GRAVEL PIT PARTIAL RECLAMATION OPERATIONS PLAN

Longa Sand & Gravel Pit

17 Twin Bridge Road
Merrimack, New Hampshire

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TABLE OF CONTENTS

1.0 INTRODUCTION 1-1

2.0 RSA 155-E: GRAVEL PIT RECLAMATION REQUIREMENTS 2-1

3.0 SITE BACKGROUND 3-1

3.1 Site Location and History 3-1
3.2 Property Owner, Operator & Environmental Consultant 3-1
3.3 Land Use of Site and Surrounding Properties 3-2

4.0 DESCRIPTION OF PROPOSED SITE OPERATIONS 4-1

4.1 Ongoing Gravel Pit Operations 4-1
4.2 Partial Gravel Pit Reclamation 4-1

5.0 TESTING AND ACCEPTANCE REQUIREMENTS 5-1

5.1 Field Screening/Visual Criteria 5-1
5.2 Soil Classification & Testing Requirements 5-2
5.3 Soil Acceptance Standards 5-3

6.0 SOIL APPROVAL PROCESS AND ON-SITE REUSE 6-1

6.1 Soil Submittal Package 6-1
6.2 Soil Placement and Tracking 6-1
6.3 Site Grading, Stormwater Management & Stabilization 6-2
6.4 Sanitary Sewer Utility Protection Plan 6-3
6.5 Site Access & Traffic Management 6-4
6.6 Pollution Prevention & Good Housekeeping 6-5

7.0 PERMITTING AND RECORDKEEPING 7-1

7.1 Local, State & Federal Approvals 7-1
7.2 Facility Records 7-2
7.3 Reclamation Plan Updates 7-3

8.0 SCHEDULE OF OPERATIONS 8-1

9.0 HEALTH AND SAFETY 9-1

APPENDICES

Appendix A – Site Locus, Natural Resource Maps & Historical USGS Maps
Appendix B – Engineered Site Plans (3 sheets) & June 2006 Sewer As-Built Plans
Appendix C – Table 3. Soil Acceptance Standards
Appendix D – Generator Profile, Material Shipping Record and Weekly Site Inspection Form
Appendix E – Stormwater Analysis
Appendix F – Spill Response Guideline and Emergency Contact List
Appendix G – Approvals, Permits and Record of Changes/Amendments

1.0 INTRODUCTION

This Gravel Pit Partial Reclamation Operations Plan (Operations Plan) is prepared for Brighter Horizons Environmental, Inc. (BHE), the project Operator, in cooperation with the Longa Family, the property Owner and Operator of an ongoing mining operation adjacent to the reclamation project limit of work. The area designated for filling activities under this Operations Plan is known as the "Reclamation Area" and is also referred to as the "Site" throughout this document. The Site consists of 3 parcels (5D-4-74-1, 5D-1-10 & 5D-2-10) that are approximately 81 acres in total land area with approximately 8.25 acres that are part of the active sand and gravel mining area. Approximately 10.8 acres that were previously excavated will serve as the proposed Reclamation Area.

Operation, maintenance and Site restoration activities will occur within the proposed Reclamation Area based on this Operations Plan, as appropriate, to successfully reclaim and restore a portion of the property. Filling will be initiated with urban fill and natural soils that meet residential standards (i.e., Env-Or 606,19, Table 600-2) and do not restrict future reuse of the Site.

BHE will conduct gravel pit reclamation operations consistent with this Operations Plan and in accordance with the approvals and/or requirements of the Town of Merrimack (Town) and the New Hampshire Department of Environmental Services (NHDES). The Operations Plan will be updated if significant changes to the project are proposed, after the new information is reviewed with the Town and NHDES, as necessary. A copy of this Operations Plan and accompanying documentation related to reclamation activities will be maintained on-site at all times and available for review by the Town and NHDES.

The ultimate goal of the reclamation is to fill the former mining area in order to provide a Site that can be redeveloped without environmental restrictions.

2.0 RSA 155-E: GRAVEL PIT RECLAMATION REQUIREMENTS

The Longa property is classified as a "grandfathered excavation" under New Hampshire Title XII Public Safety and Welfare, Chapter 155-E Local Regulation Excavations. The statute gives the Town of Merrimack, NH Planning Board (Board) the authority/responsibility to regulate the Revised Statutes Annotated (RSA) 155-E. The Merrimack Planning Board regulates excavations under the Zoning and Building Code Section 14.0, under provisions of RSA 155-E Sections 1 – 11. In general, the Boards regulation for grandfathered excavation sites does not specifically address the requirements of a "reclamation plan". According to RSA 155-E, a Reclamation Plan must incorporate the following standards for the area affected by the excavation activities which are as follows. Note that the plan to address these standards is summarized in italics:

- Except for exposed rock ledge, all areas which have been affected by the excavation or otherwise stripped of vegetation must be spread with topsoil or strippings, if any, but in any case covered by soil capable of sustaining vegetation, and shall be planted with seedlings or grass suitable to prevent erosion. Areas visible from a public way, from which trees have been removed, shall be replanted with tree seedlings, set out in accordance with acceptable horticultural practices. *These requirements are addressed in Section 6.3.*
- Earth and vegetative debris resulting from the excavation shall be removed or otherwise lawfully disposed. *Since the Site is a previously disturbed area that will be filled for reclamation, there is no significant earth and vegetative debris expected.* All slopes, except for exposed ledge, shall be graded to natural repose for the type of soil of which they are composed so as to control erosion or at a ratio of horizontal to vertical proposed by the owner and approved by the regulator. Changes of slope shall not be abrupt, but shall blend with the surrounding terrain. *Due to current Site conditions, reclamation will involve filling in an existing depression; therefore no significant slopes will be created with the proposed fill.*
- Any standing bodies of water created in the excavation project as may constitute a hazard to health and safety must be eliminated. *No standing bodies of water will be created during the filling of the Site. The stormwater management approach for the project is to keep all stormwater on-site within the reclamation area, which is consistent with current conditions. During heavy rains, some temporary pooling may occur within the reclamation area, but it is expected that suitable, free draining fill will be used to reduce the potential for pooling. This information is discussed further in Section 6.3.*
- The topography of the land shall be left so that water draining from the Site leaves the property at the original, natural drainage points and in the natural proportions of flow. *The proposed reclamation activities are intended to maintain existing stormwater management conditions with no off-site discharge to be protective of the Souhegan and Merrimack Rivers. The runoff conditions prior to the gravel mining operations will have to be considered if future development is proposed and grade changes will result in an off-site discharge of stormwater.*

Under RSA 155-E, the owner of a gravel pit must reclaim the site once mining operations cease. Although a portion the Site is an active mining operation, the property owner wants to begin reclamation at areas where mining is complete to meet the requirements of RSA 155-E. This Operations Plan was developed to address the above requirements, as well as the additional local, State and Federal permitting requirements discussed further in this plan.

3.0 SITE BACKGROUND

A brief summary of information related to the Site location and history, property ownership and land use is provided below.

3.1 Site Location and History

The property is located off Twin Bridge Road in the Town of Merrimack, New Hampshire. The Site is at a latitude of 42° 52' 11.73" North and a longitude of 71° 29' 20.10" West. Site Locus and Natural Resource Maps are provided in **Appendix A**. Current topography of the Site generally follows a northwestern high to southeastern low elevation change with an elevation high of ~150-feet above mean sea level (MSL) and an elevation low of ~100-feet above MSL. Historical USGS maps are provided in Appendix A and illustrate Site conditions prior to mining activities. These maps date back to 1905 and show a gradual slope across the Site from elevation 140-feet along the northwest to elevation 120-feet to the south at the confluence of the Merrimack and Souhegan Rivers. These maps appear to represent Site conditions prior to gravel mining activities and the most recent USGS map (2012) is generally consistent with the current topography across the Site.

The Site is bordered to the east by the Merrimack River and the Boston & Maine Railroad, to the west by Baboosic Brook, to the north by mixed commercial/residential properties and to the south by the Souhegan River. A spur track to the Boston & Maine Railroad is located within the southern portion of the Site. Typical land cover at the Site is open sand and gravel with low-lying scrub brush and young vegetation in areas where mining is not active. Portions of the 250-foot shoreland zone to the Merrimack River support a more established vegetative cover as does the former on-site disposal area that ceased operation in 1981. The former disposal area contains stumps, demolition waste and a portion was used as the former Town Dump (Town of Merrimack, ~1946-1970). The former disposal area is separate from the Reclamation Area.

3.2 Property Owner, Operator & Environmental Consultant

The Site is currently owned and operated by the Longa Family as a grandfathered sand and gravel pit under New Hampshire Title XII Public Safety and Welfare, Chapter 155-E Local Regulation Excavations. The Site consists of 3 parcels (5D-4-74-1, 5D-1-10 & 5D-2-10) that are approximately 81 acres in total land area with approximately 8.25 acres that are part of the active sand and gravel mining area. Approximately 10.8 acres that were previously excavated will serve as the proposed Reclamation Area. BHE is under contract with the Longa Family to operate the partial reclamation within this 10.8 acres, as discussed within this Operations Plan, and will be considered the Operator under this Operations Plan. AMEC Environment & Infrastructure, Inc. (AMEC) will serve as the Environmental Consultant for the project under contract to BHE. Information for project contacts and responsibilities is provided below.

Property Owner
James Longa & Sons, Inc.
17 Twin Bridge Road, Merrimack NH 03054

Contact: Jack Longa
(603) 424-9210 tel.
Responsibilities: daily control & coordination of all Site operations.

Reclamation Operator
Brighter Horizons Environmental, Inc.
PO Box 219, Chelmsford, MA 01824

Contact: Shane Duval
sduval73@aol.com
(978) 970-0500 tel.
(978) 970-0501 fax.

Responsibilities: preparation of soil submittal packages, daily tracking of on-site soil management activities; Site grading operations; weekly inspections; and Operations Plan, permit compliance, and regulatory compliance.

Environmental Consultant
AMEC Environment & Infrastructure, Inc.
2 Robbins Road, Westford, MA 01886

Contact: Rich Niles
rich.niles@amec.com
(978) 692-9090 tel.
(603) 692-6633 fax.

Responsibilities: review of soil submittal packages, review of weekly inspection reports, and engineering support for Operations Plan and permit compliance.

3.3 Land Use of Site and Surrounding Properties

The property was previously, and is currently used for earth removal activities in support of sand and gravel mining operations. Mining operations were formerly conducted by the Longa Family within the proposed 10.8 acre reclamation area, as discussed above. Active mining operations are within the 8.25 acre area to the west of the reclamation area. Site Plans are provided in **Appendix B** and illustrate the overall Site features, proposed Reclamation Area and grading plan.

The majority of the Site is zoned Residential (R) with the southern and eastern portions of the Site zoned Industrial 1 (I-1). The entire Site is located within the Aquifer Protection District, as shown on the Town of Merrimack Aquifer Conservation District & Wellhead Protection Areas map, adopted December 1996 (see map in Appendix A). The wellhead protection area for the Merrimack Village District (MVD) Wells 4 and 5 crosses the Site boundary to the north and outside of the proposed reclamation area, as shown on Sheet C-101 in Appendix B.

Sheet C-101 in Appendix B shows the estimated limit of the 250-foot shoreland protection area for Baboosic Brook and the Souhegan and Merrimack Rivers. Some portions of the proposed Reclamation Area fall within the 250-foot shoreland area; however, these areas were disturbed during previous mining activities and this partial reclamation will be an improvement. It appears that a small area along the southern portion of the proposed Reclamation Area is within the Town of Merrimack Flood Hazard Conservation District (100-yr. & 500-Yr. floodplains) since previous mining activities occurred within the 500-yr floodplain. According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map No. 33011C0501D, the base flood elevation for the 100-year floodplain in this area is approximately 118 feet MSL and the proposed reclamation activities in this area of the Site are not expected to exceed this fill elevation in order

to return to the pre-existing floodplain elevation. A copy of the above referenced FEMA maps is provided in Appendix A.

Current infrastructure and equipment associated with the active mining operation is limited to storage sheds/trailers, a garage, heavy equipment and a residential building. The Plan of Land dated August 31, 1987 and the Lot Line Revision and Consolidation Plan dated March 5, 1997 show utility easements across each of the parcels for sewer, water and electric (PSNH). There are no existing utilities within the active mining area, the proposed Reclamation Area, or the former disposal area. Proposed reclamation activities will be conducted in close proximity to the Town of Merrimack sanitary sewer utility along the spur track to the south. Protection of this utility is discussed in more detail in Section 6.4. Plan sheets C-101 and C-102 in Appendix B illustrate the above Site features based on record plans and GIS data provided by the Town of Merrimack. Many of these Site features are shown as “approximate” since AMEC did not field verify this information. This level of detail and accuracy is appropriate for this project since the majority of these features are not located in close proximity to the proposed Reclamation Area.

Currently, stormwater runoff infiltrates on-site and there is no stormwater run-off from past or current gravel mining areas to adjacent properties or features. For example, stormwater runoff that does not immediately infiltrate into the soils may accumulate at the low lying area (~EL 100) at the northern portion of the proposed Reclamation Area and result in temporary standing water, that remains on-site, with levels that fluctuate with groundwater elevations (note the Merrimack River is at ~EL 100). Site operations have resulted in grading conditions that are all below adjacent natural high ground, such that all stormwater runoff drains to the interior. Additional information related to stormwater management is discussed in Section 6.3 of this Operations Plan.

4.0 DESCRIPTION OF PROPOSED SITE OPERATIONS

This section describes the proposed Reclamation Area operation, maintenance and restoration activities. The drawings (sheet C-101 and C-102) provided in Appendix B show the proposed Reclamation Area, existing grades and the proposed grading plan.

4.1 Ongoing Gravel Pit Operations

The Longa Family will continue to operate the sand and gravel mining operation at the Site, which encompasses an approximate 8.25 acre area. The export of material is largely dependent on local construction activity and material demand. The gravel pit operations also include stump grinding and asphalt and concrete processing as products for resale. It is not anticipated that the proposed reclamation operations will impact existing Site operations or traffic flow. There is adequate space at the property for material storage and management such that material can be segregated and tracked to avoid commingling with the reclamation materials. No stumps or other debris/waste will be used as fill within the proposed Reclamation Area.

4.2 Partial Gravel Pit Reclamation

BHE proposes to import fill materials to restore the south central portion of the property by filling the former mining area to a more suitable elevation to support a future reuse of the Site to be determined by the Longa Family. The fill materials and/or natural soils will originate from various off-site construction projects and no unsuitable material (e.g., material containing unacceptable organic content), stumps, waste or construction debris will be used as fill during reclamation activities.

The fill material will be delivered to the Site and backfilled to the approximate limits shown on the plans in Appendix B. Once the reclamation portion of the Site is restored to approximately elevation 118-120 MSL, this Operations Plan may be updated or amended to expand the Reclamation Area to other previously mined areas and/or modify proposed final grades. As discussed in Section 3.1, the historical USGS maps in Appendix A illustrate Site conditions prior to mining activities. These maps date back to 1905 and show a gradual slope across the Site from elevation 140-feet along the northwest to elevation 120-feet to the south at the confluence of the Merrimack and Souhegan Rivers. The proposed reclamation activities will; therefore, restore the southeastern portion of the Site close to pre-existing conditions based on elevation contours and estimates from historical USGS maps.

As shown on the plans in Appendix B, approximately 10.8 acres of land is available within the south central portion of the property for the proposed reclamation. The gravel pit reclamation will improve Site conditions from a historical open gravel pit and assist the Longa Family in meeting its obligations to restore the Site under NH RSA 155-E. Significant changes to the project will require review and approval by the Town and NHDES, as discussed in Section 7.1.

5.0 TESTING AND ACCEPTANCE REQUIREMENTS

Field screening and laboratory analytical testing will be required for soils prior to placement at the Site. Soil testing will conform to NHDES requirements to demonstrate that the soils are suitable for placement at the Reclamation Area. The soil generator is required to provide the Reclamation Operator with all laboratory test reports and a complete Generator Profile and Material Shipping Record (see Section 6.1) prior to the soil arriving at the Site for reuse.

5.1 Field Screening/Visual Criteria

Soils that are to be placed in the Reclamation Area will be field screened and analyzed by the generator to adequately characterize the soils and to demonstrate that they are suitable as fill. Generator data will be reviewed by the Environmental Consultant on behalf of BHE.

Samples shall be collected in accordance with the following field screening/visual criteria for soils proposed for reuse within the "Reclamation Area":

- Composite soil samples shall be collected per the frequency outlined in Section 5.2. Each composite sample shall consist of at least 8 discrete samples collected from the stockpile, in-situ soil boring or test pit.
    - Each discrete sample shall be taken from newly exposed soil a minimum of 12 inches deep within the stockpile and combined with the other required discrete samples to complete each composite sample.
    - Field screening for Volatile Organic Compounds (VOCs) via soil headspace must be performed for each discrete sample and the sample with the highest headspace reading shall be submitted for laboratory analysis of VOCs (see Section 5.2).
- In-situ soil samples shall be collected per the frequency outlined in Section 5.2 for each boring/test pit. The borings/test pits shall be completed on an evenly spaced grid pattern that is representative of the soils to be characterized and within the zone of suspected or known contamination.
- Soils must not exhibit staining, odors or other discoloration that may be attributed to a release of oil or hazardous material (OHM).
- Urban fill soils cannot contain any refuse, construction and demolition (C&D) debris, or solid waste. The soil may contain incidental non-coated or non-painted brick or concrete pieces that are less than 6 inches in diameter. Any brick/concrete material must be less that 5% of the total soil volume. If the brick/concrete material contained in the soil is greater than 5%, then the concrete/brick will be designated as C&D debris, removed from the fill soils and managed separately as part of the existing Site operations by the Property Owner. The management of residual C&D debris will be at the discretion of BHE, which may be rejected. It will be the generator's responsibility to properly manage any material that is rejected by BHE.
- Street sweepings, ditch cleanings and catch basin cleanings cannot contain any significant litter (<5% by volume). Observable litter will be removed at the generator's expense or the material will be rejected.
- Dredge spoils may be accepted and used as fill providing that the sediments received at the Reclamation Area have no free draining liquid and meet the chemical characterization, as defined above and in Section 5.3.

5.2 Soil Classification & Testing Requirements

In addition to the field screening/visual criteria outlined in Section 5.1 above, soil samples will be collected, labeled and preserved in accordance with the NHDES established protocol for the respective analysis, and submitted to a New Hampshire certified laboratory under chain-of-custody procedures.

Laboratory analysis will be performed for the parameters outlined in **Table 1** at the frequency outlined in **Table 2** based on the soil type or source.

Table 1. Analytical Testing Methods

Analytical Parameter	Testing Protocol
Total Petroleum Hydrocarbons (TPH) (GC-FID)	EPA Method 8015C
Volatile Organic Compounds (VOCs)	EPA Method 8260B
Semi Volatile Organic Compounds (SVOCs)	EPA Method 8270D
Polycholorinated Biphenyls (PCBs)	EPA Method 8082A
RCRA 8 Metals	EPA Method 6010C/7471B
Ignitability/Flashpoint	EPA Method 1030
Reactivity (cyanide & sulfide)	EPA Method 9012B/9030B
Corrosivity/pH	EPA Method 9045D
Conductivity*	EPA Method 9050A

Note: *conductivity is only for street sweepings, roadside ditch soils and catch basin cleanings due to the potential presence of chlorides.

Table 2. Soil Testing Frequency

Soil Type or Source	Description	Testing Frequency
Clean Soil	Soil from non-urban or undisturbed (virgin) and non-regulated sites with no identified environmental conditions. Generator must provide a detailed environmental history and/or investigation report to support classification.	1 sample per 1,000 tons up to 5,000 tons 1 sample per 2,000 tons after 5,000 tons
Urban Fill	Soil from urban or developed sites that has the potential to contain residual levels of contaminants. Soil may be from regulated and unregulated sites.	1 sample per 500 tons up to 2,500 tons 1 sample per 1,000 tons after 2,500 tons
Street Sweepings & Catch Basin Cleanings	Street sweepings, roadside ditch soils and catch basin cleanings that are not obviously contaminated with wastewater, animal wastes, oil, gasoline or other petroleum products.	1 sample per 500 tons up to 2,500 tons 1 sample per 1,000 tons after 2,500 tons
Other Impacted Soil	Dredged spoils or soil from known impacted sites with residual levels of contaminants that are acceptable for reuse at the Site. This includes street sweepings or catch basin cleanings that have obvious or known contamination.	1 sample per 200 tons up to 2,000 tons 1 sample per 500 tons after 2,000 tons

Example: a generator is seeking approval for the reuse of 3,500 tons of urban fill at the Site. 6 samples would be required to characterize these soils (5 samples up to 2,500 tons; 1 sample for the next 1,000 tons).

5.3 Soil Acceptance Standards

The Acceptance Standards for the reuse of soils at the Site is adapted from the Soil Remediation Standards contained in Env-Or 606.19, Table 600-2. These standards are protective of future potential residential uses at the Site, but were modified based on a review of more restrictive standards that are present in other sources. This information is discussed further in the NH DES Application to Certify a Waste Derived Product for Distribution and Use (see Section 7.1.3).

The maximum concentrations for chemical constituents in soil that can be reused at the proposed Reclamation Area of the Site are provided in **Table 3** in **Appendix C**. The constituents detected as part of the analysis required in Table 1 will be compared to the limits in Table 3 (note: the list of chemicals in Table 3 is comprehensive and not all of the tests listed in Table 1 will provide results for all chemicals). The acceptable limits for additional parameters not contained in Table 3 are provided in **Table 4**. The soil characterization data provided by generators will be reviewed and compared to these standards.

Table 4. Acceptable Limits for Additional Parameters

Analytical Parameter	Acceptable Limit
Ignitability/Flashpoint	>180 ^{o}F
Reactivity (cyanide & sulfide)	Non-Detect
Corrosivity/pH	6.5-8.3
Conductivity	<4,000 umhos/cm

Characteristic Hazardous Waste (TCLP): TCLP testing shall be performed for metals or organic compounds when the total concentrations in the soil are above the theoretical levels at which the TCLP criteria may be exceeded. For guidance, generators shall consult United States Environmental Protection Agency, Memorandum #36, "Notes on RCRA Methods and QA Activities", pp. 19-21, Gail Hanson, January 12, 1993.

