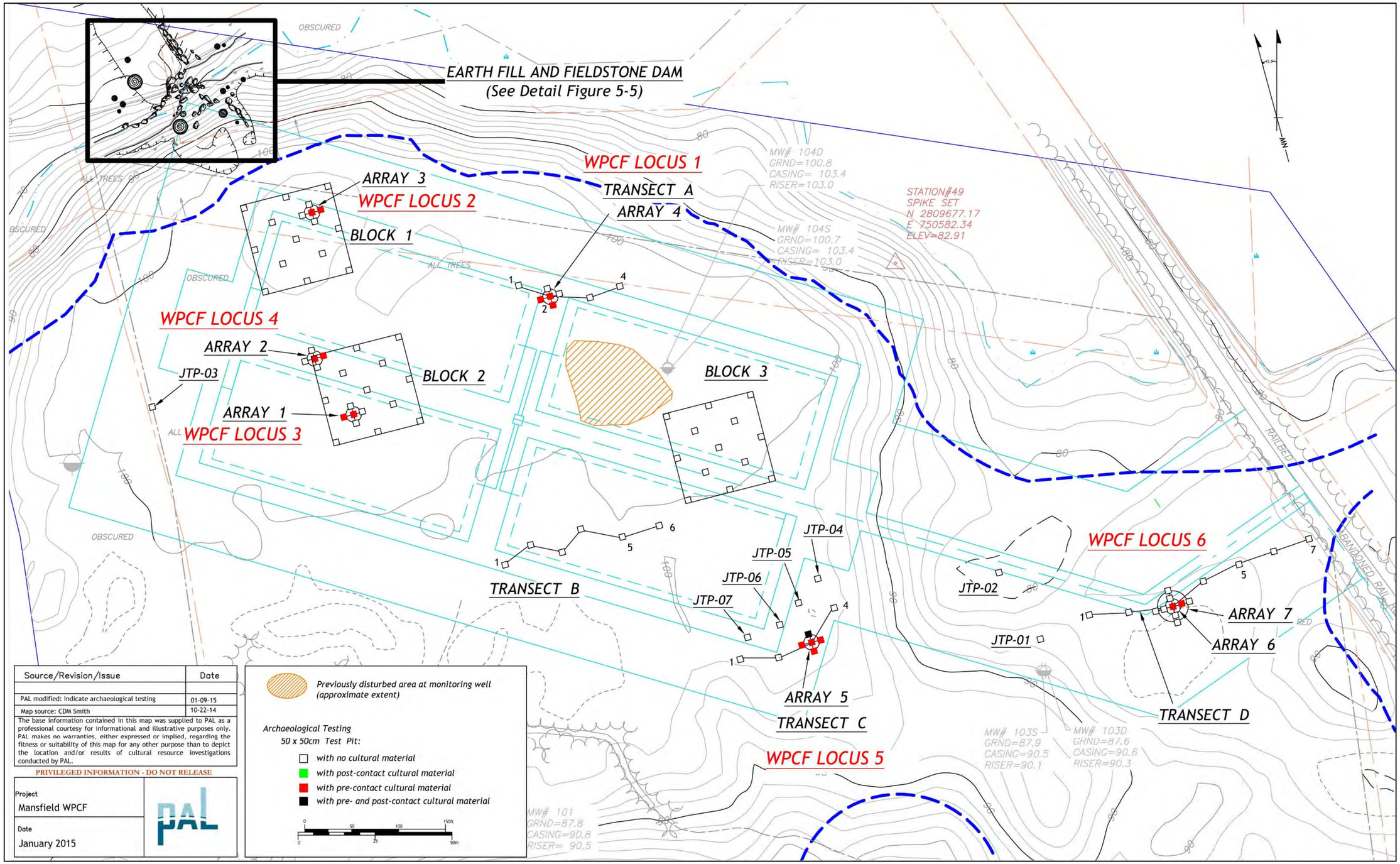


Figure 2. Location of sites within the Water Pollution Control Facility project area.

FORM D ARCHAEOLOGICAL SURVEY
PREHISTORIC ARCHAEOLOGICAL SITES

Massachusetts Historical Commission
Office of the Secretary
State House, Boston

FOR MHC OFFICE USE ONLY

Town
UTM
QUAD
NR ☐ ACT ☐ ELIG. ☐ NO DISTRICT ☐ YES ☐ NO

MHC NO.