Unacceptable Soils: Should on-site personnel notice that the soil material is suspected of containing contaminants; the load will be rejected and returned to the generating site for additional characterization at the generator's expense. Should the materials be deemed suspected of contaminants once it has been place in the cell, the material will be segregated and tested at the generator's expense to determine whether it meets the Soil Acceptance Standards. If the material is acceptable, it will be placed into the Reclamation Area. If the material is not acceptable, the material will be re-loaded and shipped back to the generator for appropriate management. If the loads contain unacceptable pieces of C&D debris or solid waste materials, these materials will be segregated and transported back to the originating site at the generator's expense.

Data Averaging: except for VOCs, PCBs and TCLP, the data for in-situ soil samples can be averaged for comparison to the standards in Table 3. However, the highest concentration of any single constituent may not be greater than 50% of the average of the same constituent. An example is provided below:

The average of all in-situ soil samples for arsenic is 8.0 mg/Kg and the limit is 11 mg/Kg. The highest concentration is 13 mg/Kg, which is >1.5 times the average (12 mg/Kg). Therefore, the soil with the highest in-situ sample is not acceptable and must be segregated from the remaining soils to be accepted at the Site.

6.0 SOIL APPROVAL PROCESS AND ON-SITE REUSE

This section describes the documentation that generators must provide, and approvals which must be granted by BHE, prior to the reuse of soil within the Reclamation Area. Information pertaining to the placement of the soil at the Site, soil tracking, and transportation routes is also described below.

6.1 Soil Submittal Package

The generator proposing to transport soil to the facility must provide a pre-characterization soil data package to the Environmental Consultant for review. This soil submittal package should be prepared by the generator prior to review by BHE to ensure that the proposed fill meets the Soil Acceptance Standards established for the Site. The pre-characterization package must include the following information:

- A description of the generator site history;
- A site figure identifying the sample locations;
- The volume of soil proposed to be delivered to the Site;
- A completed Generator Profile;
- A completed Material Shipping Record (MSR); and
- A description of field screening results and a summary table comparing the site data with the Soil Acceptance Standards, including copies of laboratory data reports.

Once the pre-characterization data package is submitted to BHE, the Environmental Consultant will review this information to determine if the soils are acceptable for reuse at the Site. The Environmental Consultant will prepare an approval letter confirming that the soil meets the Soil Acceptance Standards and BHE will coordinate with the generator for shipment.

6.2 Soil Placement and Tracking

The Generator Profile and Material Shipment Record (MSR) provided in **Appendix D** will be prepared as part of the Soil Submittal Package (refer to Section 6.1 above) and accompany all shipments of soil to the Site. Upon arrival at the Site, the trucks will be directed to the scale area where the shipment will be weighed, and information contained on the MSR input into the electronic database for tracking purposes (also see Section 7.2 for recordkeeping procedures).

Once the truck has been weighed and the appropriate paperwork completed, the truck will be directed to the off-loading area. As shown on the Proposed Grading Plan (Sheet C-102) in Appendix B, the Reclamation Area is subdivided into a grid system consisting of cells. The daily shipping log maintained by BHE will note the cell and approximate location that the material was off-loaded into. Soil weight slips will be generated at the scale area and tracked using the sample shipping log below.

Sample Soil Shipping Log for Reclamation Area

Generator ID	Truck ID	Net Wt. (tons)	Grid Cell	Date	Time Out
20130015	RB-358217	30.365	A-1	03/15/14	10:05
20130015	RB-358217	28.625	B-1	03/15/14	13:15
20130015	SF-205843	29.431	B-1	03/15/14	16:00

6.3 Site Grading, Stormwater Management & Stabilization

Site Grading

Site grading activities will be conducted in a manner to avoid overfilling sections. Once the imported soils have been deemed appropriate for on-site reuse, the transporter will be directed to the active area of the Site. BHE will have heavy equipment on-site to manage the imported soils such that continuous operation/placement will take place. The imported soils will be placed in lifts (1-2 feet) and compacted by making a minimum of 6 passes with a D-6 Caterpillar Bulldozer or equivalent equipment weighing 16 to 20 tons. Gravel access roads will be maintained throughout the reclamation operation of the Site.

Vertical grade control at elevation 120 and ground surveyed control points will be used to maintain the limit of disturbance within the proposed reclamation area. Prior to the start of reclamation activities, elevation control points and grid cells will be marked in the field to serve as guides for the Reclamation Operator and assist with the tracking of material (refer to Section 6.2). Information regarding existing and proposed grades and stormwater management is provided in the stormwater analysis in **Appendix E**.

Fill Sequencing Plan

In general, the Reclamation Area will be filled from east to west, beginning in rows 1 and 2, as shown on the grid for the proposed Grading Plan (sheet C-102). As shown on Sheet C-102 and discussed in Section 6.4, no reclamation activities will occur within Grids A-2 through A-5 and B-2 through B-5 until a Sewer Interceptor Protection Plan is approved by the Town of Merrimack Sewer Department. The interim grades during filling will be maintained in lifts such that trucks and grading equipment can access grid cells for sufficient storage and grading on a daily basis. The existing gravel road will be maintained during filling to provide access to the Reclamation Area. It is anticipated that daily filling and sequential lifts will be completed within the approximate area of 2 adjoining grid cells (~20,000 square feet).

The filling will take place such that the adjacent high ground is met at approximate elevation 120-feet MSL. The 11 acre area will be filled and graded such that a minimum 1% slope is maintained to the interior of the reclamation area down to elevation 118-feet MSL.

A maximum proposed elevation has not been established for the overall Site due to the undeveloped plan for future reuse of the Site. If a Site development or reuse plan is developed, an updated grading plan will be generated based on Site grading conditions at that time.

Unacceptable Soil Materials

If unacceptable soil materials (e.g., clays, silts and soils with a low bearing pressure) are imported to the Site, the transporter will be directed to a designated soil mixing area within the Reclamation Area to allow for blending with other soils of higher structural quality. On-site provisions will be made to manage materials that may contain deleterious material (e.g., woody debris) and large stones or boulders that will impede grading activities.

Stormwater Management

As discussed above, the filling will occur up to approximately elevation 120-feet MSL. As described above, the 11 acre area will be filled and graded such that a 1% slope is maintained to the interior of the reclamation area down to elevation 118-feet MSL. Any stormwater generated within the Reclamation Area will remain within the Site and infiltrate into the soil. There will be no off-site discharge of stormwater during reclamation of the Site, similar to existing conditions. A stormwater analysis was completed to evaluate the proposed grading conditions and storage capacity to contain the 100-year, 24-hour storm event and prevent an off-site stormwater discharge. The results of this analysis are provided in Appendix E. The proposed design includes a small area adjacent to the spur track along the southwest portion of the Reclamation Area that will be graded to the southwest and stormwater runoff will discharge off-site. The design of the grading and stabilization of this area will be developed as part of the Sewer Interceptor Protection Plan (see Section 6.4).

Site erosion and sedimentation control will be maintained during the reclamation process to avoid impacts to grading operations. Permitting with respect to erosion and sediment controls is discussed in Section 7.0. If necessary, dust can be managed through sprinkling of water. A weekly inspection form will be completed to document Site activities and conditions. A blank inspection form is provided in Appendix D.

Site Stabilization

The proposed fill sequence and stormwater management approach will not result in an off-site stormwater discharge during reclamation activities. The Reclamation Operator may; however, need to manage runoff at active fill and grading areas to prevent erosion that will disrupt Site operations. If necessary, prior to final stabilization and/or outside of the growing season, wood chips from stump grindings will be used to temporarily stabilize soils.

Once a section of the Reclamation Area has been filled within 6 inches of the proposed grades on Sheet C-102, the area will be stabilized with 6 inches of a vegetative support soil and native grass species (e.g., conservation seed mix). If necessary, a straw mulch will be used to temporarily stabilize soils until vegetation grows. An erosion control blanket or straw mat will be used on slopes steeper than 3H:1V. Site stabilization will be addressed as part of the permitting requirements discussed in Section 7.0.

6.4 Sanitary Sewer Utility Protection Plan

Site grading and filling activities will be completed on land adjacent to the Town of Merrimack's easement for sanitary sewer utilities. Grading at Grids A-2 through A-5 (Sheet C-102) will be in close proximity to the existing sanitary sewer manholes and the horizontal alignment of the sanitary sewer pipe within the 20' right-of-way along the spur track. AMEC met with the Town of Merrimack Community Development staff and the Sewer Collections Manager on May 23, 2013

to review and discuss the proposed reclamation activities in this portion of the Site. The following information was discussed regarding existing conditions and the Town's requested approach to protect the sanitary sewer utilities as the Reclamation Area is filled.

The raised spur track and sewer utilities between SMH-98 and SMH-101 were destroyed during the 2006 flood that overtopped the embankment and flowed into the Longa gravel Site. The Town of Merrimack replaced the sewer utilities and armored the embankment to protect against future erosion, as shown on the June 2006 sewer as-built plans in Appendix B. Reclamation activities along this portion of the spur track require further design and review/approval by the Town of Merrimack Sewer Department. No reclamation activities will occur within Grids A-2 through A-5 and B-2 through B-5 until a Sewer Interceptor Protection Plan is approved by the Town of Merrimack Sewer Department. As part of the Sewer Interceptor Protection Plan, the Town of Merrimack Sewer Department has requested the following:

- A detailed grading plan along the sewer utility corridor;
- Details showing the removal and replacement of embankment armoring;
- Stormwater design (construction & post-construction);
- Specification of suitable fill materials in close proximity to utilities (to be determined);
- Periodic construction oversight by an engineer; and
- A final as-built plan following reclamation.

It is important to note that the depth of proposed grading and fill is shallow along the majority of the spur track and increases to the north, further from the utility, to meet proposed grades. For example, sewer manhole 97 has a rim elevation of 120.16 and proposed grading up to elevation 120 should not impact this structure. Additionally, the invert elevation for the 18" RCP sewer line at SMH-97 is 106.88, which is greater than 13 feet below the proposed grade of 120. The proposed grading activities within the adjacent reclamation area at approximately elevation 108 are more than 30 feet from these sewer utilities. The proposed grading conditions and reclamation of the Site will fill the adjacent low-lying area and provide further protection of the sewer utilities.

The remaining sanitary sewer utilities adjacent to the proposed Reclamation Area are greater than 25 feet from the nearest horizontal grading area. The proposed grading activities along the east and south of the Reclamation Area are anticipated to further stabilize the slope that is currently protecting the Town's sanitary sewer utilities.

6.5 Site Access & Traffic Management

The property is accessible from the south via the F.E. Everett Turnpike and from the north via the Daniel Webster Highway (Route 3). Trucks will travel along Route 3 and turn onto Twin Bridge Road, which leads directly to the Site. Since the Site is an active sand and gravel operation, it is not anticipated that the amount and type of traffic accessing the Site will change significantly or impact surrounding properties. No further traffic management is; therefore, proposed at this time. Signs will be posted along the interior gravel access roads to direct trucks to the scale, reclamation and soil mixing areas, as appropriate.

6.6 Pollution Prevention & Good Housekeeping

BHE proposes to follow best management practices during the active filling and operation of the Reclamation Area. All heavy equipment will be equipped with spill kits and operators will be trained in emergency spill preparedness.

In the event of an accidental fuel spill during reclamation operations, BHE will respond as follows:

1. Stop the source of the leak or spill, under safe conditions;
2. Construct temporary earthen berms and the spill area to contain surface runoff from entering the area of the spill;
3. Notify NHDES, if necessary, and undertake appropriate response actions;
4. Contract with an emergency spill contractor to assist in on-site cleanup, as necessary;
5. If determined to be necessary, remove contaminated soil for proper off-site disposal; and
6. Take other corrective action deemed necessary by NHDES to mitigate the impacts of the spill.

A sample emergency spill response guideline is provided in **Appendix F**. An emergency contact list is also provided in Appendix F and will be posted at the scale area.

7.0 PERMITTING AND RECORDKEEPING

Site restoration will be completed once the property is filled to the proposed grades shown on the sheet C-102 in Appendix B. It is expected that Site restoration activities will be completed between two and four years from the commencement of the project, depending upon the volume of material generated, imported and placed on an annual basis.

7.1 Local, State & Federal Approvals

7.1.1 Town of Merrimack

Planning Board Approval

As discussed previously, the Longa property is classified as a "grandfathered excavation" under New Hampshire Title XII Public Safety and Welfare, Chapter 155-E Local Regulation Excavations. Based on correspondence with staff from the Merrimack Community Development Office, the Merrimack Planning Board must review and approve the project.

On February 4, 2013, the Partial Reclamation Project was presented to the Merrimack Conservation Commission and comments were subsequently forwarded to the Merrimack Planning Board. On February 19, 2013, the Partial Reclamation Project was presented to the Merrimack Planning Board to request a waiver from Site Plan Review and approval of the project, as described in a letter to Timothy Thompson, Community Development Director on February 5, 2013. Following this meeting, the project documents were updated to address the Planning Board's comments, as well as those from the Merrimack Sewer Department. AMEC met with the Merrimack Sewer Department on May 23, 2013 to review and discuss the project with respect to nearby sewer utilities.

An updated letter discussing the project was submitted on May 28, 2013 to the Town of Merrimack Planning Board to request a waiver from Site Plan Review and the project was reviewed at the Board's June 18, 2013 meeting. A copy of the Merrimack Planning Board Review for Acceptance & Consideration of Final Approval for a Waiver of Full Site Plan Review, dated June 21, 2013 is provided in **Appendix G**. Additional changes to the Operations Plan to meet the conditions of the June 21, 2013 letter are pending review of the application to "Certify a Waste Derived Product for Distribution and Use".

Community Development and Department of Public Works Approvals

The Town of Merrimack Stormwater Management Standards (Chapter 412) requires the submittal of a Stormwater Management Plan (SWMP) for land disturbances greater than 20,000 square feet. Although the majority of the reclamation area drains to the interior, a small portion of the Site along the spur track to the southwest is proposed to drain off-site. Prior to construction, a SWMP will be developed for the Site to address stormwater management and submitted to the Merrimack Department of Public Works for approval. This SWMP will be developed concurrent with the SWPPP to meet the Federal permit requirements discussed in Section 7.1.4.

As discussed in Section 6.4, no reclamation activities will occur within Grids A-2 through A-5 and B-2 through B-5 until a Sewer Interceptor Protection Plan is approved by the Town of Merrimack Sewer Department. BHE is requesting approval of the Reclamation Plan with the condition to address this requirement within the first 3 months of operation.

7.1.2 State of New Hampshire, Shoreland Permit by Notification

The Merrimack River is a protected river under the New Hampshire Rivers Management and Protection Program (RMPP). Therefore, projects within ¼ mile of the river are subject to review by the Lower Merrimack River Local Advisory Committee (LMRLAC). During the February 28, 2013 meeting, BHE and AMEC met with the LMRLAC to discuss the project. The LMRLAC was supportive of the reclamation project and provided comments to the Merrimack Conservation Commission and Planning Board for consideration of the final project review and approval.

On May 28, 2013, a Shoreland Permit by Notification was submitted to the NHDES for proposed work to be completed within the Merrimack River 250-foot shoreland setback. An Alteration of Terrain (AOT) permit is not required for the proposed project due to the previously disturbed mining activities at the Site prior to 1981. This information was reviewed by, and discussed between Gregory Michael, Bernstein Shur and Ridgely Mauck, NHDES on February 8, 2013. A copy of the accepted Shoreland Permit by Notification is provided in Appendix G.

7.1.3 State of New Hampshire, Certified Waste Derived Product Permit

BHE and AMEC met with representatives from the NHDES Solid Waste and Hazardous Waste Remediation Programs on February 22, 2013 to review and discuss the project. Through this meeting and follow-up correspondence with NHDES staff, the proposed reclamation with urban fill soils requires approval through Env-Sw 1500 Certification of Waste-Derived Products. As such, an application to "Certify a Waste Derived Product for Distribution and Use" was prepared and will be submitted to NHDES in early October 2013. Once available, a copy of the approval from NHDES will be included in Appendix G and any conditions of approval will be incorporated into this Operations Plan.

7.1.4 Federal U.S. EPA NPDES Construction General Permit

Due to grading/filling greater than one acre and the potential for portions of the proposed reclamation area to discharge stormwater off-site (e.g., spur track area), it appears that the project is subject to the U.S. Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP), Permit No. NHR120000. As such, a Stormwater Pollution Prevention Plan (SWPPP) and Notice of Intent (NOI) to obtain coverage under the CGP will be developed prior to the start of construction. In general, the stormwater management and Site grading approach outlined in this Operations Plan will assist in meeting these requirements. A copy of the NOI and EPA authorization to discharge stormwater will be incorporated into Appendix G and a copy of the SWPPP will be maintained on-site.

7.2 Facility Records

Once soil has been accepted for reuse at the Site (refer to Section 6.1), the Reclamation Operator will track soils received at the facility using the Material Shipping Record (MSR) (Appendix D) and an electronic database. The following records will be maintained within an operations trailer on-site and at the BHE office for a period of at least 3 years following Reclamation Operations:

- Soil Submittal Packages
- Soil Acceptance Letters
- Completed Material Shipping Records & Weight Tickets
- Daily Material Tracking Log
- Weekly Site Inspection Forms

Data and information related to the Reclamation Operation will be provided to the Town of Merrimack and NHDES upon written request.

7.3 Reclamation Plan Updates

This Operations Plan will be updated if significant changes to the project are proposed and this information will be reviewed with the Town and NHDES, as necessary. A record of changes and any subsequent approvals is provided in Appendix G.

8.0 SCHEDULE OF OPERATIONS

The anticipated schedule for the reclamation is dependent upon the amount of material available for import during the course of operations, which is subject to local and regional economic factors and activity in the construction industry. Filling operations are anticipated to commence in early 2014, pending permits and approvals. It is estimated that approximately 250,000 cy to 500,000 cy of material will be imported on an annual basis for an initial period of approximately 2 years.

Hours of Operation:

- Monday through Saturday
- 7:00 a.m. to 5:00 p.m.

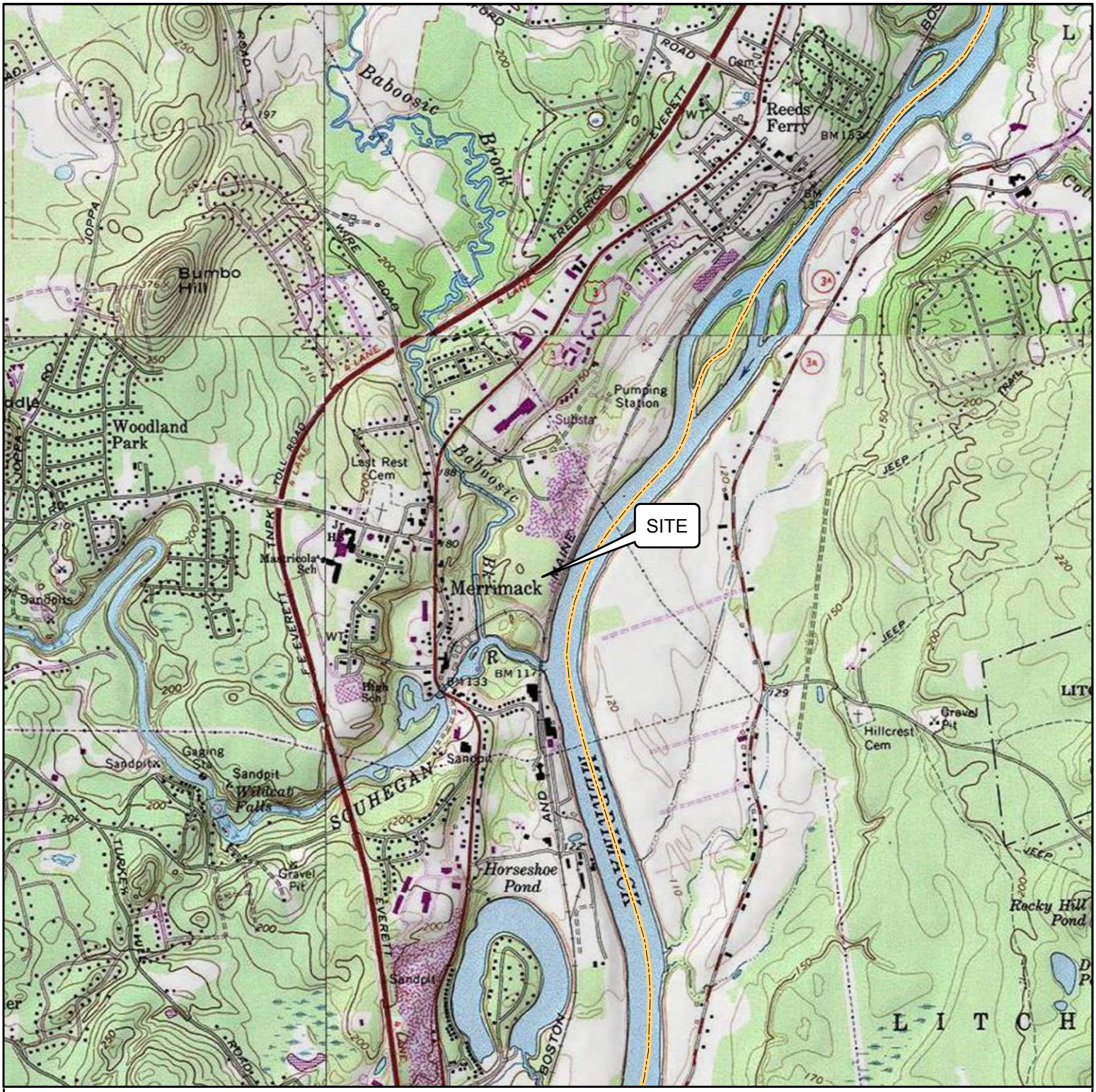
In the event of a natural disaster or other emergency conditions that result in excess amounts of fill material, the facility may, on a temporary basis, accept deliveries outside the normal delivery schedule. No deliveries of materials will be allowed unless the Reclamation Operator is attending the facility. The facility is typically closed during all federally recognized holidays.