IDENTIFICATION

1. SITE NAME(S) WPCF Locus 6 — MAS NO. — OTHER NO.

2. TOWN/CITY Norton — COUNTY Bristol

3. STREET AND NUMBER (IF NOT AVAILABLE, GIVE DETAILED DESCRIPTION OF HOW TO REACH SITE)
located about 350 m northeast of Pine Street and about 70m west of railroad easement

4. OWNER(S) AND ADDRESS(ES) Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD), Mansfield Town Hall, Six Park Row, Mansfield, MA 02048.
☐ Public ☑ Private

5. SITE LOCATED BY
☑ CRM Survey ☐ Avocational Collector ☐ Field School ☐ Other (Specify)
Describe Sampling Strategy used to Locate Site 50x50cm test pits on judgmental transect and in 2.5m and 5m array patterns.

DESCRIPTION

6a. PERIOD(S) (Check all applicable boxes
☐ Paleo ☐ Early Woodland ☐ Contact
☐ Early Archaic ☐ Middle Woodland ☑ Unknown
☐ Middle Archaic ☐ Late Woodland ☐ Other (Specify)
☐ Late Archaic

6b. Estimated Occupation Range unknown

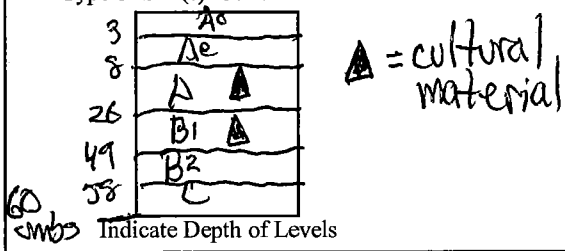
☐ Single Component ☐ Multi-Component
Specify All Components
unknown

7. DATING METHODS
C-14 ☐ Intuition ☐ Other (specify)
Comparative Materials

8. DESCRIBE SITE TYPE / FUNCTION small temporary encampment.

9. DESCRIBE SIZE AND HORIZONTAL AND VERTICAL BOUNDARIES
Horizontal extent appears to be about 10 sq m. Vertical extent is from about 10 to 50cm below surface.

10. GENERALIZED SITE PROFILE
Type of Soil(s) Cultural Material



ENVIRONMENT

11. SOIL
USDA Soil Serie: Windsor
Contour Elevation: 87 feet above sea level
% Slope of Ground: ☑ 0 - 5 ☑ 5 - 15 ☐ 15 - 25 ☐ Over 25
Acidity: 1 ——— 7 ——— 14 (Acid) (Base) 5.0

12. TOPOGRAPHY
☐ Flat ☐ Gentle undulation ☐ Other
☑ Rolling Hill ☐ Mountains

13. WATER
NEAREST WATER SOURCE: unnamed stream wooded wetland
SIZE AND SPEED: small, slow
DISTANCE FROM SITE: about 65m
SEASONAL AVAILABILITY: year round

14. VEGETATION
PRESENT: second growth white pine ,oak, red maple forest
PAST: open fields/pasture in 19th century

CONDITION

15. SITE INTEGRITY
☐ Undisturbed ☑ Good ☐ Fair ☐ Destroyed
IF DISTURBED, DESCRIBE DISTURBANCE

16. SURROUNDING ENVIRONMENT
☑ Open Land ☑ Woodland ☑ Eroded Soils ☐ Residential ☐ Scattered Buildings Visible from Site
☐ Commercial ☐ Industrial ☑ Rural
☐ Coastal ☑ Isolated

17. ANY THREATS TO SITE
☑ Yes ☐ No
DESCRIBE POTENTIAL THREATS
proposed construction of access road and sewer force main for wastewater treatment facility

18. ACCESSIBILITY TO PUBLIC
☐ Free Access ☑ Need Owner Permission ☐ Restricted ☐ No Access

RESEARCH STATUS

19. PREVIOUS WORK		
☐ Surface Collecte	By Whom / Affiliation	Date
☐ "Pot hunted"	By Whom / Affiliation	Date
☑ Tested	By Whom / Affiliation PAL staff	Date 11/2014
☐ Excavation	By Whom / Affiliation	Date

20. PRESENT LOCATION OF MATERIALS (INCLUDE ADDRESS)
PAL Inc 26 Main Street Pawtucket , RI 02860

21. REFERENCES / REPORTS Ritchie, Duncan 2015 Intensive Archaeological Survey of the Wastewater Pollution Control Facility, Norton, Massachusetts. PAL report 3038. submitted to CDM Smith, Inc, Boston, MA.and MFN Regional Wastewater District, Mansfield, MA.