9.0 HEALTH AND SAFETY

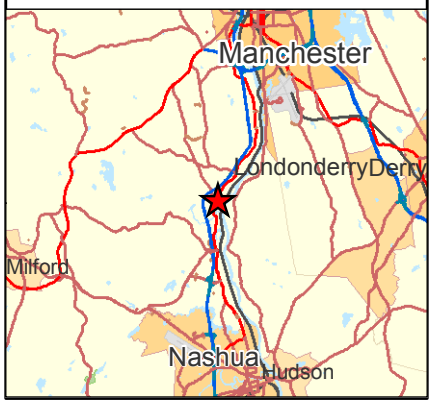
Due to the nature of heavy equipment and filling operations, health and safety concerns do exist during reclamation operations. The Reclamation Operation by BHE will comply with all applicable provisions of federal, state and local health and safety statutes, codes and regulations including 29 CFR Parts 1910 and 1926. A Site-specific Health & Safety Plan will be developed and maintained on-site. As discussed in Section 6.6, a sample emergency spill response guideline and emergency contact list are provided in Appendix F.

Appendix A

Site Locus, Natural Resource Maps & Historical USGS Maps



Location of Study Area



USGS Locus Map
Soil Reuse and Partial Reclamation
Longa Sand and Gravel Pit

17 Twin Bridge Road
Merrimack, New Hampshire

Notes & Sources

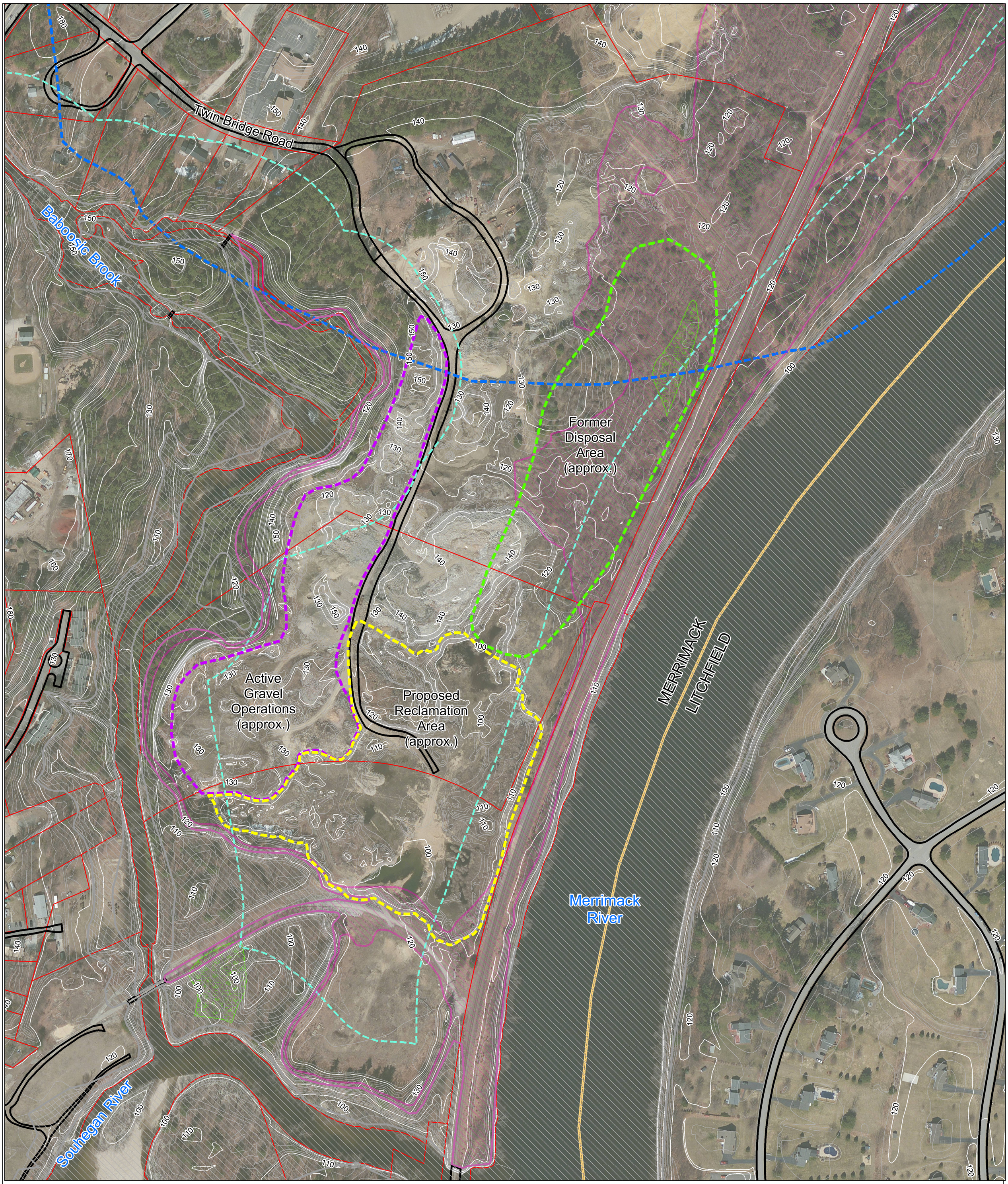
Topo Data: ESRI, 2012.

N

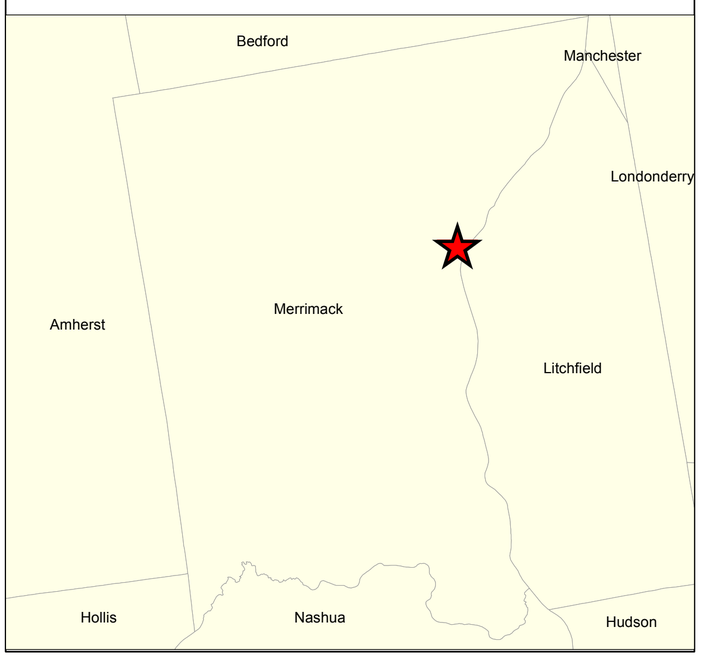
0 1,000 2,000 Feet

amec
AMEC Environment & Infrastructure, Inc.
2 Robbins Road
Westford, MA 01886
(978) 692-9090

FIGURE
1



Location of Study Area



Conceptual Site Plan
Soil Reuse and Partial Reclamation
Longa Sand and Gravel Pit

17 Twin Bridge Road
Merrimack, New Hampshire

Notes & Sources

The locations of the former disposal area, current gravel operations and proposed reclamation area are estimated based on historical reports and information provided by the property owner and all boundaries should be considered approximate.

Aerial Imagery: BING, 2010.
Road, Parcel, Contours, and Town Boundary data provided by the Town of Merrimack, 2012.
NWI and State Wetland data by NH GRANIT, 2012.
Wellhead Protection Area data provided by NRPC, 2012.

Legend

- Active Gravel Operations (approx.)
- Proposed Reclamation Area (approx.)
- Former Disposal Area (approx.)
- Road
- Parcel Boundary
- Contour 2ft (10 ft interval colored white)
- Town Boundary
- Wellhead Protection Area (MVD)
- Wetlands (State and NWI)
- 250 FT Shoreline Area (approx.)
- 100 Year Floodplain Boundary Line
- 500 Year Floodplain Boundary Line

Feet
0 125 250

N

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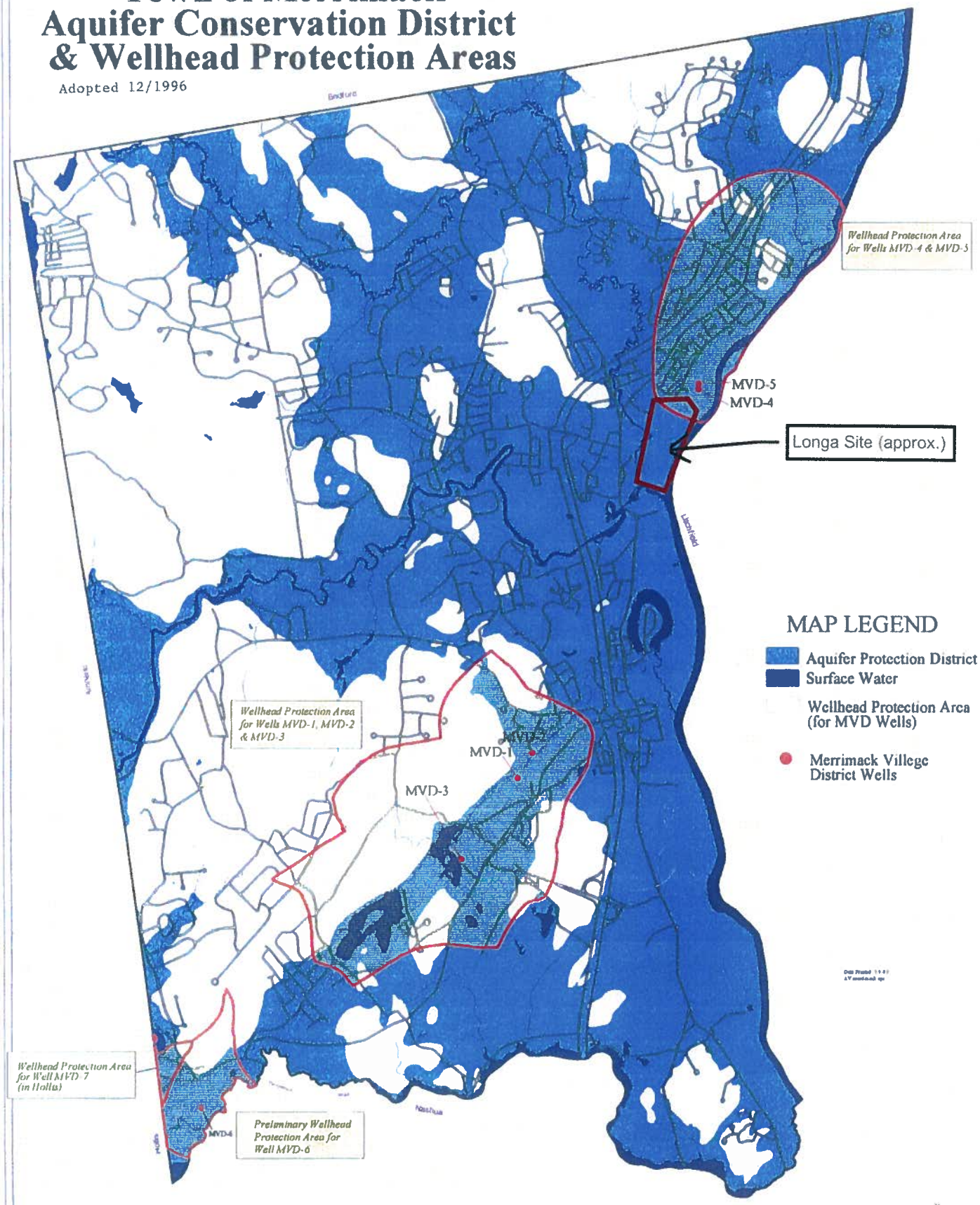
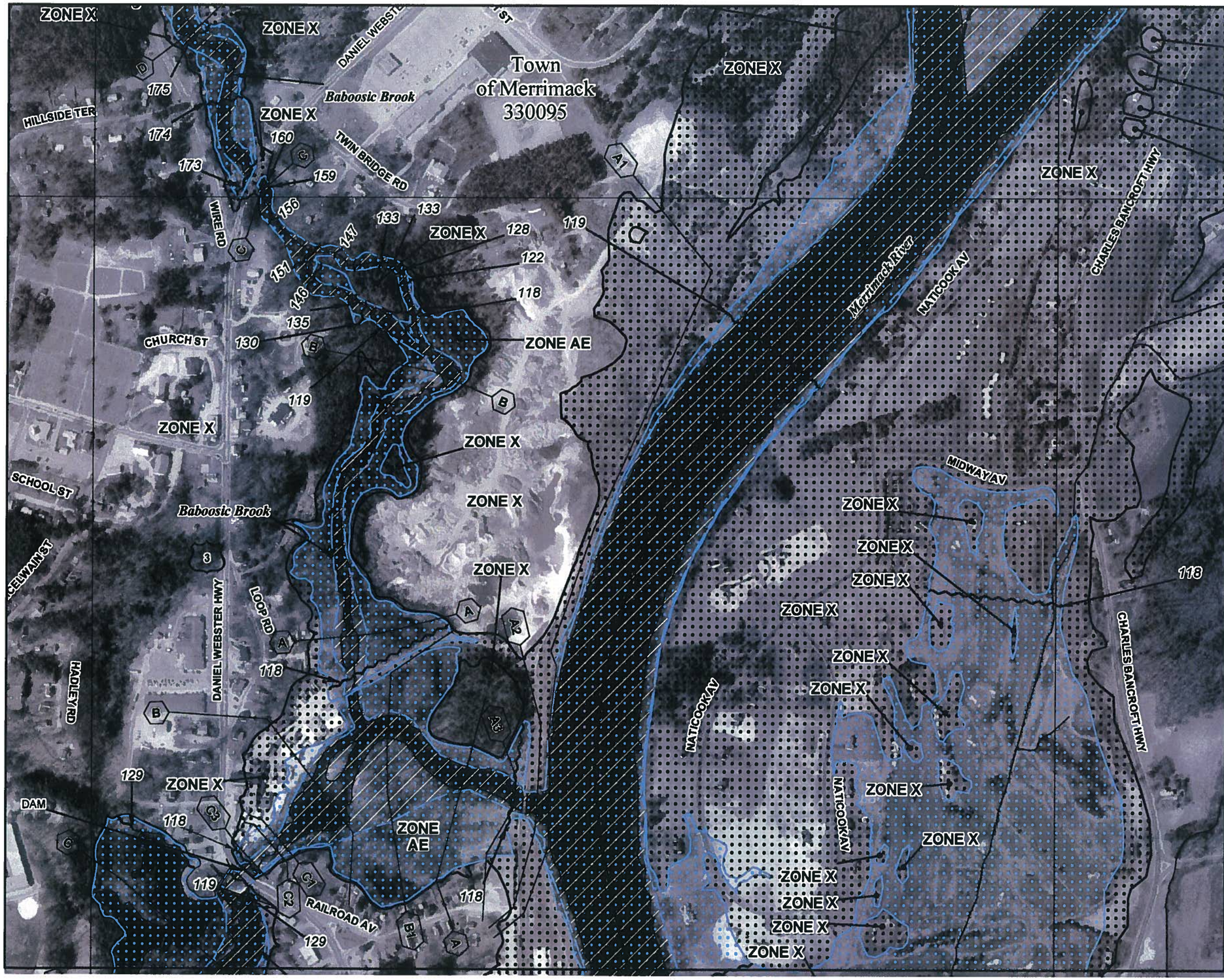
(978) 692-9090

FIGURE
1

Town of Merrimack
Aquifer Conservation District & Wellhead Protection Areas

Adopted 12/1996





MAP SCALE 1" = 500'

250 0 500 1000 FEET

0 150 300 METE

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0501D

FIRM

FLOOD INSURANCE RATE MAP

HILLSBOROUGH COUNTY, NEW HAMPSHIRE

(ALL JURISDICTIONS)

PANEL 501 OF 701

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LITCHFIELD, TOWN OF	330093	0501	D
MERRIMACK, TOWN OF	330095	0501	D

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
33011C0501D

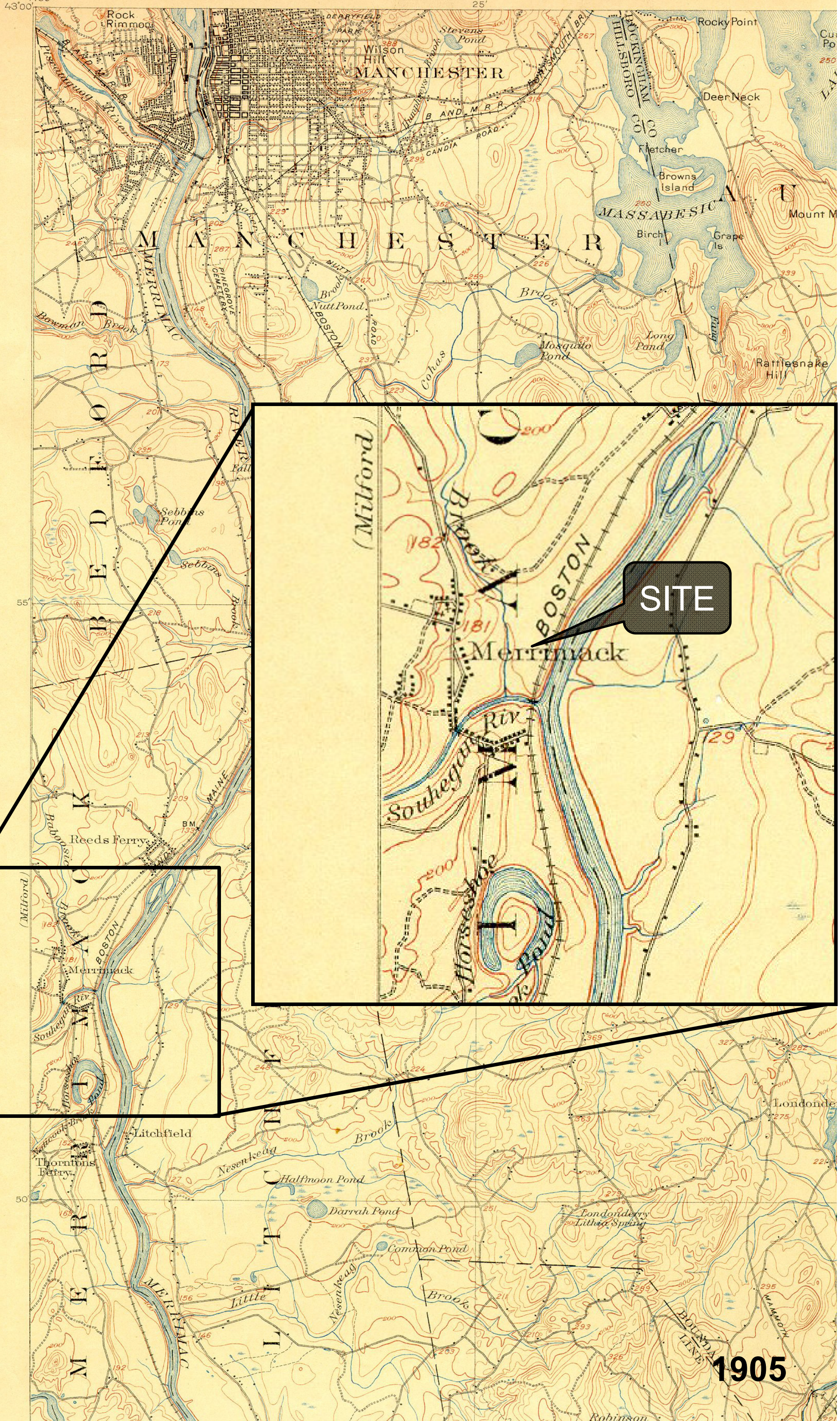
EFFECTIVE DATE
SEPTEMBER 25, 2009

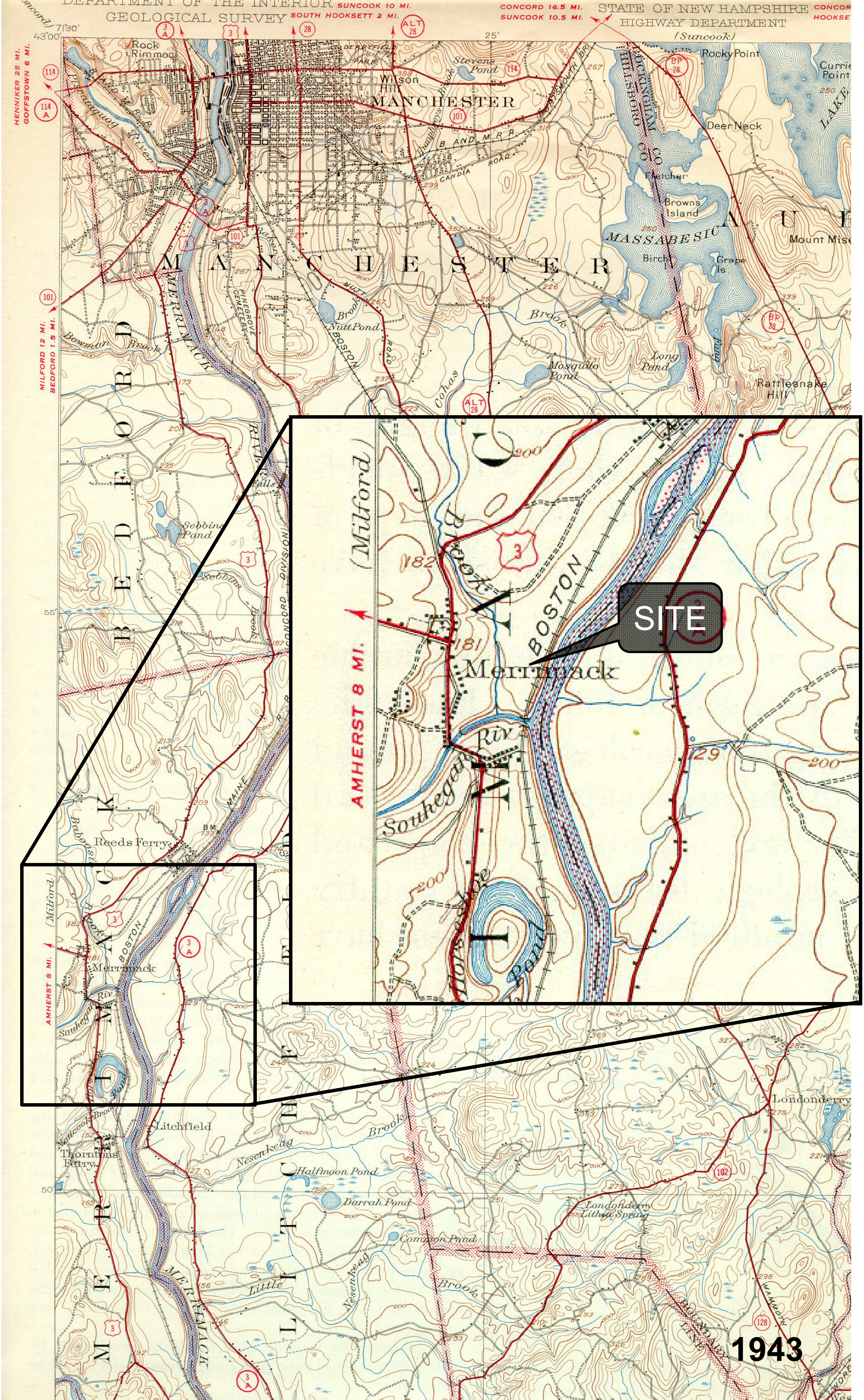
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

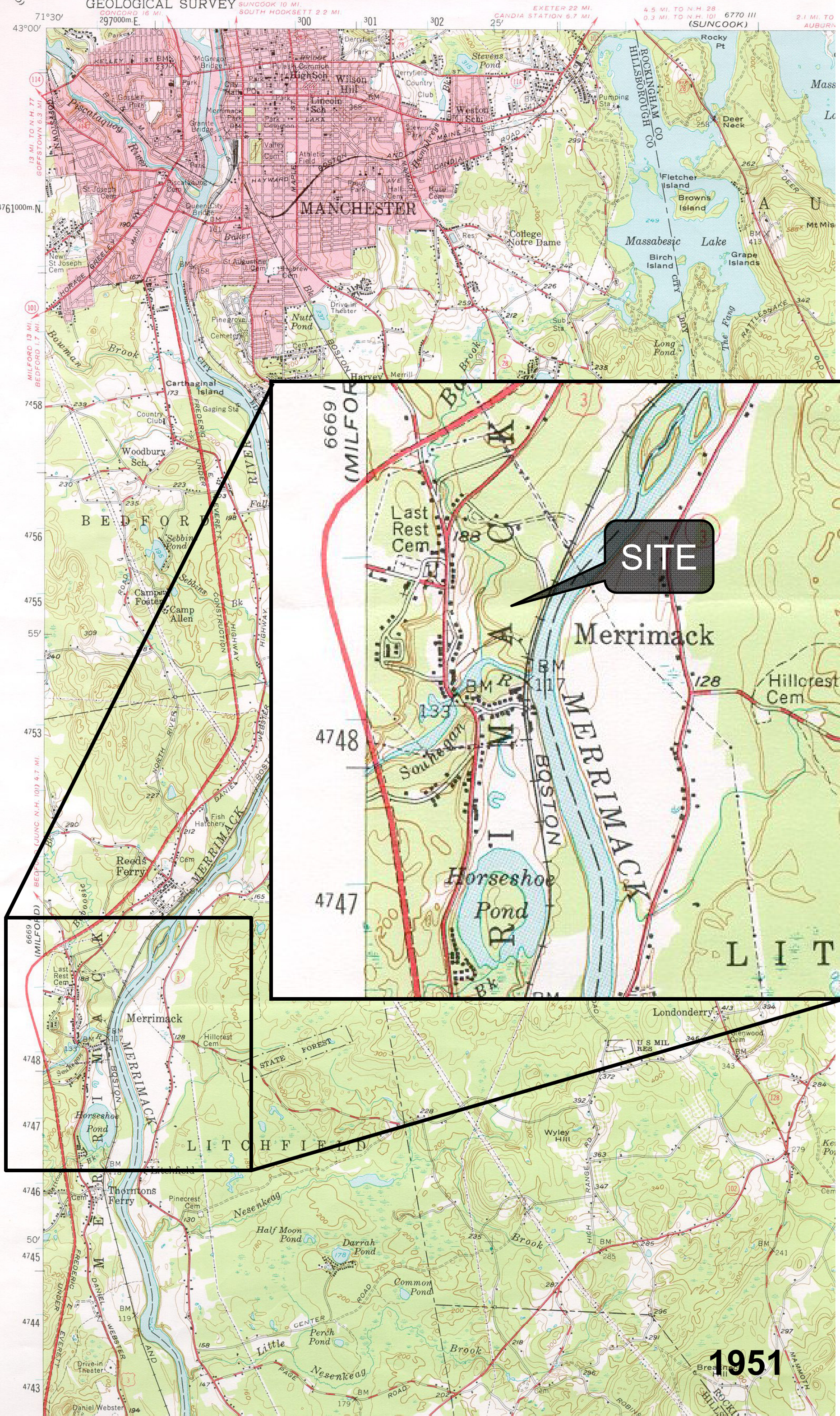
U.S. GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

TOPOGRAPHY




DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NEW HAMPSHIRE
HIGHWAY DEPARTMENT
SUNCOOK 10 MI.
SOUTH HOOKSETT 2 MI.
CONCORD 16.5 MI.
SUNCOOK 10.5 MI.
HENNIKER 25 MI.
GOFFSTOWN 6 MI.
MILFORD 12 MI.
BEDFORD 1.5 MI.
AMHERST 8 MI.
MANCHESTER
MERRIMACK
BEDFORD
MILFORD
LITCHFIELD
Rock Rimmon
Wilson Hill
Stevens Pond
Rocky Point
Deer Neck
Fletcher
Browns Island
MASSABESIC
Birch
Grape Is
Mount Misery
Rattlesnake Hill
Long Pond
Mosquito Pond
Nutt Pond
Sebbins Pond
Reeds Ferry
Merrimack
Southegan Riv
Horse Shoe Pond
Litchfield
Thorntons Ferry
Halfmoon Pond
Durrah Pond
Common Pond
Londonderry
Londonderry Lithia Spring
SITE
1943

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



Appendix B

Engineered Site Plans (3 sheets) & June 2006 Sewer As-Built Plans

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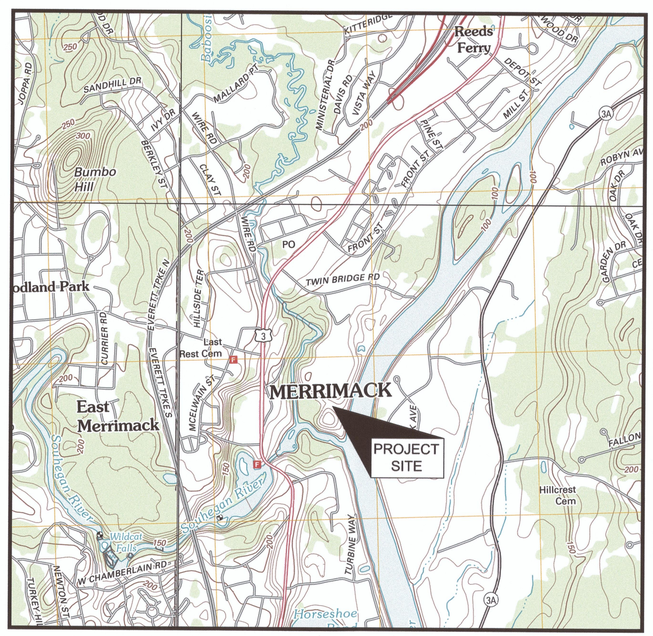
SOIL REUSE AND PARTIAL RECLAMATION
LONGA SAND AND GRAVEL PIT

17 TWIN BRIDGE ROAD, MERRIMACK, NH
MAY, 2013
ISSUED FOR PLANNING BOARD APPROVAL



LOCUS MAP
NOT TO SCALE

AERIAL IMAGE
NOT TO SCALE

DRAWING INDEX

SHEET NUMBER	DRAWING TITLE	DRAWING NUMBER
	COVER SHEET	
1	OVERALL SITE PLAN	C-101
2	PROPOSED GRADING PLAN	C-102

APPLICANT

BRIGHTER HORIZONS ENVIRONMENTAL, INC.
4 COURTHOUSE LANE
CHELMSFORD, MASSACHUSETTS 01824

OWNER

JAMES E. LONGA
17 TWIN BRIDGE ROAD
MERRIMACK, NEW HAMPSHIRE 03054

PREPARED BY

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.
2 ROBBINS ROAD
WESTFORD, MASSACHUSETTS 01886

APPROVED MERRIMACK PLANNING BOARD

CHAIRMAN _____ DATE _____

SECRETARY _____ DATE _____

ISSUED FOR PLANNING BOARD APPROVAL

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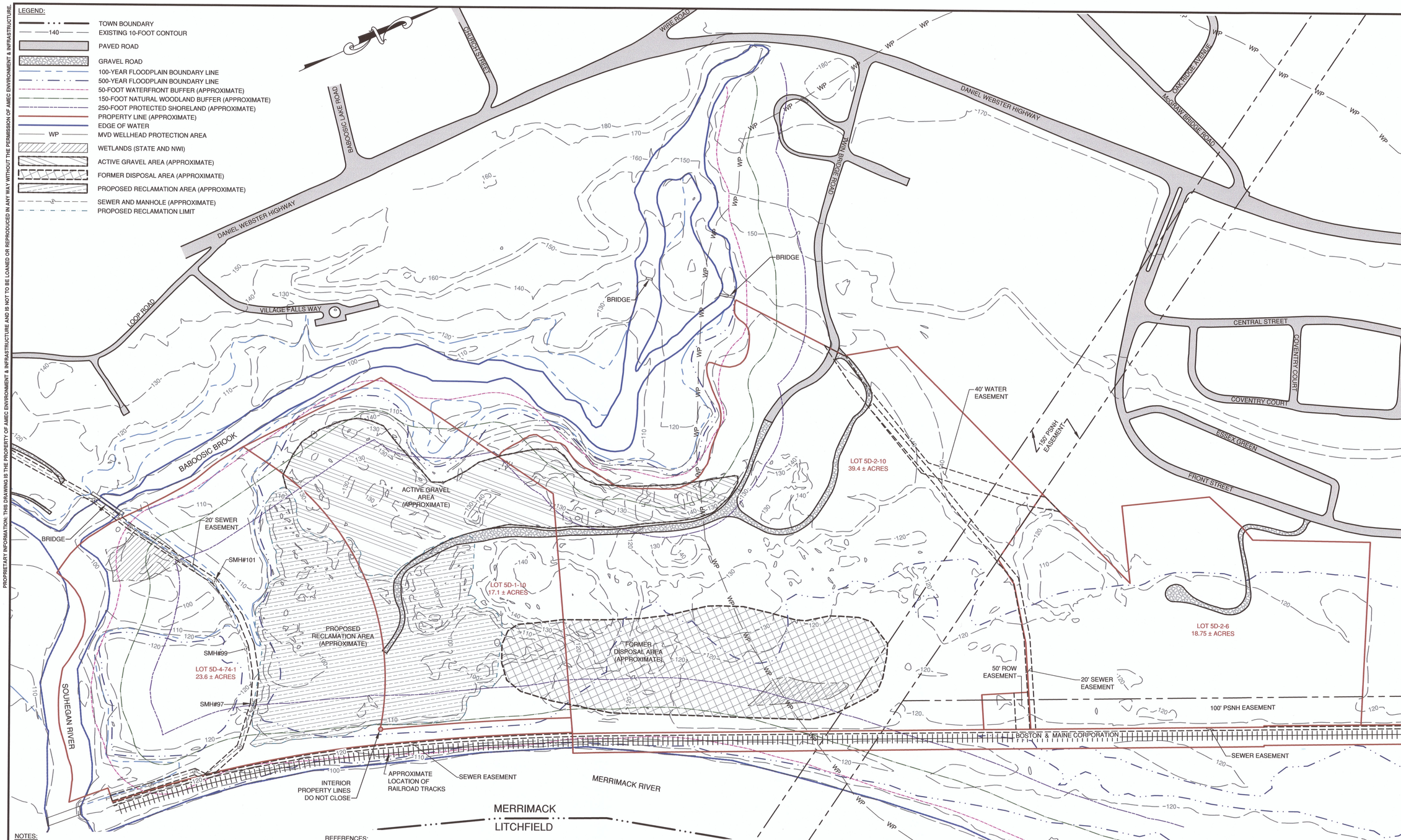

NOTES:

1. THE LOCATION AND DELINEATION OF THE FORMER DISPOSAL AREA, CURRENT GRAVEL OPERATIONS AND PROPOSED RECLAMATION AREAS ARE APPROXIMATE.
2. PROPERTY LINE AND EASEMENT LINE LOCATIONS FROM REFERENCES ARE APPROXIMATE AND REPRESENT RECORD PLANS DIMENSIONS, UNLESS OTHERWISE SPECIFIED.
3. TOWN BOUNDARY DATA INCLUDING SURFACE WATER, TOPOGRAPHY, AND ROADWAY INFORMATION PROVIDED BY THE TOWN OF MERRIMACK, 2012 AND ARE APPROXIMATE.
4. TOPOGRAPHY SHOWN WITHIN THE LIMITS OF THE PROPOSED RECLAMATION AREA AND ACTIVE GRAVEL AREA ARE APPROXIMATE AND MAY VARY.
5. SEWER LOCATION SHOWN WITHIN EASEMENT IS APPROXIMATE AND INFERRED FROM RECORD PLANS:
   - 5.1. AS-BUILT PLANS BY MERIDIAN LAND SERVICES, INC, JUNE 7, 2006, PROVIDED BY THE TOWN OF MERRIMACK SEWER DEPARTMENT.
   - 5.2. SUBDIVISION PLAN OF LAND CHEMICAL PRODUCTS CORPORATION MERRIMACK, NH, JULY 26, 1976, RECORDED IN THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS PLAN #9426.

REFERENCES:

1. PLAN TITLED "LOT LINE REVISION & CONSOLIDATION PLAN OF LAND" BELONGING TO MERRIMACK VILLAGE DISTRICT & JAMES E. LONGA TWIN BRIDGE ROAD MERRIMACK NH. PREPARED BY MERIDIAN LAND SERVICES DATED MARCH 6, 1997 AND RECORDED IN THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS PLAN #28776.
2. PLAN TITLED "COMPILED BOUNDARY PLAN OF LAND OF JAMES E. LONGE, JAMES LONGA & SON INC. JAMES E. LONGA TWIN BRIDGE ROAD MERRIMACK NH. PREPARED BY GEORGE F. KELLER INC. DATED AUGUST 31, 1987 AND RECORDED IN THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS PLAN #25334.
3. PLAN TITLE "MERRIMACK VILLAGE DISTRICT EASEMENT ON LAND OF JAMES E. LONGA" TWIN BRIDGE ROAD MERRIMACK NH. PREPARED BY GEORGE F. KELLER INC. DATED AUGUST 31, 1987 AND RECORDED IN THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS PLAN #21647.
4. PLAN TITLED "SUBDIVISION PLAN OF LAND CHEMICAL PRODUCTS CORPORATION MERRIMACK, N.H." PREPARED BY THOMAS F. MORAN, INC. DATED JULY 26, 1976 AND RECORDED IN THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS PLAN #9426.
5. PLAN TITLED "LAND IN MERRIMACK, N.H., BOSTON & MAINE CORPORATION TO TOWN OF MERRIMACK N.H." DATED JULY 1969 AND RECORDED IN THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS PLAN #4908 SHEET 3 OF 4.

APPROVED MERRIMACK PLANNING BOARD

CHAIRMAN _____ DATE _____

SECRETARY _____ DATE _____

0' 50' 100' 150' 200'
1" = 150'

ISSUED FOR PLANNING BOARD APPROVAL

amec
ENVIRONMENT & INFRASTRUCTURE, INC.
2 ROBBINS ROAD
WESTFORD, MASSACHUSETTS 01886
TELEPHONE: (978) 692-9090
FAX: (978) 692-6633
WEB: WWW.AMEC.COM

REVISION	DATE	ISSUE / REVISION DESCRIPTION	ISSUED BY	APPROVED

PROJECT: SOIL REUSE AND PARTIAL RECLAMATION LONGA SAND AND GRAVEL PIT

TITLE: OVERALL SITE PLAN

CLIENT: BRIGHTER HORIZONS ENVIRONMENTAL, INC. 4 COURTHOUSE LANE CHELMSFORD, MA

SEAL: STATE OF NEW HAMPSHIRE — DANELLE A. ANTERN — No. 12185 — LICENSED PROFESSIONAL ENGINEER

DESIGNED BY: DAA	DRAWN BY: DED
CHECKED BY: KH / RN	DATE: MAY 2013
SCALE: AS SHOWN	REVISION: 0
PROJECT NUMBER: 3652120017	
DRAWING NUMBER: C-101	
SHEET NUMBER: 1 OF 2	

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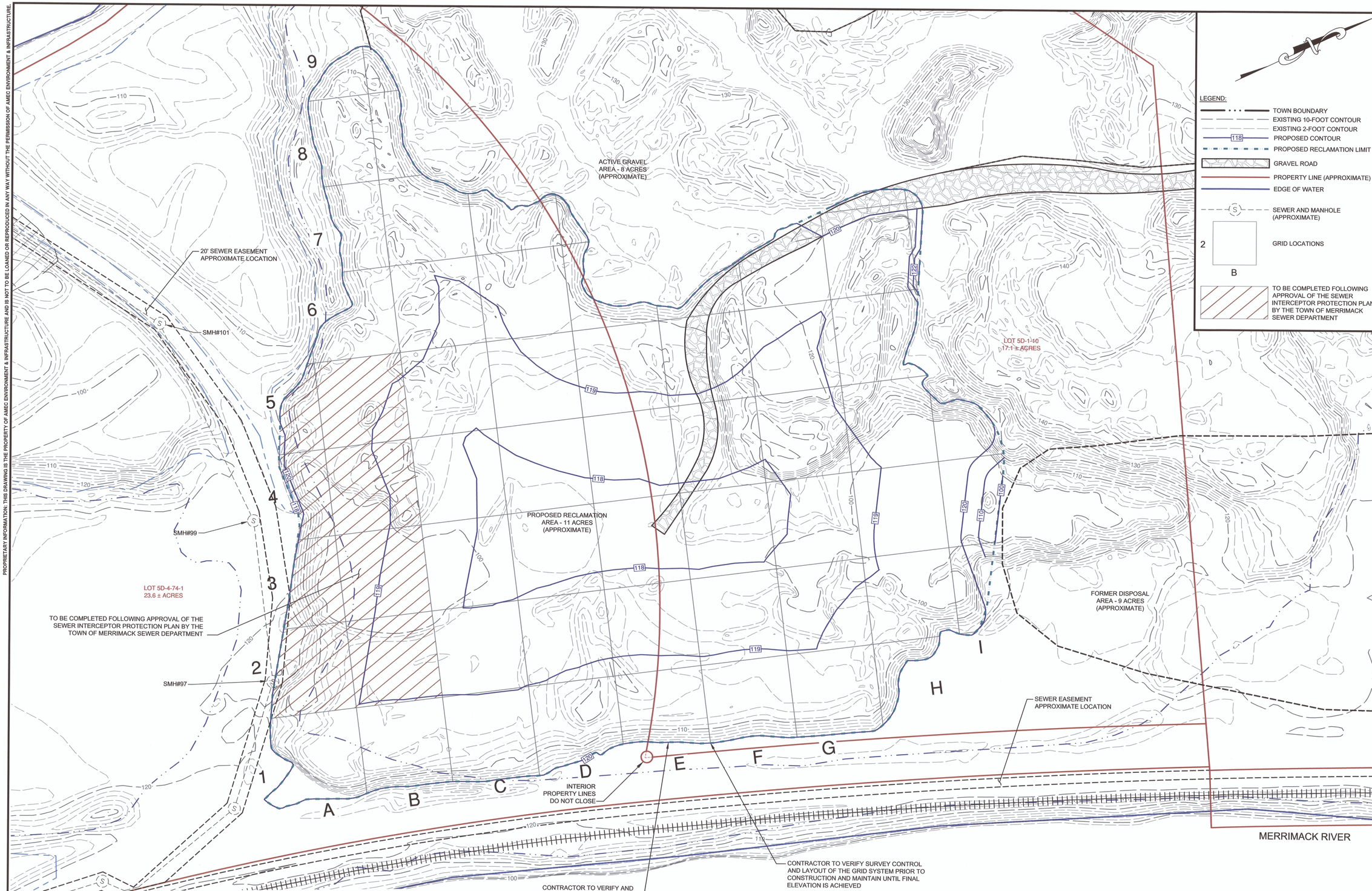

NOTES:

1. APPROXIMATE LIMIT OF GRADING (ELEVATION 120') SHOWN BASED ON SOURCE DESCRIBED IN NOTE 3 ON DRAWING NUMBER C-101. CONTRACTOR SHALL VERIFY THE HORIZONTAL AND VERTICAL LAYOUT PRIOR TO MATERIAL PLACEMENT.
2. E&S CONTROLS SHALL BE COORDINATED WITH THE ENGINEER PRIOR TO CONSTRUCTION.
3. CONTRACTOR SHALL CONTACT DIG SAFE AT 1-888-DIGSAFE PRIOR TO CONSTRUCTION. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
4. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE APPROVED SITE OPERATIONS PLAN.