SIGNIFICANCE

22. RECOVERED DATA (identify in DETAIL, including features, pits, burials, faunal material, etc.)

Unifacial tool made from a 5.0-cm-long and 3.5-cm-wide pebble of deeply weathered, light tan/gray rhyolite; and a small shoulder barb fragment of a projectile point made of dark gray rhyolite. Its narrow outline, sharply pointed termination, and remnant shoulder to stem angle are similar to those found on Early Archaic bifurcate-base projectile points. One very small (0-1cm) flake of white quartz.

23. ARCHAEOLOGICAL OR HISTORICAL SIGNIFICANCE

Based on results of close interval (2.5m, 5m) subsurface testing, MWPCF Locus 6 is not considered potentially significant and additional archaeological investigation is unlikely to yield more information.

SITE PLAN

24. ATTACH PORTION OF USGS QUAD WITH SITE AREA MARKED TO THIS FORM

25. SKETCH PLAN OF SITE

See Attached Map

Scale:

26. PHOTOS: Attach if available
Label each with: Date of photo, photographer, view shown, name of site

REPORTED BY:	NAME D Ritchie	ADDRESS 26 Main Street, Pawtucket, RI 02860	
	ORGANIZATION PAL Inc		DATE 1/12/2015

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FIELD EVALUATION

COMMENTS

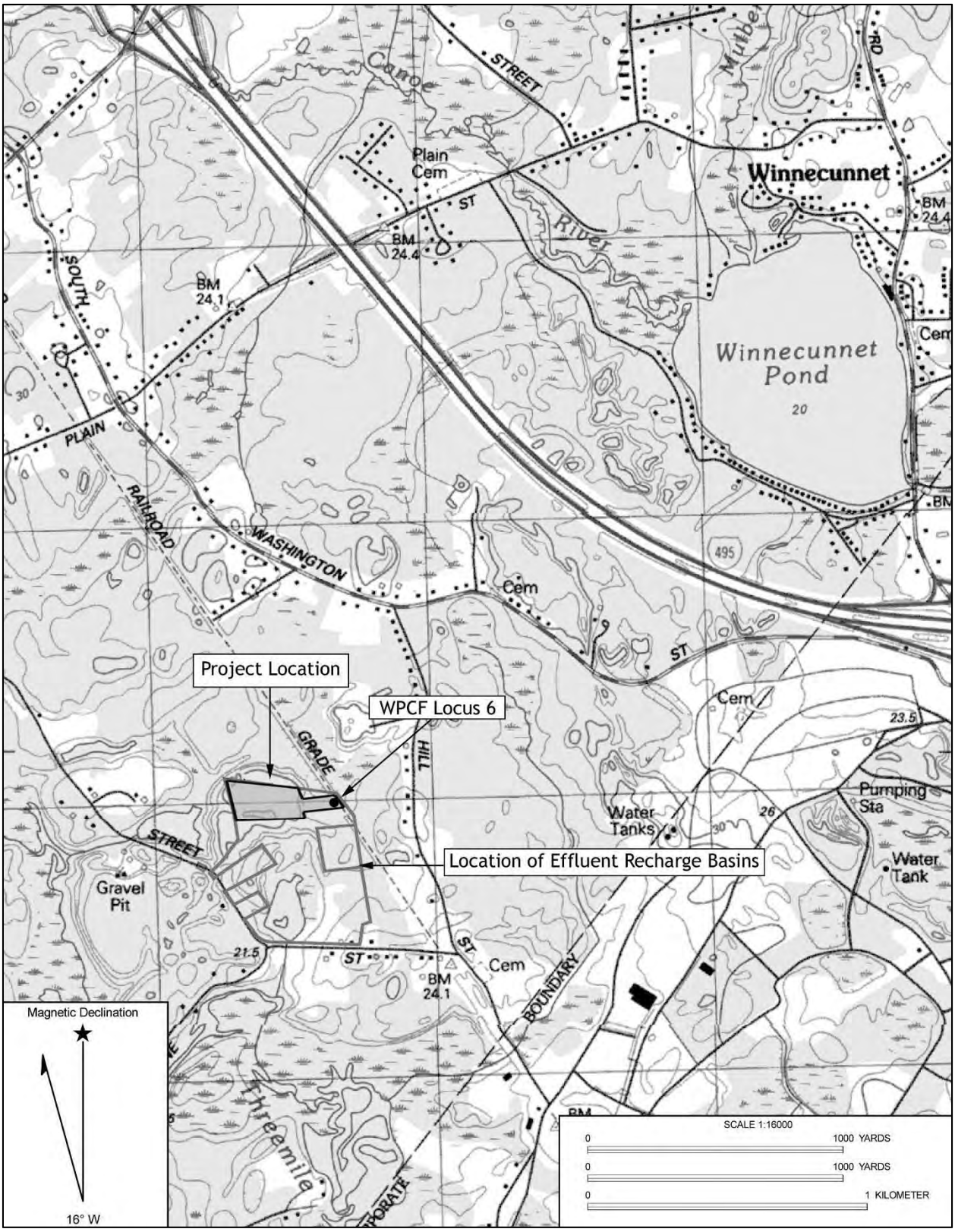

Figure 1. Location of WPCF Locus 6 within the Water Pollution Control Facility project area on the Norton, Massachusetts, 7.5 minute USGS topographic quadrangle.

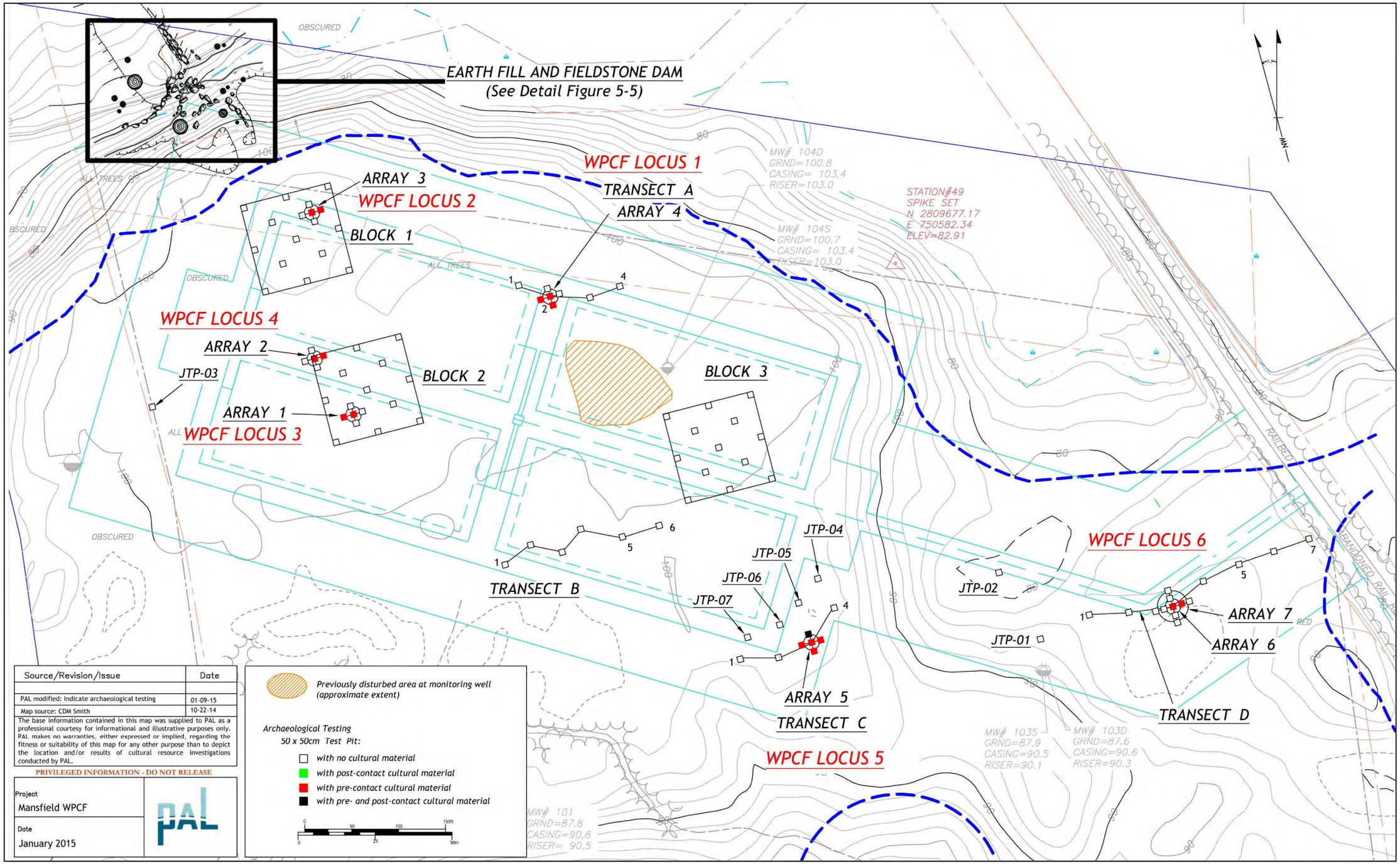

Figure 2. Location of sites within the Water Pollution Control Facility project area.