APPROVED MERRIMACK PLANNING BOARD

CHAIRMAN _____ DATE _____

SECRETARY _____ DATE _____

0' 25' 50' 75'
1" = 50'

ISSUED FOR PLANNING BOARD APPROVAL

amec
ENVIRONMENT & INFRASTRUCTURE, INC.
2 ROBBINS ROAD
WESTFORD, MASSACHUSETTS 01886
TELEPHONE: (978) 692-9090
FAX: (978) 692-6633
WEB: WWW.AMEC.COM

REVISION	DATE	ISSUE / REVISION DESCRIPTION	ISSUED BY	APPROVED

PROJECT: SOIL REUSE AND PARTIAL RECLAMATION LONGA SAND AND GRAVEL PIT

TITLE: PROPOSED GRADING PLAN

CLIENT: BRIGHTER HORIZONS ENVIRONMENTAL, INC. 4 COURTHOUSE LANE CHELMSFORD, MA

SEAL: STATE OF NEW HAMPSHIRE DANIELLE D. AHERN No. 12185 LICENSED PROFESSIONAL ENGINEER

DESIGNED BY: DAA	DRAWN BY: DED
CHECKED BY: KH / RN	DATE: MAY 2013
SCALE: AS SHOWN	REVISION: 0
PROJECT NUMBER: 3652120017	
DRAWING NUMBER: C-102	
SHEET NUMBER: 2 OF 2	

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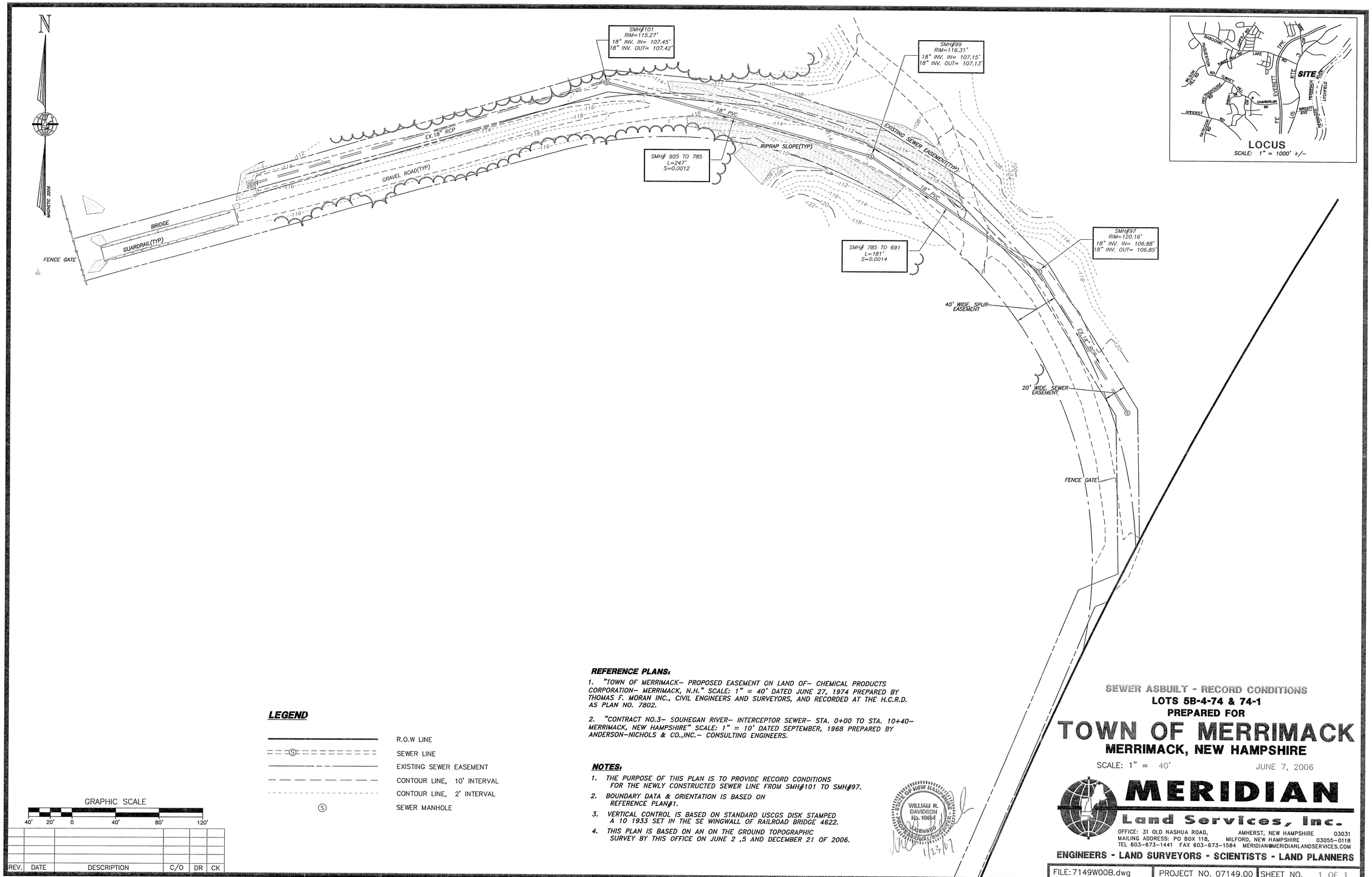


LEGEND

———	R.O.W LINE
= = Ⓢ = = = = = =	SEWER LINE
——— — — ———	EXISTING SEWER EASEMENT
— — — — — — — —	CONTOUR LINE, 10' INTERVAL
- - - - - - - - - -	CONTOUR LINE, 2' INTERVAL
Ⓢ	SEWER MANHOLE

GRAPHIC SCALE

40' 20' 0 40' 80' 120'

REV.	DATE	DESCRIPTION	C/O	DR	CK

REFERENCE PLANS:

1. "TOWN OF MERRIMACK– PROPOSED EASEMENT ON LAND OF– CHEMICAL PRODUCTS CORPORATION– MERRIMACK, N.H." SCALE: 1" = 40' DATED JUNE 27, 1974 PREPARED BY THOMAS F. MORAN INC., CIVIL ENGINEERS AND SURVEYORS, AND RECORDED AT THE H.C.R.D. AS PLAN NO. 7802.

2. "CONTRACT NO.3– SOUHEGAN RIVER– INTERCEPTOR SEWER– STA. 0+00 TO STA. 10+40– MERRIMACK, NEW HAMPSHIRE" SCALE: 1" = 10' DATED SEPTEMBER, 1968 PREPARED BY ANDERSON–NICHOLS & CO.,INC.– CONSULTING ENGINEERS.

NOTES:

1. THE PURPOSE OF THIS PLAN IS TO PROVIDE RECORD CONDITIONS FOR THE NEWLY CONSTRUCTED SEWER LINE FROM SMH#101 TO SMH#97.
2. BOUNDARY DATA & ORIENTATION IS BASED ON REFERENCE PLAN#1.
3. VERTICAL CONTROL IS BASED ON STANDARD USCGS DISK STAMPED A 10 1933 SET IN THE SE WINGWALL OF RAILROAD BRIDGE 4622.
4. THIS PLAN IS BASED ON AN ON THE GROUND TOPOGRAPHIC SURVEY BY THIS OFFICE ON JUNE 2 ,5 AND DECEMBER 21 OF 2006.

STATE OF NEW HAMPSHIRE
WILLIAM R. DAVIDSON
No. 10864
LICENSED
PROFESSIONAL LAND SURVEYOR
1/23/07

SEWER ASBUILT - RECORD CONDITIONS

LOTS 5B-4-74 & 74-1

PREPARED FOR

TOWN OF MERRIMACK

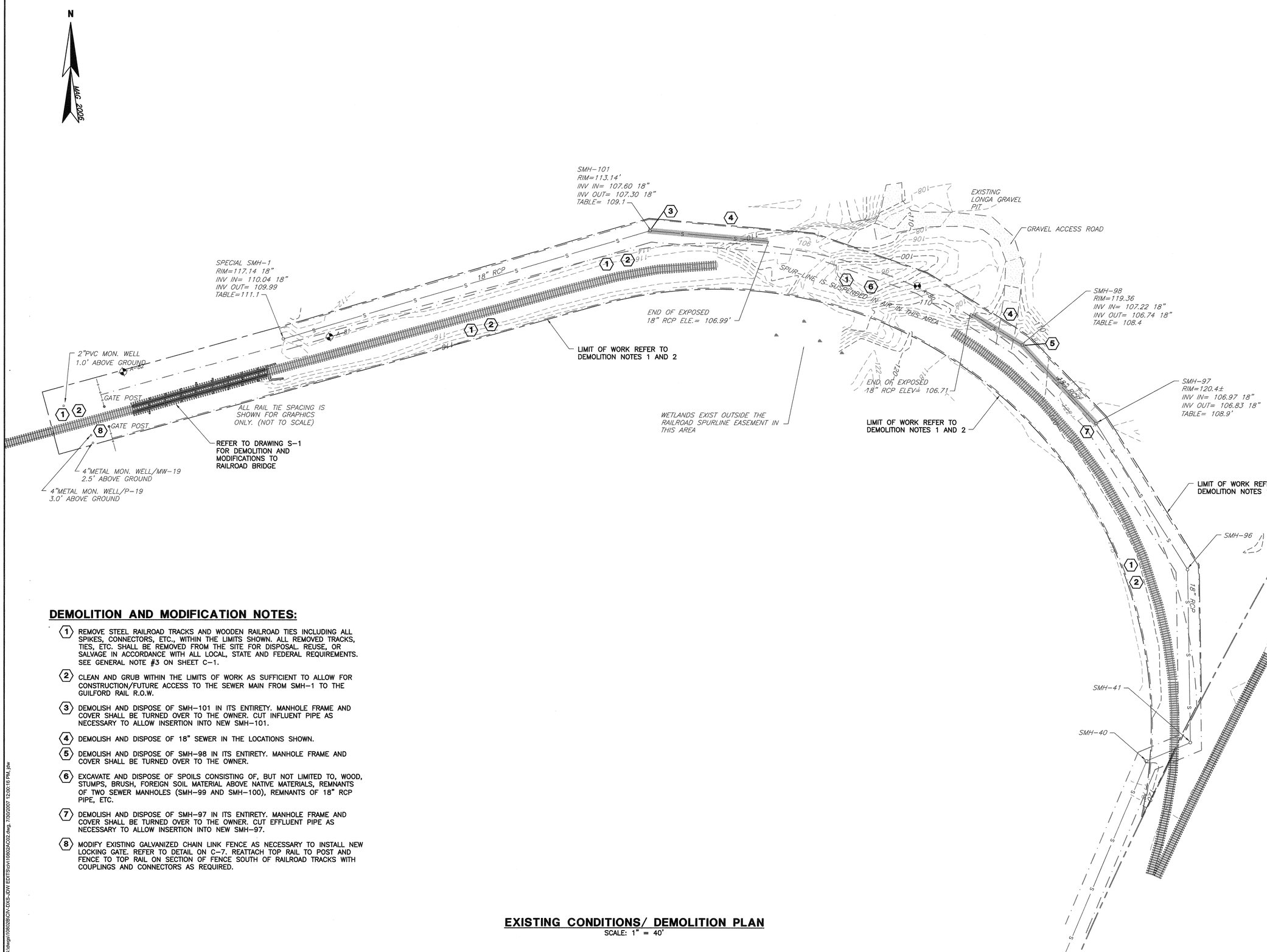
MERRIMACK, NEW HAMPSHIRE

SCALE: 1" = 40' JUNE 7, 2006

MERIDIAN
Land Services, Inc.
OFFICE: 31 OLD NASHUA ROAD, AMHERST, NEW HAMPSHIRE 03031
MAILING ADDRESS: PO BOX 118, MILFORD, NEW HAMPSHIRE 03055-0118
TEL 603-673-1441 FAX 603-673-1584 MERIDIAN@MERIDIANLANDSERVICES.COM
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS

FILE: 7149W00B.dwg	PROJECT NO. 07149.00	SHEET NO. 1 OF 1

AL2



DEMOLITION AND MODIFICATION NOTES:

1. REMOVE STEEL RAILROAD TRACKS AND WOODEN RAILROAD TIES INCLUDING ALL SPIKES, CONNECTORS, ETC., WITHIN THE LIMITS SHOWN. ALL REMOVED TRACKS, TIES, ETC. SHALL BE REMOVED FROM THE SITE FOR DISPOSAL, REUSE, OR SALVAGE IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REQUIREMENTS. SEE GENERAL NOTE #3 ON SHEET C-1.
2. CLEAN AND GRUB WITHIN THE LIMITS OF WORK AS SUFFICIENT TO ALLOW FOR CONSTRUCTION/FUTURE ACCESS TO THE SEWER MAIN FROM SMH-1 TO THE GUILFORD RAIL R.O.W.
3. DEMOLISH AND DISPOSE OF SMH-101 IN ITS ENTIRETY. MANHOLE FRAME AND COVER SHALL BE TURNED OVER TO THE OWNER. CUT INFLUENT PIPE AS NECESSARY TO ALLOW INSERTION INTO NEW SMH-101.
4. DEMOLISH AND DISPOSE OF 18" SEWER IN THE LOCATIONS SHOWN.
5. DEMOLISH AND DISPOSE OF SMH-98 IN ITS ENTIRETY. MANHOLE FRAME AND COVER SHALL BE TURNED OVER TO THE OWNER.
6. EXCAVATE AND DISPOSE OF SPOILS CONSISTING OF, BUT NOT LIMITED TO, WOOD, STUMPS, BRUSH, FOREIGN SOIL MATERIAL ABOVE NATIVE MATERIALS, REMNANTS OF TWO SEWER MANHOLES (SMH-99 AND SMH-100), REMNANTS OF 18" RCP PIPE, ETC.
7. DEMOLISH AND DISPOSE OF SMH-97 IN ITS ENTIRETY. MANHOLE FRAME AND COVER SHALL BE TURNED OVER TO THE OWNER. CUT EFFLUENT PIPE AS NECESSARY TO ALLOW INSERTION INTO NEW SMH-97.
8. MODIFY EXISTING GALVANIZED CHAIN LINK FENCE AS NECESSARY TO INSTALL NEW LOCKING GATE. REFER TO DETAIL ON C-7. REATTACH TOP RAIL TO POST AND FENCE TO TOP RAIL ON SECTION OF FENCE SOUTH OF RAILROAD TRACKS WITH COUPLINGS AND CONNECTORS AS REQUIRED.

EXISTING CONDITIONS/ DEMOLITION PLAN

SCALE: 1" = 40'

PROGRESS PRINTS	
ISSUED FOR REVIEW:	6-22-06
ISSUED FOR BIDDING:	6-28-06
VAULT LOCATION:	
LAST WORKED ON:	
FILENAME:	

NO	REVISIONS	APP'D	DATE
1	RECORD DRAWING	CAD	6-2007
2			
3			
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DRAWN BY SAL
CHECKED BY JRE
DATE 6/28/06
APPROVED BY CAD
DATE 6/28/06
BOOK NO.
PROJECT NO. 10802A
SCALE 1" = 100'

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TOWN OF MERRIMACK
MERRIMACK, NEW HAMPSHIRE
SOUHEGAN RIVER
INTERCEPTOR SEWER REPLACEMENT

EXISTING CONDITIONS
AND DEMOLITION PLAN

DWG C-2
2 OF 8

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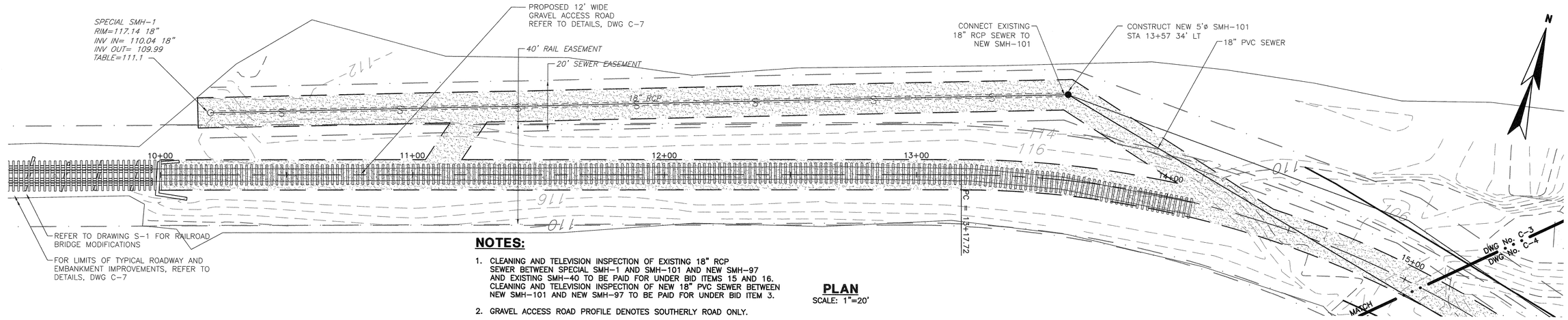
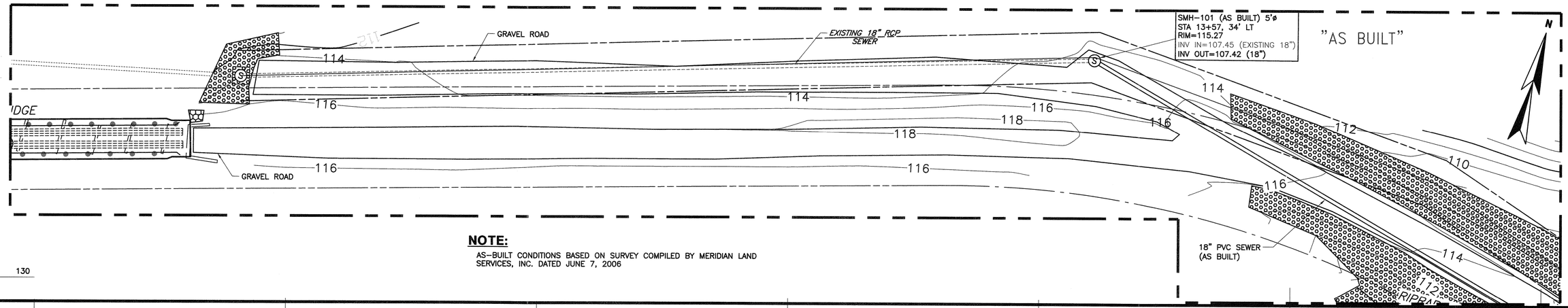


NOTES:

1. CLEANING AND TELEVISION INSPECTION OF EXISTING 18" RCP SEWER BETWEEN SPECIAL SMH-1 AND SMH-101 AND NEW SMH-97 AND EXISTING SMH-40 TO BE PAID FOR UNDER BID ITEMS 15 AND 16. CLEANING AND TELEVISION INSPECTION OF NEW 18" PVC SEWER BETWEEN NEW SMH-101 AND NEW SMH-97 TO BE PAID FOR UNDER BID ITEM 3.
2. GRAVEL ACCESS ROAD PROFILE DENOTES SOUTHERLY ROAD ONLY.

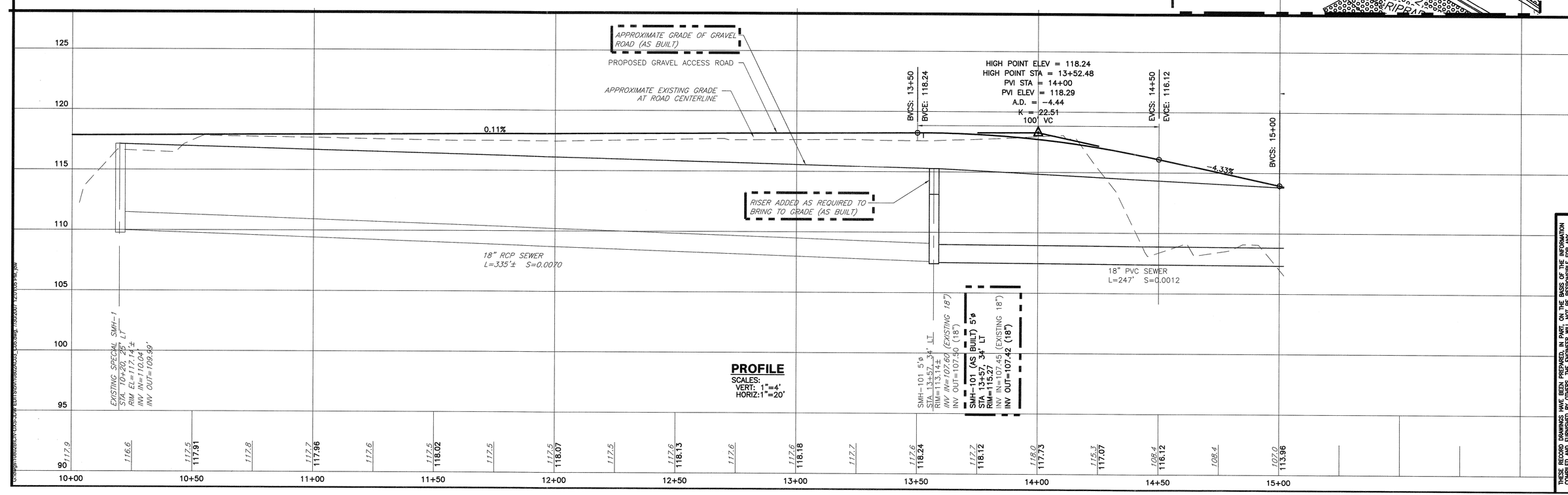
PLAN

SCALE: 1"=20'



NOTE:

AS-BUILT CONDITIONS BASED ON SURVEY COMPILED BY MERIDIAN LAND SERVICES, INC. DATED JUNE 7, 2006



PROFILE

SCALES:
VERT: 1"=4'
HORIZ:1"=20'

NO	REVISIONS	APP'D	DATE
1	RECORD DRAWING	CAD	6-2007
2			
3			
4			
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PROGRESS PRINTS
ISSUED FOR REVIEW: 6-22-06
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VAULT LOCATION:
LAST WORKED ON:
FILENAME:

DRAWN BY SAL
CHECKED BY JRE
DATE 6/28/06
APPROVED BY CAD
DATE 6/28/06
BOOK NO.
PROJECT NO. 10802A
SCALE 1"=20'