FORM D ARCHAEOLOGICAL SURVEY
HISTORIC ARCHAEOLOGICAL SITES

Massachusetts Historical Commission
Office of the Secretary
State House, Boston

FOR MHC OFFICE USE ONLY

Town
UTM
QUAD

MHC NO. No MHC#

NR ☐ ACT ☐ ELIG. ☐ NO DISTRICT ☐ YES ☐ NO

IDENTIFICATION

1. SITE NAME(S) Earth Fill and Fieldstone Dam — MAS NO. — OTHER NO.

2. TOWN/CITY Norton — COUNTY Bristol

3. STREET AND NUMBER (IF NOT AVAILABLE, GIVE DETAILED DESCRIPTION OF HOW TO REACH SITE)
located about 300m north of Pine Street and 115m west of railroad easement.

4. OWNER(S) AND ADDRESS(ES) Mansfield/Foxborough/Norton Regional Wastewater District (MFNRWD),Mansfield Town Hall, Six Park Row, Mansfield, MA 02048. ☐ Public ☑ Private

5. SITE LOCATED BY
☑ CRM Survey ☐ Avocational Collector ☐ Field School ☐ Other (Specify)
Describe Sampling Strategy used to Locate Site walkover inspection

DESCRIPTION

6a. PERIOD(S) (Check all applicable boxes
☐ 17th C. ☐ 18th C. ☑ 19th C. ☐ 20th C. ☐ Unknown

6b. Estimated Occupation Range probably 19th century

7. DATING METHODS
MAPS not shown on historic maps
TITLE SEARCH ☐ Yes ☑ No
ADDITIONAL DOCUMENTS
Comparative Materials
OTHER

8a. SITE TYPE ☐ Agrarian ☐ Residential ☑ Industrial ☐ Commercial ☐ Military ☐ Unknown ☐ Other (Specify)

8b. DESCRIBE earth fill dam with fieldstone facing

9. DESCRIBE SIZE AND HORIZONTAL AND VERTICAL BOUNDARIES
On SE embankment of stream is short section of dam about 7 m long and 4.5 m wide. Borrow pit about 4.5 m long and 6 m wide is at base of a steep slope on south side of stream. Section of dam on NW side of stream about 20 m long and 6 m in maximum width extends outside the MFNRWD property to unpaved roadway or cart path.

10. STRATIGRAPHY

Surface Indicators	Stratigraphy
☑ Standing Ruins	☐ Stratified
☐ Surface Finds	☐ NOT Stratified
☐ Markers	☑ Below Ground Structural Remains
☐ Cellar Hole	

ENVIRONMENT

11. SOIL
USDA Soil Serie: Windsor
Contour Elevation: 70 feet above sea level
% Slope of Ground: ☑ 0 - 5 ☑ 5 - 15 ☐ 15 - 25 ☐ Over 25
Acidity: 1 (Acid) — 7 — 14 (Base) 5.0

12. TOPOGRAPHY
☑ Flat ☐ Gentle undulation ☐ Other
☑ Rolling Hill ☐ Mountains

13. WATER
NEAREST WATER SOURCE: unnamed stream
SIZE AND SPEED: small, slow
DISTANCE FROM SITE: on site
SEASONAL AVAILABILITY: year round

14. VEGETATION
PRESENT: second growth red maple, shrubs, oak, white pine
PAST

CONDITION

15. SITE INTEGRITY
☑ Undisturbed ☐ Good ☐ Fair ☐ Destroyed
IF DISTURBED, DESCRIBE DISTURBANCE

16. SURROUNDING ENVIRONMENT
☑ Open Land ☑ Woodland ☐ Eroded Soils ☐ Residential ☐ Scattered Buildings Visible from Site
☐ Commercial ☐ Industrial ☑ Rural
☐ Coastal ☑ Isolated

17. ANY THREATS TO SITE ☐ Yes ☑ No
DESCRIBE POTENTIAL THREATS: none

18. ACCESSIBILITY TO PUBLIC
☐ Free Access ☑ Need Owner Permission ☐ Restricted ☐ No Access

RESEARCH STATUS

19. PREVIOUS WORK

☐ Surface Collecte	By Whom / Affiliation	Date
☐ "Pot hunted"	By Whom / Affiliation	Date
☐ Tested	By Whom / Affiliation	Date
☐ Excavation	By Whom / Affiliation	Date

20. PRESENT LOCATION OF MATERIALS (INCLUDE ADDRESS)
PAL Inc 26 Main Street Pawtucket , RI 02860

21. REFERENCES / REPORTS Ritchie, Duncan 2015 Intensive Archaeological Survey of the Wastewater Pollution Control Facility, Norton, Massachusetts. PAL report 3038. submitted to CDM Smith, Inc, Boston, MA.and MFN Regional Wastewater District, Mansfield, MA.

SIGNIFICANCE

22. RECOVERED DATA (identify in DETAIL, including structures, related outbuildings, landscape features, etc.)

Documentary: none of dam. Mill downstream on Pine Street (Briggs Wheelwright Shop) downstream near Pine Street shown on a late nineteenth-century map of Norton (Beers 1871)

Archeological see attached sketch plan

23. ARCHAEOLOGICAL OR HISTORICAL SIGNIFICANCE

Potentially significant for association with rural industrial site downstream. This dam was probably built in the mid to late-nineteenth century to impound and store water for a small mill site (the Briggs Wheelwright Shop) downstream near Pine Street.

SITE PLAN

24. ATTACH PORTION OF USGS QUAD WITH SITE AREA MARKED TO THIS FORM

25. SKETCH PLAN OF SITE

See Attached Map

Scale:

26. PHOTOS: Attach if available
Label each with: Date of photo, photographer, view shown, name of site

REPORTED BY:	NAME D Ritchie	ADDRESS 26 Main Street, Pawtucket RI 02860	
	ORGANIZATION PAL Inc		DATE 1/12/2015