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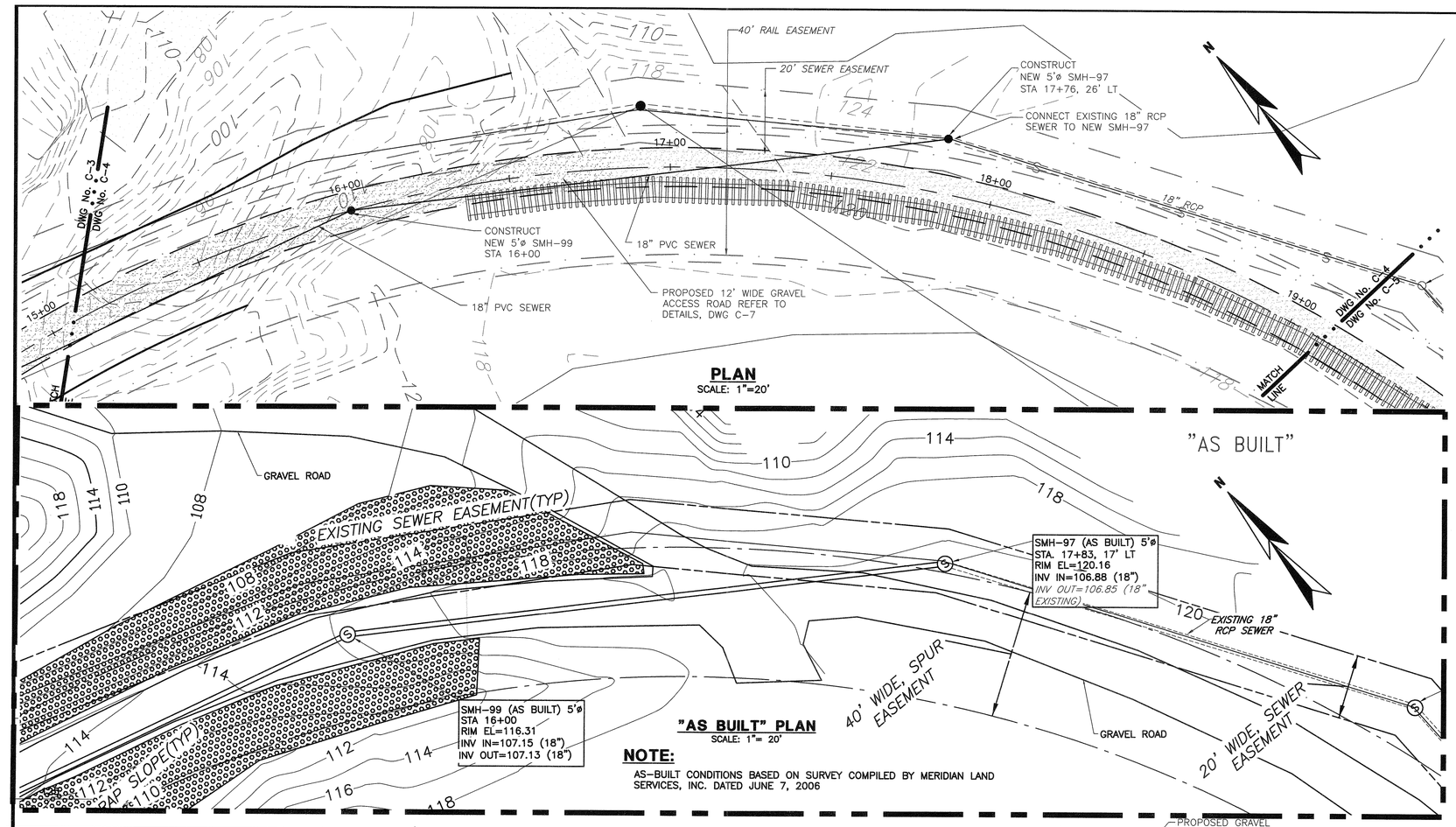
TOWN OF MERRIMACK
MERRIMACK, NEW HAMPSHIRE
SOUHEGAN RIVER
INTERCEPTOR SEWER REPLACEMENT

PLAN & PROFILE
STA 10+00 TO 15+00

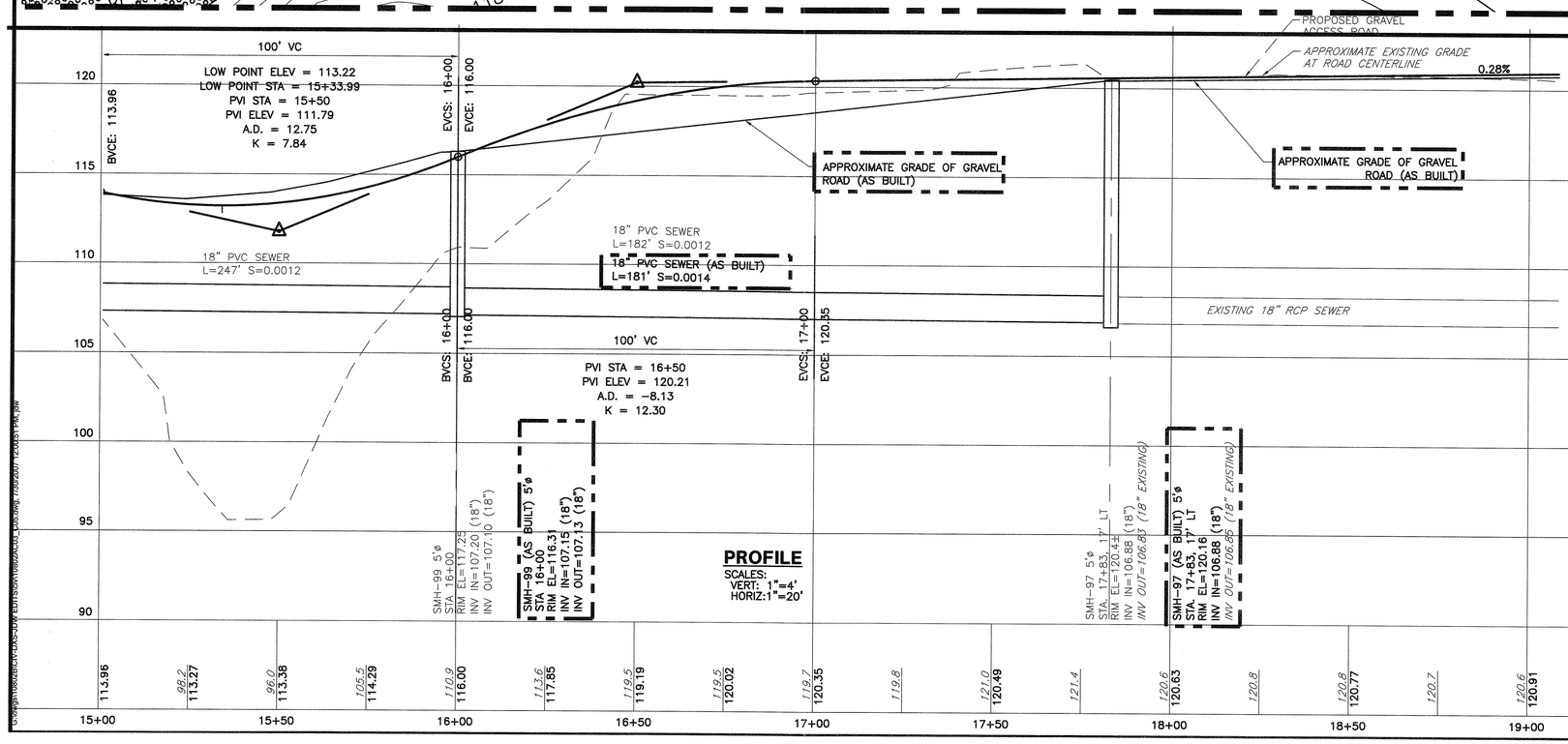
DWG C-3
3 OF 8



PLAN
SCALE: 1"=20'

"AS BUILT" PLAN
SCALE: 1"= 20'

NOTE:
AS-BUILT CONDITIONS BASED ON SURVEY COMPILED BY MERIDIAN LAND SERVICES, INC. DATED JUNE 7, 2006



PROFILE
SCALES:
VERT: 1"=4'
HORIZ:1"=20'

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TOWN OF MERRIMACK
MERRIMACK, NEW HAMPSHIRE
SOUHEGAN RIVER
INTERCEPTOR SEWER REPLACEMENT

PLAN & PROFILE
STA 15+00 TO 19+00

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1	RECORD DRAWING	CAD	6-2007
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PROGRESS PRINTS
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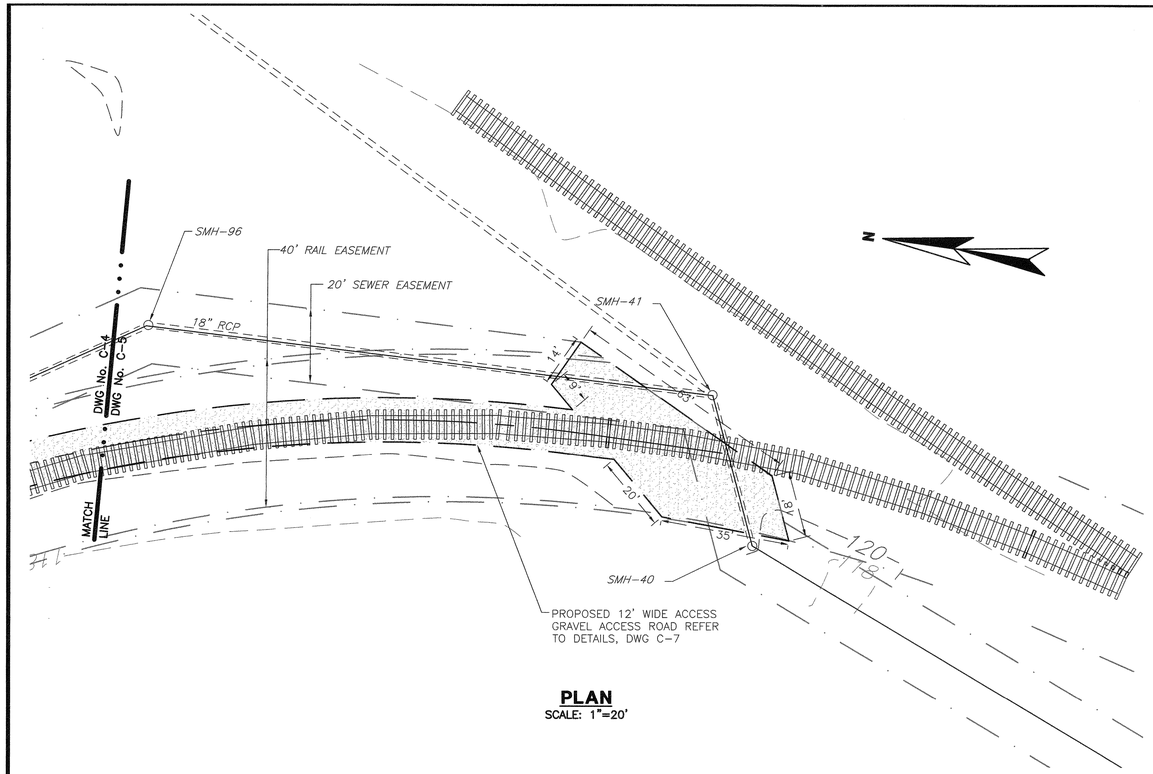
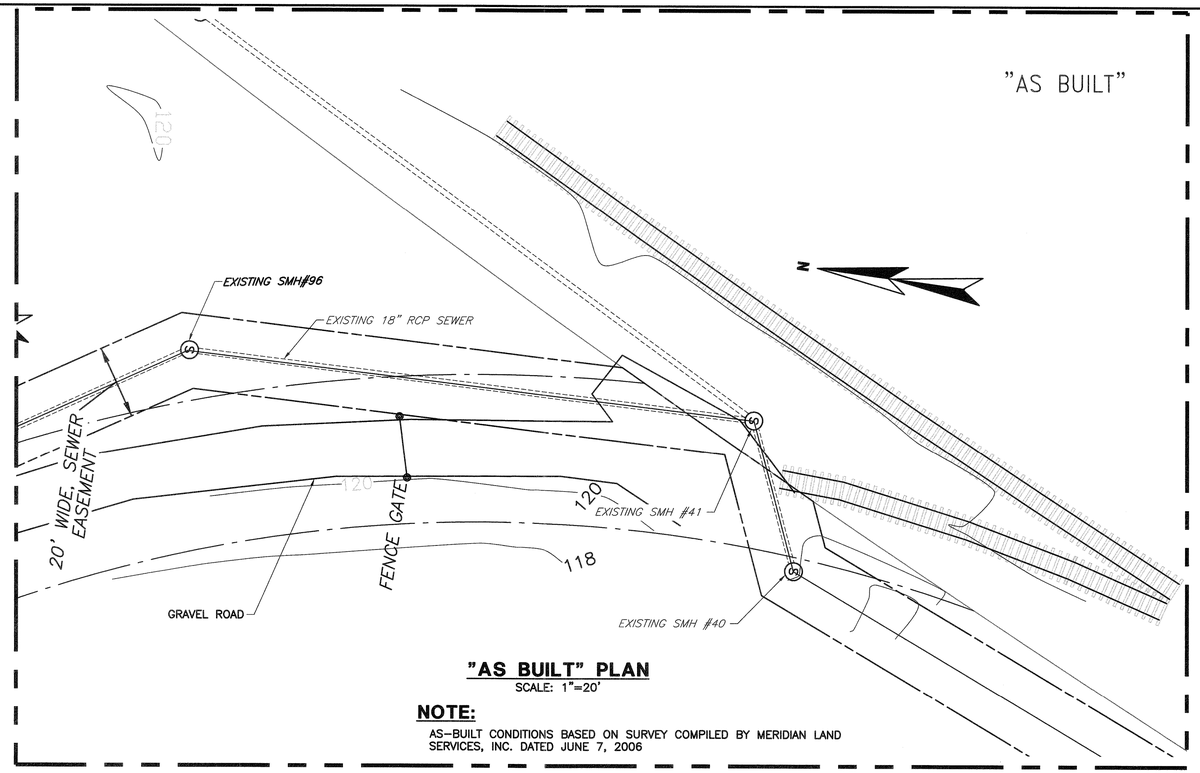
ISSUED FOR BIDDING: 6-28-06
VAULT LOCATION:
LAST PLOTTED ON:
FILENAME:

DRAWN BY SAL
CHECKED BY JRE
DATE 6/28/06
APPROVED BY CAD
DATE 6/28/06
BOOK NO.
PROJECT NO. 10802A
SCALE 1"=20'

DWG C-4

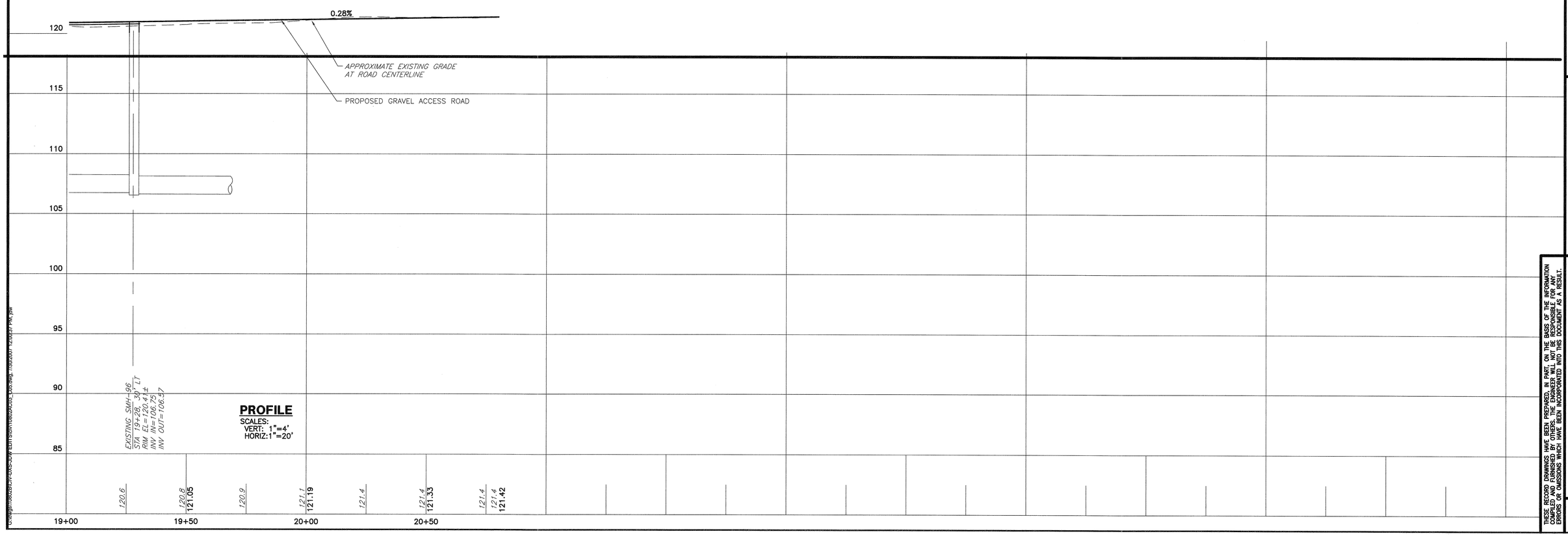


PLAN
SCALE: 1"=20'



"AS BUILT" PLAN
SCALE: 1"=20'

NOTE:
AS-BUILT CONDITIONS BASED ON SURVEY COMPILED BY MERIDIAN LAND SERVICES, INC. DATED JUNE 7, 2006



PROFILE
SCALES:
VERT: 1"=4'
HORIZ:1"=20'

NO.	REVISIONS	APP'D	DATE
1	RECORD DRAWING	CAD	6-2007
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BOOK NO.
PROJECT NO. 10802A
SCALE 1"=20'

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TOWN OF MERRIMACK
MERRIMACK, NEW HAMPSHIRE
SOUHEGAN RIVER
INTERCEPTOR SEWER REPLACEMENT

PLAN & PROFILE
STA 19+00 TO 20+69

DWG C-5
5 OF 8

EROSION AND SEDIMENTATION CONTROL NOTES

THIS PLAN HAS BEEN DEVELOPED AS A STRATEGY TO CONTROL SOIL EROSION AND SEDIMENTATION DURING AND AFTER CONSTRUCTION. THIS PLAN IS BASED ON THE STANDARDS AND SPECIFICATIONS FOR EROSION PREVENTION IN URBAN AND DEVELOPING AREAS AS CONTAINED IN THE "STORMWATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL HANDBOOK FOR URBAN AND DEVELOPING AREAS IN NEW HAMPSHIRE" DATED AUGUST 1992.

THE PROPOSED LOCATIONS OF SILTATION AND EROSION CONTROL STRUCTURES REQUIRED ARE SHOWN ON THE DRAWING. PROVIDE SILT FENCE, STONE CHECK DAMS AND OTHER EROSION CONTROL MEASURES AS REQUIRED TO ADEQUATELY PREVENT SEDIMENT TRANSPORT AS NOTED IN THE HANDBOOK.

1. THE CONTRACTOR SHALL PROVIDE PROPER EROSION CONTROL AND DRAINAGE MEASURES IN ALL AREAS OF WORK, AND CONFINE SOIL SEDIMENT TO WITHIN THE LIMITS OF EXCAVATION AND GRADING. PRIOR TO BEGINNING EXCAVATION WORK, EROSION CONTROL FENCE SHALL BE INSTALLED AT THE DOWNGRADIENT PERIMETER OF THE ACTUAL LIMITS OF CLEARING, GRUBBING AND/OR GRADING, AS SHOWN ON THE DRAWINGS. EROSION CONTROL MEASURES SHOWN ON THE DRAWINGS ARE A MINIMUM, CONTRACTOR SHALL TAKE ALL OTHER NECESSARY MEASURES.

2. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE DONE IN ACCORDANCE WITH THE "STORMWATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL HANDBOOK FOR URBAN AND DEVELOPING AREAS IN NEW HAMPSHIRE", NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES, ROCKINGHAM COUNTY CONSERVATION DISTRICT, USDA SOIL CONSERVATION SERVICE, DATED AUGUST 1992.

3. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING EROSION CONTROL MEASURES THROUGHOUT CONSTRUCTION PERIOD. ALL DISTURBED EARTH SURFACES SHALL BE STABILIZED IN THE SHORTEST PRACTICAL TIME. TEMPORARY EROSION CONTROL DEVICES SHALL BE EMPLOYED UNTIL SUCH TIME AS ADEQUATE SOIL STABILIZATION HAS BEEN ACHIEVED OR SATISFACTORY GROWTH OF GRASS IS ESTABLISHED.

4. THE CONTRACTOR SHALL FURNISH THE ENGINEER, IN WRITING, HIS WORK PLAN GIVING PROPOSED LOCATIONS FOR STORAGE OF ALL MATERIALS TO BE USED IN THE CONSTRUCTION OF THE PROJECT BEFORE BEGINNING CONSTRUCTION. A SCHEDULE OF WORK SHALL ACCOMPANY THE WORK PLAN. ACCEPTANCE OF THIS PLAN WILL NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF COMPLETION OF THE WORK AS SPECIFIED. PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES, CONTRACTOR SHALL MEET WITH THE ENGINEER AND OWNER TO DISCUSS EROSION CONTROL REQUIREMENTS AND DEVELOP A MUTUAL UNDERSTANDING RELATIVE TO DETAILS OF EROSION CONTROL.

5. TEMPORARY STORAGE OF STOCKPILED MATERIAL SHALL BE STABILIZED IN A MANNER THAT WILL MINIMIZE EROSION.

6. THOSE AREAS UNDERGOING ACTUAL CONSTRUCTION WILL BE MAINTAINED IN AN UNTREATED OR UNVEGETATED CONDITION FOR THE MINIMUM TIME REQUIRED. IN GENERAL, AREAS TO BE VEGETATED SHALL BE PERMANENTLY STABILIZED WITHIN 15 DAYS OF FINAL GRADING AND TEMPORARILY STABILIZED WITHIN 30 DAYS OF INITIAL DISTURBANCE OF THE SOIL.

7. SEDIMENT BARRIERS (SILT FENCE, STONE CHECK DAMS, ETC.) SHOULD BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OF UPGRADIENT DRAINAGE AREAS.

8. INSTALL SILT FENCE AT TOE OF SLOPES TO FILTER SILT FROM RUNOFF. SEE SILT FENCE DETAIL FOR PROPER INSTALLATION. SILT FENCE WILL REMAIN IN PLACE PER NOTE #9.

9. ALL EROSION CONTROL STRUCTURES WILL BE INSPECTED, REPLACED AND/OR REPAIRED EVERY 7 DAYS AND IMMEDIATELY FOLLOWING ANY SIGNIFICANT RAINFALL OR SNOW MELT OR WHEN NO LONGER SERVICEABLE DUE TO SEDIMENT ACCUMULATION OR DECOMPOSURE. SEDIMENT DEPOSITS MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE QUARTER THE HEIGHT OF THE BARRIER. SEDIMENT CONTROL DEVICES SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL AREAS UPSLOPE ARE PERMANENTLY STABILIZED.

10. NO SLOPES, EITHER PERMANENT OR TEMPORARY, SHALL BE STEEPER THAN TWO HORIZONTAL TO ONE VERTICAL (2 TO 1) UNLESS STABILIZED WITH PERMANENT EROSION CONTROL MEASURES.

11. WHEN FEASIBLE, TEMPORARY SEEDING OF DISTURBED AREAS THAT HAVE NOT BEEN FINISH GRADED SHALL BE COMPLETED 30 DAYS PRIOR TO THE FIRST KILLING FROST.

12. IF FINAL SEEDING OF THE DISTURBED AREAS IS NOT TO BE COMPLETED 30 DAYS PRIOR TO THE ANTICIPATED DATE OF THE FIRST KILLING FROST, USE TEMPORARY MULCHING (DORMANT SEEDING MAY BE ATTEMPTED AS WELL) TO PROTECT THE SITE AND DELAY PERMANENT SEEDING, UNTIL UPGRADIENT AREAS ARE STABILIZED.