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FIELD EVALUATION

COMMENTS

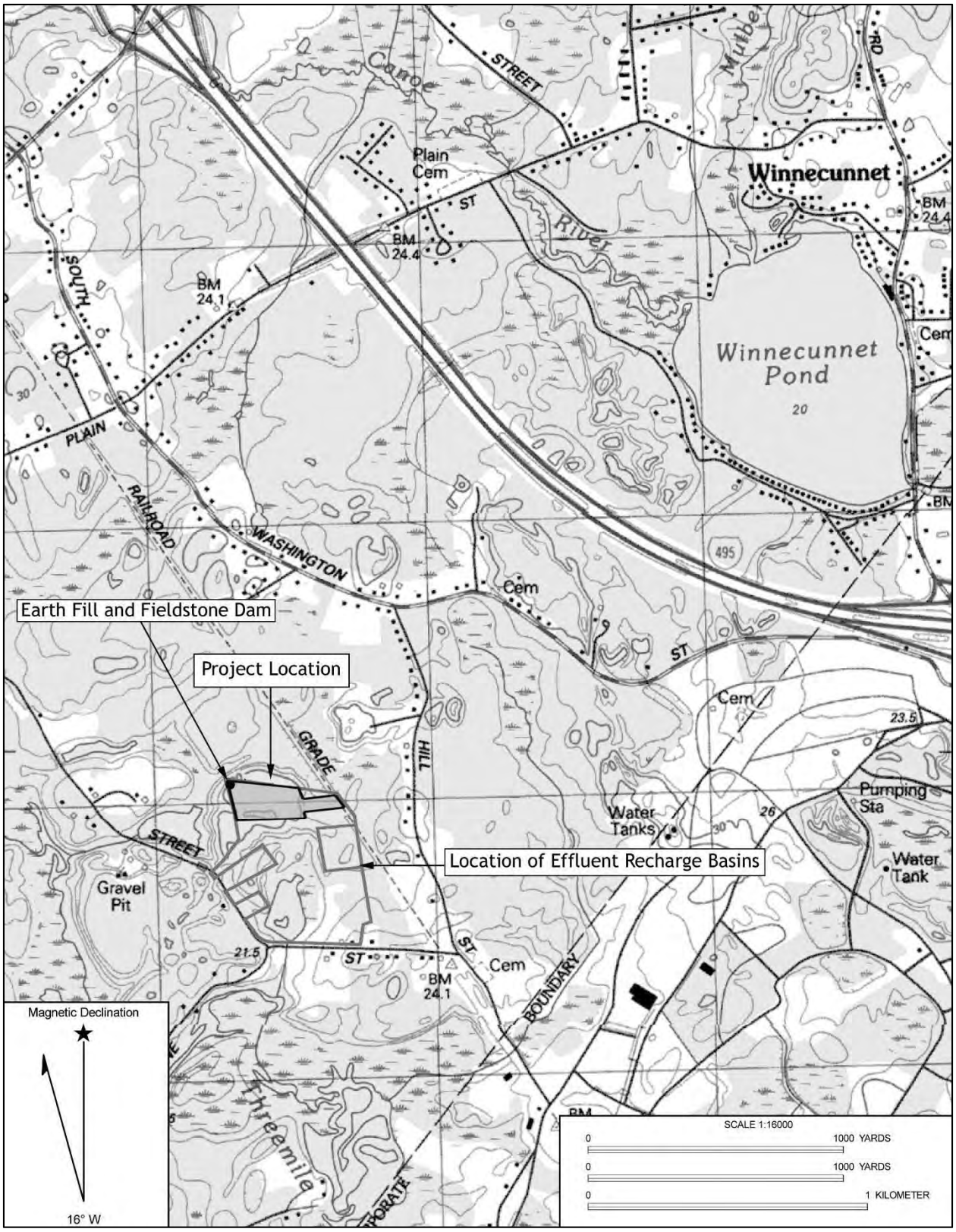

Figure 1. Location of Earth Fill and Fieldstone Dam within the Water Pollution Control Facility project area on the Norton, Massachusetts, 7.5 minute USGS topographic quadrangle.