13. REMOVE ALL SEDIMENT WHICH COLLECTS BEHIND EROSION CONTROL FENCING AND DISPOSE OF MATERIAL ON LANDFILL AREA AS DIRECTED BY OWNER. AT NO TIME SHALL THE INTEGRITY OF THE EROSION CONTROL FENCE BE IN DANGER DUE TO BUILDUP OF SEDIMENT.

14. REVEGETATION MEASURES WILL COMMENCE UPON COMPLETION OF CONSTRUCTION EXCEPT AS NOTED ABOVE. SEE SPECIFICATION SECTION 02485 FOR REQUIREMENTS AND LOCATIONS.

15. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED ONCE THE WORK AREA IS STABILIZED. ALL INSTALLED EROSION CONTROL FACILITIES SHALL BE REMOVED AT THE END OF THE PROJECT.

16. WETLANDS (EXCEPTING THOSE WHICH ARE TO BE FILLED IN ACCORDANCE WITH STATE AND FEDERAL REGULATIONS) WILL BE PROTECTED WITH SILT FENCE INSTALLED AT THE EDGE OF THE WETLAND OR THE BOUNDARY OF WETLAND DISTURBANCE.

17. IN GENERAL, AREAS WITHIN 100 FEET OF DELINEATED WETLANDS OR STREAMS SHALL HAVE A MAXIMUM PERIOD OF EXPOSURE OF NOT MORE THAN 15 DAYS. FOLLOW APPROPRIATE EROSION CONTROL MEASURES PRIOR TO EACH STORM IN ALL AREAS WITHIN 100 FEET OF DELINEATED WETLANDS OR STREAMS.

18. THE CONTRACTOR SHALL STABILIZE ALL DITCHES PRIOR TO THE DIRECTING OF FLOW TO THEM AND/OR DIRECTING FLOW FROM THE DITCHES TO EXISTING WATER COURSES.

MULCH ANCHORING

ANCHOR MULCH WITH: MULCH NETTING (AS PER MANUFACTURER); ASPHALT EMULSION (150 TO 200 GALLONS PER ACRE); CHEMICAL TACK (AS PER MANUFACTURER'S SPECIFICATIONS); OR WOOD CELLULOSE FIBER (750 LBS/ACRE). WETTING FOR SMALL AREAS AND ROAD DITCHES MAY BE PERMITTED.

ADDITIONAL TEMPORARY SEED MIXTURE (OR PERIODS LESS THAN 12 MONTHS)

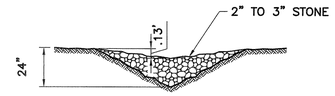
SEASON	SEED	RATE
SUMMER (5/15–8/15)	SUDAN GRASS	40 LBS/ACRE
LATE SUMMER/EARLY FALL (8/15–9/15)	ANNUAL RYEGRASS PERENNIAL RYEGRASS	40 LBS/ACRE 30 LBS/ACRE
LATE SUMMER/EARLY FALL (8/15–9/5)	WINTER RYE	112 LBS/ACRE
WINTER (9/15–4/1)	MULCH W/DORMANT SEED	80 LBS/ACRE*
SPRING (4/1–5/15)	OATS PERENNIAL RYEGRASS	80 LBS/ACRE 30 LBS/ACRE
SPRING (4/1–6/1)	PERENNIAL RYEGRASS	30 LBS/ACRE

MULCH AND MULCH ANCHORING — * seed rate only

MULCH

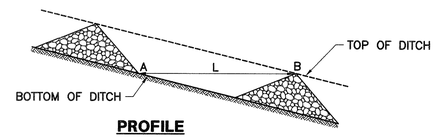
LOCATION	MULCH	RATE (1000 S.F.)
PROTECTED AREA	STRAW OR HAY *	90 POUNDS
WINDY AREAS	STRAW OR HAY (ANCHORED) *	90 POUNDS
MODERATE TO HIGH VELOCITY AREAS OR STEEP SLOPES (GREATER THAN 3:1)	JUTE MESH, EXCELSIOR MAT OR EQUIV.	AS REQUIRED AS REQUIRED

* A HYDRO–APPLICATION OF CELLULOSE FIBER MAY BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SHALL BE USED ON HAY MULCH FOR WIND CONTROL.



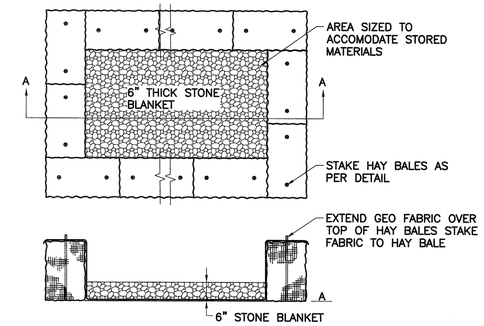
CROSS SECTION

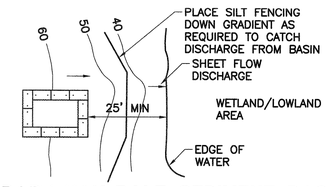
DITCH SLOPE (FT/FT)	L (FT)
0.020	100
0.030	66
0.040	50
0.050	40
0.080	25
0.100	20
0.120	17
0.150	13



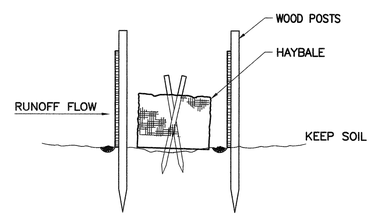
PROFILE

STONE CHECK DAM DETAIL
NTS

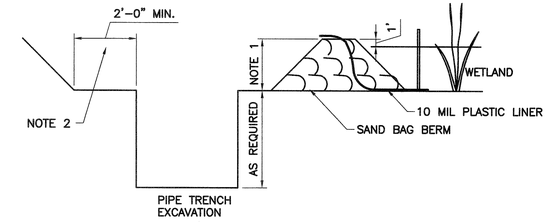




TEMPORARY HAY BALE SEDIMENT BASIN
NTS



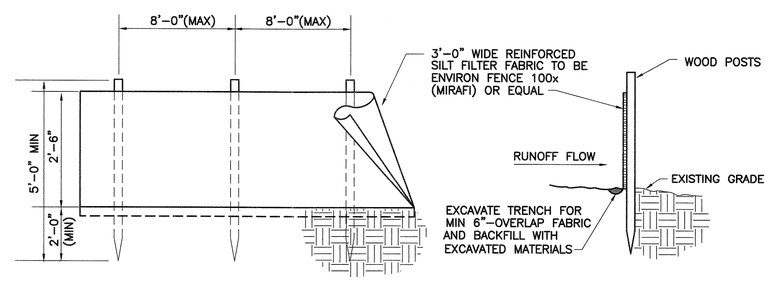
DOUBLE ROW SILT FENCE AND HAY BALE BARRIER
NTS



NOTE:
1. HEIGHT OF BERM TO BE CONSTRUCTED BASED ON DEPTH OF WATER SO AS TO MAINTAIN 1' MINIMUM FREE BOARD.

2. SPOIL FROM TRENCH EXCAVATION AND SAND BAG BERM TO BE KEPT BACK AT A MINIMUN OF 2 FEET FROM EDGE OF TRENCH AS PER OSHA REGULATIONS.

PIPE TRENCH EXCAVATION DETAIL
NTS



SILT FENCE INSTALLATION DETAIL
NTS

NO	REVISIONS	APP'D	DATE
1	RECORD DRAWING	CAD	6–2007

PROGRESS PRINTS
ISSUED FOR REVIEW: 6-22-06
ISSUED FOR BIDDING: 6-28-06

VAULT LOCATION:
LAST WORKED ON:
FILENAME:

DRAWN BY SAL
CHECKED BY JRE
DATE 6/28/06
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DATE 6/28/06
BOOK NO. ___
PROJECT NO. 10802A
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TOWN OF MERRIMACK
MERRIMACK, NEW HAMPSHIRE
SOUHEGAN RIVER
INTERCEPTOR SEWER REPLACEMENT

EROSION CONTROL NOTES AND DETAILS

DWG C–6
6 OF 8

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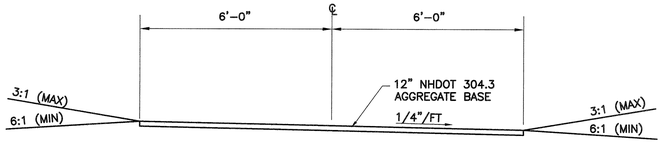
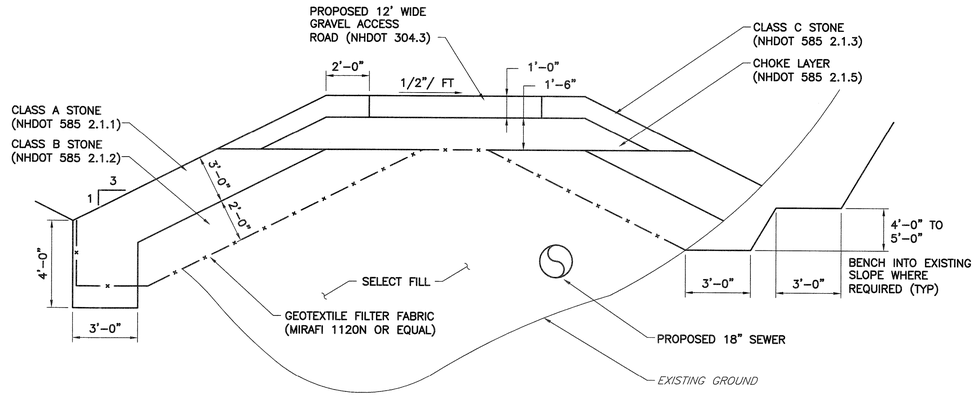


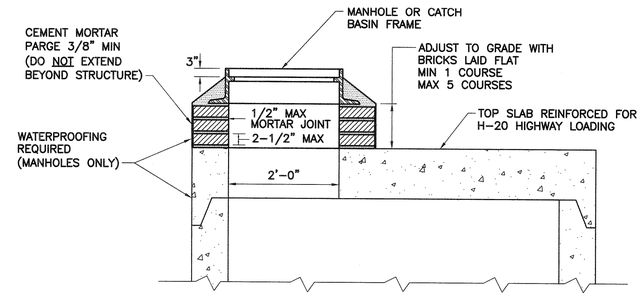
TYPICAL ROADWAY SECTION
STA 10+00 TO STA 14+00+/- & STA 16+25+/- TO STA 20+68

NTS



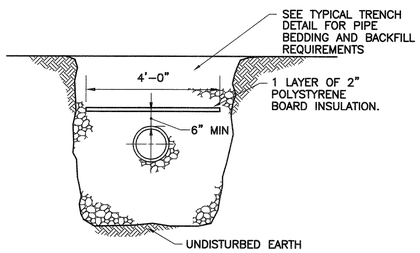
TYPICAL ROADWAY AND EMBANKMENT SECTION DETAIL
STA 14+00+/- TO STA 16+25+/-

NTS



FLAT SLAB TOP MANHOLE FRAME INSTALLATION

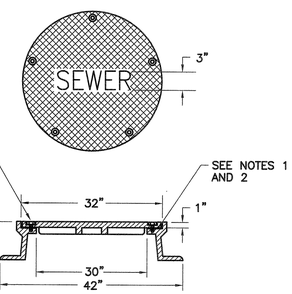
NTS



NOTE: TRENCH PIPE INSULATION TO BE USED WHERE DEPTH OF COVER IS LESS THAN 4 FEET OR AS DIRECTED BY THE ENGINEER.

TRENCH PIPE INSULATION DETAIL

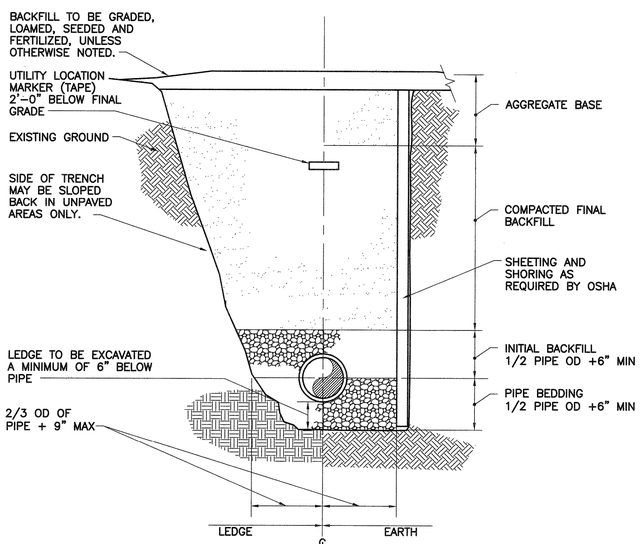
NTS



NOTES:
1. BEARING SURFACES OF FRAME AND COVER MACHINED
2. GASKET RUBBER OR CR60 NEOPRENE
3. STAINLESS CAP SCREWS

WATERTIGHT COVER AND FRAME

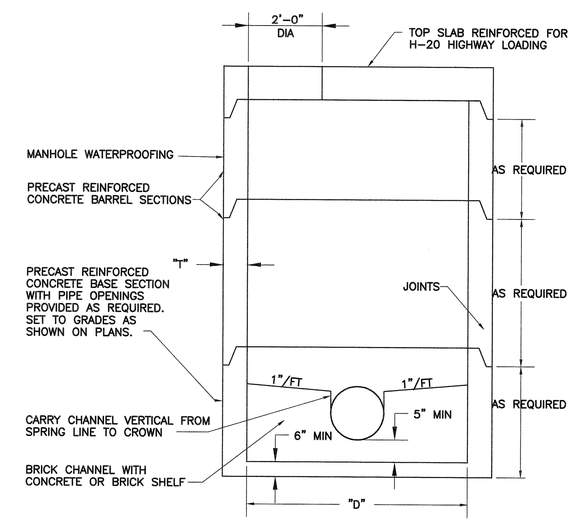
NTS



NOTES:
1. ALL EXCAVATION MUST MEET OSHA STANDARDS
2. INSTALL 3 FOOT LONG IMPERVIOUS MATERIAL DAM IN BEDDING/INITIAL BACKFILL MATERIAL EVERY 100' TO PREVENT TRENCH GROUND WATER FROM BEING CHANNELED ALONG BEDDING/INITIAL BACKFILL.
3. SEE SPECIFICATIONS FOR BEDDING AND BACKFILL REQUIREMENTS.

PIPE TRENCH DETAIL

NTS

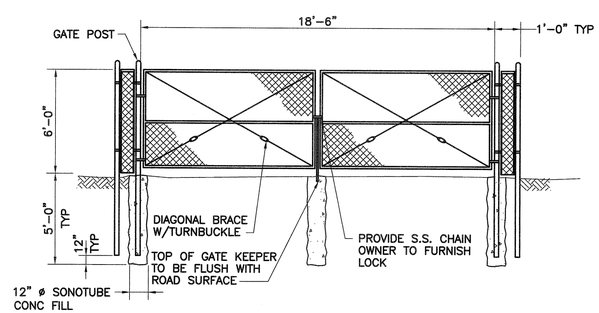


NOTE: MANHOLE CHANNELS REQUIRING CHANGE IN ALIGNMENT ARE TO BE BUILT ON A SMOOTH RADIUS. IF SIDE PIPES ENTER CHANNEL, SHAPE TO RECEIVE ADDED SIDE FLOW.

DIAMETER ("D")	MAX PIPE DIAMETER STRAIGHT THRU TO 45° DEFLECTION	MINIMUM WALL THICKNESS ("T")
60"	UP TO 44" O.D.	6"

5' DIA FLAT SLAB TOP MANHOLE

NTS



CHAIN LINK LOCKING GATE DETAIL

NTS

NO	REVISIONS	APP'D	DATE
1	RECORD DRAWING	CAD	6-2007
2			
3			
4			
5			

PROGRESS PRINTS
ISSUED FOR REVIEW: 6-22-06
ISSUED FOR BIDDING: 6-28-06
VAULT LOCATION:
LAST WORKED ON:
FILENAME:

DRAWN BY SAL
CHECKED BY JRE
DATE 6/28/06
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DATE 6/28/06
BOOK NO. ___
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SOUHEGAN RIVER
INTERCEPTOR SEWER REPLACEMENT

MISCELLANEOUS DETAILS

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DWG C-7

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Appendix C

Table 3. Soil Acceptance Standards

Table 3
SOIL ACCEPTANCE STANDARDS

Chemical Name	CAS No.	Concentration (mg/kg)
Acenaphthene	83-32-9	340
Acenaphthylene	208-96-8	490
Acetone	67-64-1	75
Acrylonitrile	107-13-1	0.5
Alachor	15972-60-8	0.2
Aldicarb	116-06-3	0.1
Aldicarb sulfone	1646-88-4	0.1
Aldicarb sulfoxide	1646-87-3	0.2
Aldrin	309-00-2	0.09
Alkylbenzenes[+]	N/A	59 (total)*
Allyl chloride	107-05-1	1
Anthracene	120-12-7	1,000
Antimony	7440-36-0	9
Arsenic	7440-38-2	11
Atrazine	1912-24-9	0.09
Barium	7440-39-3	750*
Benzene	71-43-2	0.3
Benzidine	92-87-5	0.004
Benzo(a)anthracene	56-55-3	0.7*
Benzo(a)pyrene	50-32-8	0.7
Benzo(b)fluoranthene	205-99-2	1
Benzo(g,h,i)perylene	191-24-2	480*
Benzoic acid	65-85-0	350
Benzo(k)fluoranthene	207-08-9	7*
Beryllium	7440-41-7	1
Biphenyl, 1,1-	92-52-4	174
Bis (2Chloroisopropyl) ether	108-60-1	5
Bis (Chloroethyl) ether	111-44-4	0.7
Bisphenol A	80-05-7	1,300
Boron	7440-42-8	1,000
Bromodichloromethane	75-27-4	0.1
Bromoform	75-25-2	0.1
Bromomethane	74-83-9	0.3
Butylbenzene, n-	104-51-8	59*
Butylbenzene, sec-	135-98-8	59*
Butylbenzene, tert-	98-06-6	59*
Cadmium	7440-43-9	32*
Camphor	76-22-2	760
Carbofuran	1563-66-2	0.6
Carbon disulfide	75-15-0	460
Carbon tetrachloride	56-23-5	12
Chlordane	57-74-9	4
Chloroaniline, p-	106-47-8	1.3
Chloromethane	74-87-3	3
Chlorophenol, 2-	95-57-8	2
Chlorotoluene, 2 (o)	95-49-8	15
Chlorotoluene, 4 (p)	106-43-4	2,400
Chromium (III)	16065-83-1	1,000
Chromium (VI)	18540-29-9	130

Adapted from Table 600-2 - Soil Remediation Standards
Chapter Env-Or - Contaminated Site Management
New Hampshire Code of Administrative Rules

Table 3
SOIL ACCEPTANCE STANDARDS

Chemical Name	CAS No.	Concentration (mg/kg)
Chrysene	218-01-9	70*
Clopyralid	1702-17-6	13,000
Cyanazine	21725-46-2	0.03
Cyanide	57-12-5	100
2,4-D (Dichlorophenooxy acetic acid, 2,4-)	94-75-7	300
Dalapon	75-99-0	3
DDD (Dichlorodiphenyl dichloroethane, p,p')	72-54-8	6
DDE (Dichlorodiphenyl dichloroethylene, p,p')	72-55-9	4
DDT (Dichlorodiphenyl trichloroethane, p,p')	50-29-3	4
Dibenzo(a,h)anthracene	53-70-3	0.7
Dibromochloromethane	124-48-1	1
Dibromochloropropane	96-12-8	0.1
Dibutylphthalate	84-74-2	2,600
Dichlorobenzene, 1,2- (o-DCB)	95-50-1	88
Dichlorobenzene, 1,3- (m-DCB)	541-73-1	150
Dichlorobenzene, 1,4- (p-DCB)	106-46-7	7
Dichlorobenzidine, 3,3'-	91-94-1	0.7
Dichlorodifluoromethane	75-71-8	1,000
Dichloroethane, 1,1-	75-34-3	3
Dichloroethane, 1,2-	107-06-2	0.09*
Dichloroethylene, 1,1-	75-35-4	2
Dichloroethylene, cis-1,2-	156-59-2	2
Dichloroethylene, trans-1,2-	156-60-5	9
Dichloromethane (Methylene chloride)	75-09-2	0.1
Dichlorophenol, 2,4-	120-83-2	0.7
Dichloropropane, 1,2-	78-87-5	0.1
Dichloropropene, 1,3-	542-75-6	0.1
Dieldrin	60-57-1	0.06
Diethyl ether	60-29-7	3900
Diethyl phthalate	84-66-2	1,000
Di-(2-ethylhexyl)phthalate (DEHP)	117-81-7	72
Diisopropyl ether (DIPE)	108-20-3	10
Dimethyl phthalate	131-11-3	700
Dimethylphenol, 2,4-	105-67-9	4
Dinitrophenol, 2,4-	51-28-5	0.7
Dinitrotoluene, 2,4-	121-14-2	0.7
Dinoseb	88-85-7	1
Dioxane, 1,4-	123-91-1	5
Diphenylhydrazine, 1,2-	122-66-7	1
Diquat (dibromide)	85-00-7	0.3
Endosulfan	115-29-7	45
Endothall	145-73-3	1
Endrin	72-20-8	8
Ethyl tert butyl ether (ETBE)	637-92-3	0.7
Ethylbenzene	100-41-4	90*
Ethylene dibromide	106-93-4	0.1
Ethylene glycol	107-21-1	91
Fluoranthene	206-44-0	810*
Fluorene	86-73-7	77

Adapted from Table 600-2 - Soil Remediation Standards
Chapter Env-Or - Contaminated Site Management
New Hampshire Code of Administrative Rules