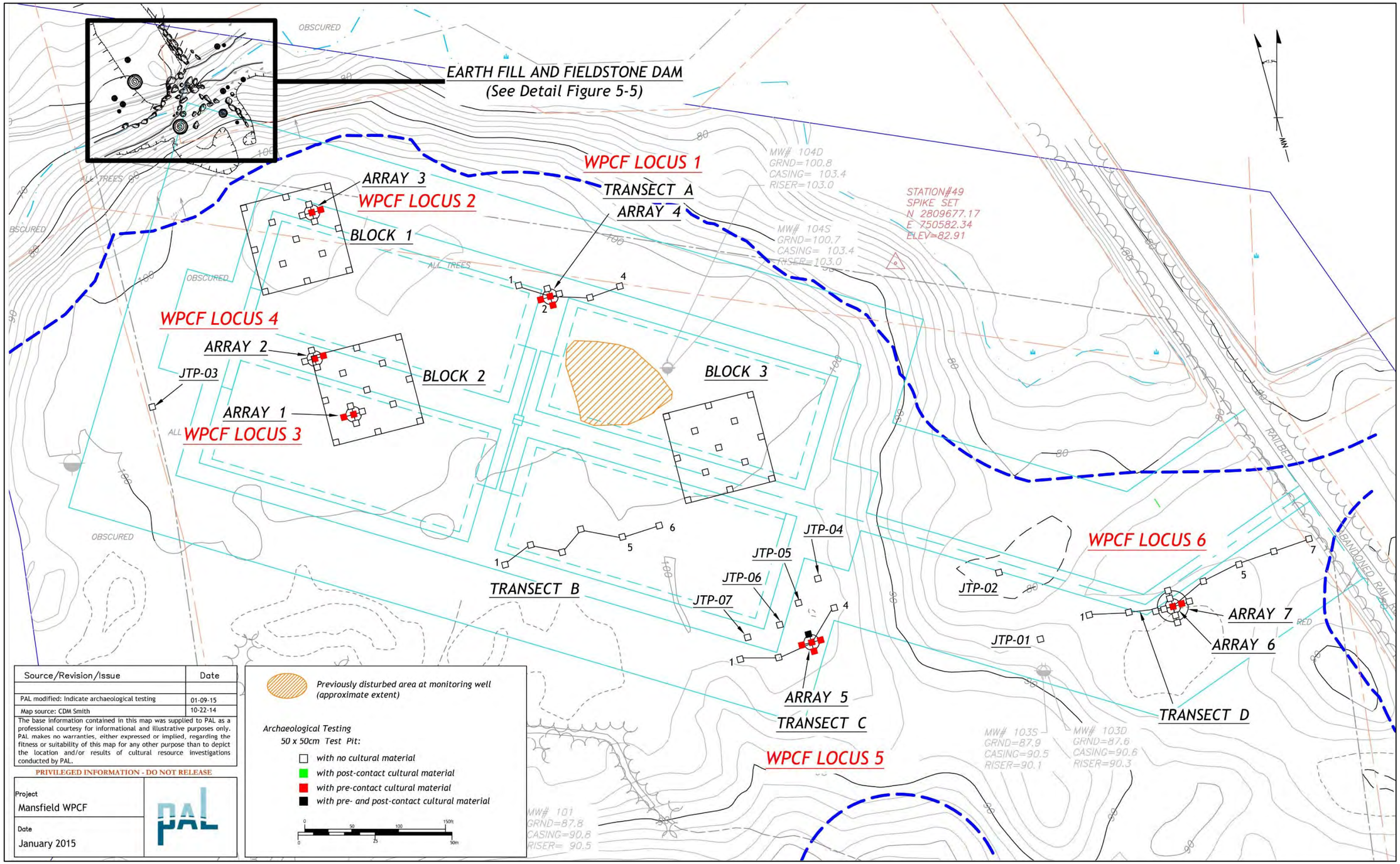

Figure 2. Location of sites within the Water Pollution Control Facility project area.

APPENDIX L

FEIR DISTRIBUTION LIST

FEIR
Distribution List

Secretary Matthew A. Beaton
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Commissioner Martin Suuberg
Department of Environmental Protection
Commissioner's Office
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Southeastern Regional Office
Attn: MEPA Coordinator
Lakeville, MA 02347

Massachusetts Department of Transportation
Executive Office of Transportation
Attn: Environmental Reviewer
10 Park Plaza – Room 3170
Boston, MA 02116

Massachusetts Department of Transportation – District #5
1000 County Street
Taunton, MA 02780

Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

Massachusetts Bay Transit Authority
Attn: MEPA Reviewer
10 Park Plaza, Suite 3910
Boston, MA 02216

Southeastern Regional Planning and Economic Development District
88 Broadway
Taunton, MA 02780

Natural Heritage and Endangered Species Program
Commonwealth of Massachusetts
Route 135
Westborough, MA 02116-3969

Water Resources Commission
Attn: Michele Drury
Commonwealth of Massachusetts
100 Cambridge Street
Boston, MA 02114

U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01810

Massachusetts Department of Conservation and Recreation
Attn: MEPA Coordinator
251 Causeway Street, Suite 600
Boston, MA 02114

Massachusetts Aeronautics Division (formerly Massachusetts Aeronautics Commission)
Logan Office Center
One Harborside Drive
Suite 205N
East Boston, MA 02128-2909

Water Supply Citizens Advisory Committee
485 Ware Road
Belchertown, MA 01007

Mansfield Board of Selectmen/Water and Sewer Commissioners
Town Hall
Six Park Row
Mansfield, MA 02048

William Ross, Mansfield Town Manager
Six Park Row
Mansfield, MA 02048

Mansfield Department of Public Works
Attn: Lee Azinheira
Six Park Row
Mansfield, MA 02048

Mansfield Conservation Commission
Town Hall
Six Park Row
Mansfield, MA 02048

Mansfield Planning Board
Town Hall
Six Park Row
Mansfield, MA 02048

Mansfield Board of Health
Town Hall
Six Park Row
Mansfield, MA 02048

Norton Board of Selectmen
70 East Main Street
Norton, MA 02766

Town of Norton
Water & Sewer Department
166 John Scott Boulevard
P.O. Box 1168
Norton, MA 02766

Norton Conservation Commission
70 East Main Street
Norton, MA 02766

Town of Norton
Planning Board/Planning & Zoning Department
70 East Main Street
Norton, MA 02766

Town of Norton
Highway Department
DPW Garage
70 Rear East Main Street (Mail to: 70 East Main St.)
Norton, MA 02766

Norton Board of Health
Norton Town Hall
70 East Main Street (2nd floor)
Norton, MA 02766

Town of Foxborough
Board of Water and Sewer Commissioners
40 South Street
Foxborough, MA 02035

MFN District Commissioners
Attn: Mike Yunits, Commission Chairman
70 East Main Street
Norton, MA 02766

MFN District Water Pollution Control Facility
Attn: Ken Hackett
80 Hill Street (at Crane St)
Norton, Massachusetts 02766

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