Table 3
SOIL ACCEPTANCE STANDARDS

Chemical Name	CAS No.	Concentration (mg/kg)
Fluoride	7782-41-4	2,200
Formaldehyde	50-00-0	1
Heptachlor	76-44-8	0.2
Heptachlor epoxide	1024-57-3	0.1
Hexachlorobenzene	118-74-1	0.8
Hexachlorobutadiene	87-68-3	7
Hexachlorocyclohexane, alpha	319-84-6	0.06
Hexachlorocyclohexane, beta	319-85-7	0.06
Hexachlorocyclohexane, gamma	58-89-9	0.09
Hexachlorocyclopentadiene	77-47-4	200
Hexachlorodibenzodioxin, 2,3,7,8-	34465-46-8	0.0007
Hexachloroethane	67-72-1	0.7
Indeno(1,2,3-cd)pyrene	193-39-5	0.7*
Isophorone	78-59-1	1
Isopropyl benzene	98-82-8	23*
Isopropyl toluene, p-	99-87-6	59*
Lead	7439-92-1	400
Manganese	7439-96-5	5,200
MCPA (2-Methyl-4-chlorophenoxyacetic acid)	94-74-6	13
MCPP (2-(2- Methyl-4-chlorophenoxy) propionic acid)	93-65-2	26
Mercury (inorganic)	7439-97-6	4*
Methanol	67-56-1	50
Methoxychlor	72-43-5	130
Methyl ethyl ketone (MEK)	78-93-3	51
Methyl isobutyl ketone (MIBK)	108-10-1	29
Methyl mercury	22967-92-6	3
Methylnaphthalene, 2-	91-57-6	96
Methyl phenol, 2-	95-48-7	0.9
Methyl phenol, 4-	106-44-5	0.7
Methyl tert butyl ether (MTBE)	1634-04-4	0.13*
Metolachlor	51218-45-2	3
Metribuzin	21087-64-9	5
Monochlorobenzene	108-90-7	6
Naphthalene	91-20-3	3*
Non-Carcinogenic PAH Group[++]	N/A	480 (total)*
Nickel	7440-02-0	400
Oxamyl	23135-22-0	2
Pentachlorophenol	87-86-5	3
Phenanthrene	85-01-8	480*
Phenol	108-95-2	56
Picloram	1918-02-1	6
Polychlorinated Biphenyls (PCBs)	1336-36-3	1
Propyl benzene, n-	103-65-1	59*
Pyrene	129-00-0	480*
Selenium	7782-49-2	180
Silver	7440-22-4	45*
Simazine	122-34-9	0.4
Styrene	100-42-5	17
TCDD,2,3,7,8-(Dioxin)	1746-01-6	0.001

Adapted from Table 600-2 - Soil Remediation Standards
Chapter Env-Or - Contaminated Site Management
New Hampshire Code of Administrative Rules

Table 3
SOIL ACCEPTANCE STANDARDS

Chemical Name	CAS No.	Concentration (mg/kg)
Tertiary amyl methyl ether (TAME)	994-05-8	3
Tertiary butyl alcohol (TBA)	75-65-0	2
Tetrachloroethane, 1,1,1,2-	630-20-6	0.8
Tetrachloroethane, 1,1,2,2,-	79-34-5	4
Tetrachloroethylene (PCE)	127-18-4	2
Tetrachlorophenol 2,3,4,6	58-90-2	130
Tetrahydrofuran	109-99-9	200
Thallium	7440-28-0	10
Toluene	108-88-3	100
Total Petroleum Hydrocarbons	N/A	10,000
Toxaphene	8001-35-2	1
2,4,5-TP (Silvex)	93-72-1	60
Trichlorobenzene, 1,2,4-	120-82-1	19
Trichlorobenzene, 1,3,5-	108-70-3	340
Trichloroethane, 1,1,1-	71-55-6	78
Trichloroethane, 1,1,2-	79-00-5	0.1
Trichloroethylene (TCE)	79-01-6	0.8
Trichlorofluoromethane	75-69-4	1,000
Trichloromethane (Chloroform)	67-66-3	3
Trichlorophenol, 2,4,5-	95-95-4	24
Trichlorophenol, 2,4,6-	88-06-2	0.7
Trichloropropane, 1,2,3-	96-18-4	0.2
Trimethylbenzene, 1,2,4	95-63-6	59*
Trimethylbenzene, 1,3,5	108-67-8	59*
Vinyl chloride	75-01-4	1
Xylenes (mixed isomers)	1330-20-7	500
Zinc	7440-66-6	1,000

Notes: *varies from the standard provided in Table 600-2, Chapter Env-Or 600.
Alkylbenzenes: n-Butylbenzene, sec-Butylbenzene, tert-Butylbenzene, 4-Isopropyl toluene, n-Propylbenzene, 1,2,4- Trimethylbenzene, 1,3,5-Trimethylbenzene
Non-Carcinogenic PAH Group: Pyrene, Benzo(g,h,I) Perylene and Phenanthrene

Appendix D

Generator Profile, Material Shipping Record and Weekly Site Inspection Form

Brighter Horizons Environmental, Inc.

Gravel Pit Partial Reclamation, Longa Sand and Gravel Pit

17 Twin Bridge Road, Merrimack, NH 03054 (603) 424-9210

Generator Profile

1. Generator Information

Name: _____ Address: _____

Contact: _____ _____

Phone: E-mail:

2. Site Information

Name: _____ Address: _____

_____

Type of Facility: _____

3. Type of Material

☐ Clean soil ☐ Urban fill soil ☐ Other impacted soil

☐ Street sweepings

4. Quantity

_____ Tons _____ Cubic yards

5. Please provide a brief description of the material including source and type of contamination (leaking tanks, spill, vehicle accident, etc.); the type of soil; and any debris or other potential contaminants.

_____

_____

6. ***Attach Other Generator Documentation, Soil Sampling Plan, and/or Laboratory Analyses***

---

7. ***Generator's Certification***

To the best of my knowledge the waste represented by this waste profile is not considered a hazardous waste by USEPA standards and does not contain asbestos, radioactive material or polychlorinated biphenyls (PCB's). I certify that the information provided in this profile and any supporting analytical data accurately represents the material to be shipped to the Longa Sand and Gravel Pit, 17 Town Bridge Road, Merrimack, NH 03054. All analytical was performed by a State of NH certified lab. Further, I am authorized to sign on behalf of the Generator.

Generator signature: _____ Title: _____

Name (Type or Print): _____ Company Name: _____

SITE OPERATOR USE ONLY

Approver: Approval Date:

Soil Type: Final Disposition:

Appendix E

Stormwater Analysis

Longa Soil Reclamation Project

Stormwater Analysis

May 28, 2013

The proposed work consists of restoring approximately 11 acres of land designated as the 'Proposed Reclamation Area' which is located within the southeast portion of the site, as shown on Sheet 1 of 2. The purpose of this work is to restore the site to natural adjacent grade by filling the Proposed Reclamation Area with soils meeting the acceptance criteria as defined in the Operations Plan and the NH DES Certified Derived Waste Application. The filling will take place within the former gravel pit mining area such that the adjacent high ground is met at approximately elevation 120-feet mean sea level (MSL). The 11 acre area will be filled and graded such that a 1% slope is maintained to the interior of the reclamation area down to elevation 118-feet MSL. This basin shaped configuration supports the stormwater analysis below for the reclamation area to infiltrate all stormwater generated within the proposed fill area with no proposed stormwater discharge to the surrounding area.

The project is anticipated to be constructed in sequence from southeast to northwest by filling and compacting in lifts. A grid system will be staked in the field such that deposition of imported material will be easily identified and recorded when placed, as outlined in the Operations Plan.

Soils, Slopes, Vegetation and Current Drainage Patterns

The site is generally flat within the mined area with large stockpiles of earth material (awaiting processing) and a low-lying area to the north. The Proposed Reclamation Area is currently used as a material staging and stockpile area that will cease once importing for reclamation commences.

The Natural Resources Conservation Service (NRCS) Soil Survey for Hillsborough County, New Hampshire delineates the soils on the project site as Hinckley loamy sand (HsD), Occum fine sandy loam (Om), Udipsamments (UdA), and Windsor loamy sand (WdA, WdB, WdC, WdD). All soils within the Proposed Reclamation Area have a hydrologic soil group of "A" which represents a high infiltration rate (low runoff potential) when thoroughly wet. The hydraulic soil classification for the imported soil is difficult to predict and therefore was not used in the stormwater evaluation below. The NRCS Soil Survey for the Site is attached for reference.

Currently all stormwater generated within the Proposed Reclamation Area flows to the low lying area within the site to the north, as shown on Sheet 1 (C-101) of 2, and infiltrates. This general stormwater management concept will be maintained during reclamation such that all stormwater generated within the reclamation area will be contained and infiltrated within the reclamation area. There is no stormwater discharge proposed for the reclamation project. Any future changes to grades at the site will require an updated stormwater management approach for review and approval by the Town of Merrimack, NH Planning Board.

Reclamation Site Estimates

The following are estimates for reclamation of the site:

Reclamation Area:	477,709 sf (10.97 acres)
Top Elevation (120ft):	466,963 sf (10.72 acres)
Bottom Elevation (118ft):	43,995 sf (1.01 acres)

Watershed Analysis

A watershed analysis was performed for the Proposed Reclamation Area to demonstrate that the proposed filling pattern will contain a large storm event and not result in a discharge of stormwater to adjacent property (Figure 1). The Proposed Reclamation Area will be filled in sequence such that at any time during operations, stormwater will be contained and infiltrated onsite within the Proposed Reclamation Area. This also precludes the need for sediment barriers to prevent potential adverse impacts to adjacent property and/or nearby water resources.

Using the final grades within the Proposed Reclamation Area (Sheet 2 of 2, C-102), a worst case stormwater analysis was calculated. This is considered worst case since the stormwater storage is minimized (maximum interim grading is achieved) and no infiltration is considered for the imported soils. Although some infiltration will occur through the imported soils, this worst case analysis is provided to demonstrate that the maximum storage of the proposed grading is capable of storing the entire 100-year, 24-hour storm event (see Table 1).

There is a small slope to the north of the reclamation area that requires filling up to elevation 120-feet before sloping back to the interior. This slope is considered negligible and will drain to the existing low lying area. By filling the area proposed, the project is decreasing the amount of

stormwater contributing to this existing low area, which is also adjacent to the former disposal area, and will result in an overall improvement to the site to restore it to a more usable condition and protect adjacent utilities and right of ways.

Run-on was accounted for in each drainage area described below due to adjacent high ground and the potential for stormwater generation in several locations. The contributing drainage areas shown on Figure 1 are conservative in area due to the active mining operation to the west, which may currently be lower in elevation than the proposed final grades shown on Sheet 2 of 2, C-102.

Assuming the site is impermeable (worst case) once filled per the proposed grading plan, the maximum elevation achieved for the 100-year 24-hour storm event is calculated to be 119.53-feet, which leaves 0.47-feet of freeboard surrounding the site. This freeboard depth translates to an available storage volume of 6.327 acre-feet.

Table 1: 100-year 24-hour Storm Event

Subcatchment	Area (acre)	CN	Volume (af)
OnSite	14.44	93	6.327
OffSite	1.54	88	0.608

A second hydrologic analysis was completed for the 100-year 24-hour storm event, in which all stormwater generated within the Proposed Reclamation Area will be contained and allowed to infiltrate. Assuming no primary discharge point and an exfiltration rate of 2.41 in/hr (Rawls Rate Table, attached), the maximum elevation achieved during the 100-year storm event (see attached HydroCAD calculations) is 118.98-feet.

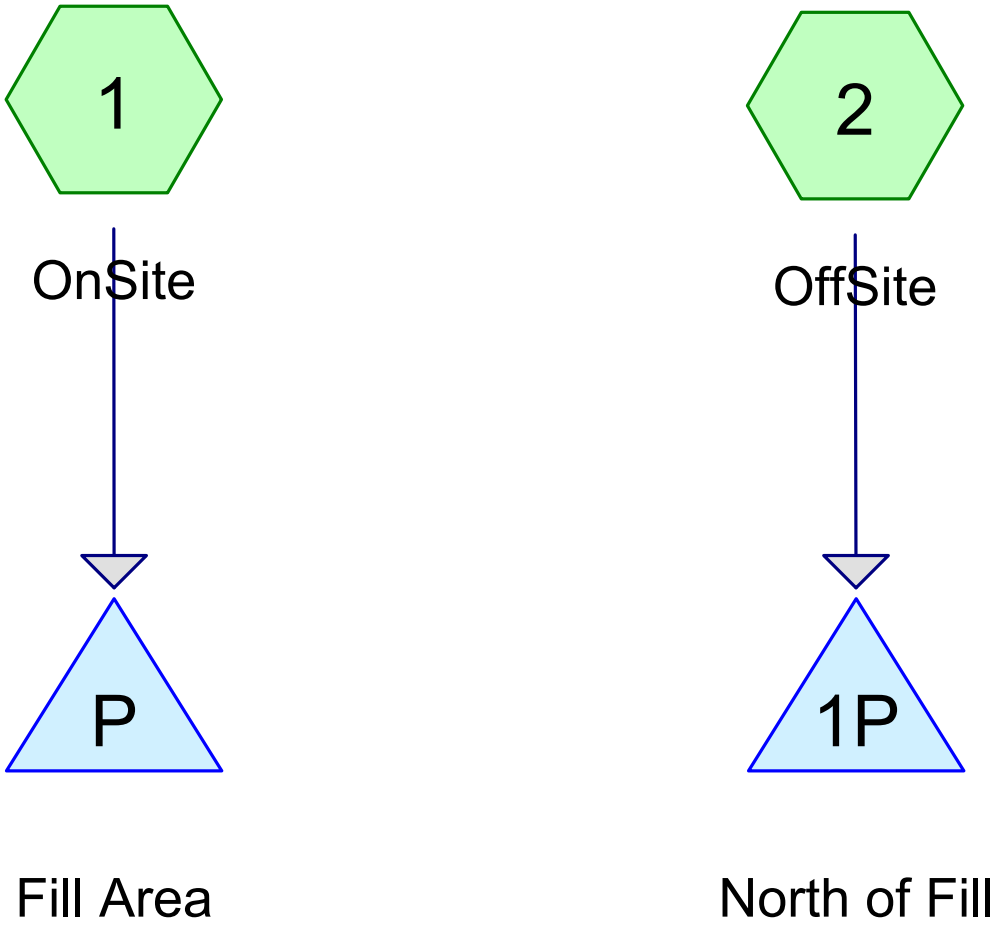
Conclusion

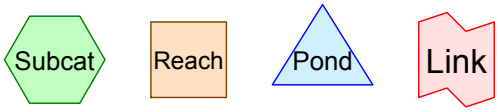
In conclusion, the stormwater generated as a result of reclamation within the limits shown on the Proposed Grading Plan (Sheet C-102) will not affect adjacent property or significantly alter the drainage patterns from current conditions. There is no proposed stormwater discharge off-site.

HYDROCAD DRAINAGE ANALYSIS

IMPERVIOUS 25-YEAR, 24-HOUR
IMPERVIOUS 100-YEAR, 24-HOUR

PERVIOUS 25-YEAR, 24-HOUR
PERVIOUS 100-YEAR, 24-HOUR





Drainage Diagram for Longa_FillStorage Impermeable FINAL
Prepared by {enter your company name here}, Printed 5/26/2013
HydroCAD® 9.10 s/n 04780 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.470	77	Newly graded area, HSG A (1, 2)
11.510	98	Water Surface, HSG A (1, 2)
15.980		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
15.980	HSG A	1, 2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
15.980		**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: OnSite Runoff Area=14.440 ac 74.24% Impervious Runoff Depth>4.06"
Tc=5.0 min CN=93 Runoff=68.69 cfs 4.883 af

Subcatchment 2: OffSite Runoff Area=1.540 ac 51.30% Impervious Runoff Depth>3.55"
Flow Length=40' Slope=0.5000 '/' Tc=5.0 min CN=88 Runoff=6.67 cfs 0.456 af

Pond 1P: North of Fill Peak Elev=118.66' Storage=0.456 af Inflow=6.67 cfs 0.456 af
Outflow=0.00 cfs 0.000 af

Pond P: Fill Area Peak Elev=119.34' Storage=4.881 af Inflow=68.69 cfs 4.883 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 15.980 ac Runoff Volume = 5.339 af Average Runoff Depth = 4.01"
27.97% Pervious = 4.470 ac 72.03% Impervious = 11.510 ac

Summary for Subcatchment 1: OnSite

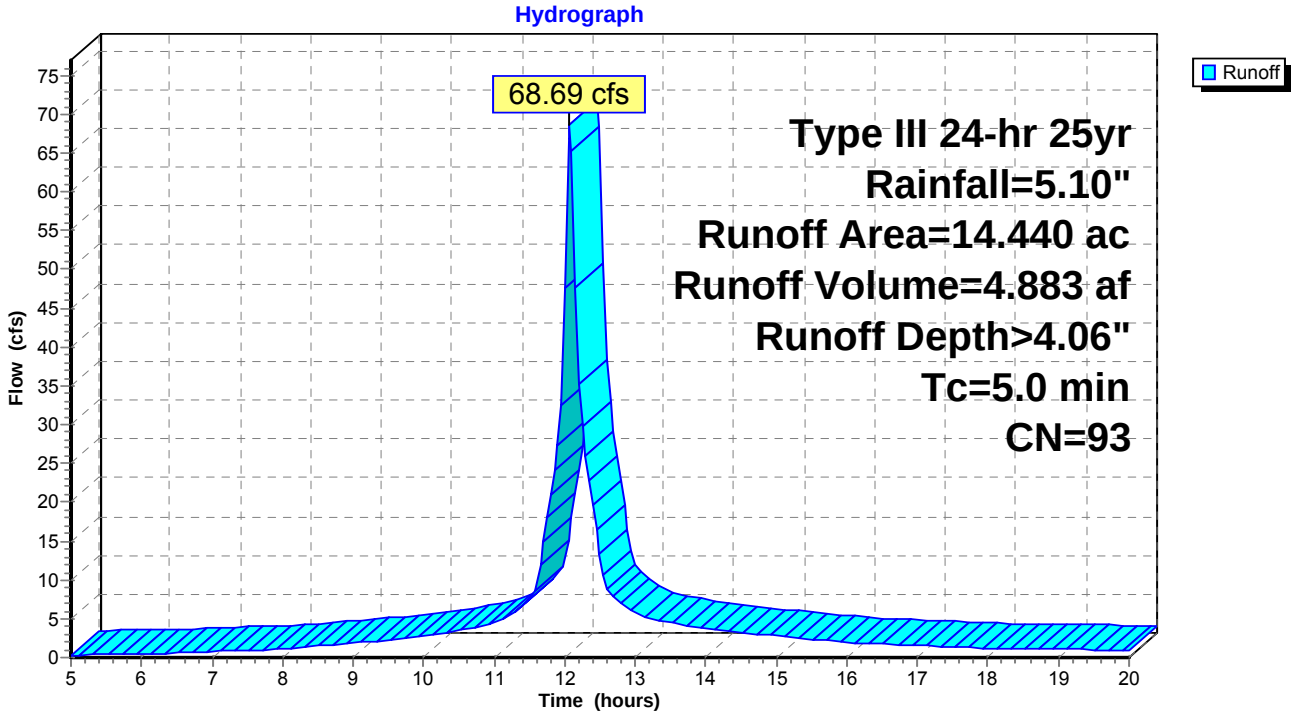
Runoff = 68.69 cfs @ 12.07 hrs, Volume= 4.883 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.10"

Area (ac)	CN	Description
10.720	98	Water Surface, HSG A
3.720	77	Newly graded area, HSG A
14.440	93	Weighted Average
3.720		25.76% Pervious Area
10.720		74.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, rainfall**

Subcatchment 1: OnSite



Summary for Subcatchment 2: OffSite

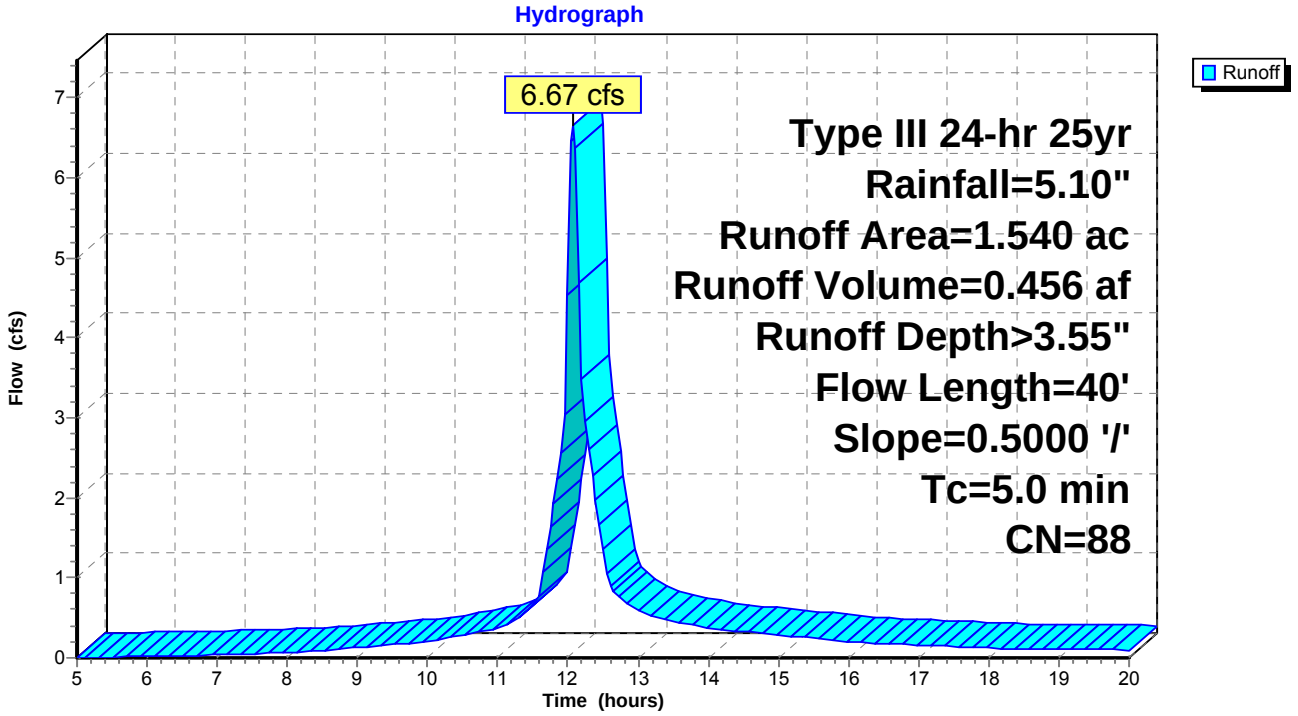
Runoff = 6.67 cfs @ 12.07 hrs, Volume= 0.456 af, Depth> 3.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.10"

Area (ac)	CN	Description
0.750	77	Newly graded area, HSG A
0.790	98	Water Surface, HSG A
1.540	88	Weighted Average
0.750		48.70% Pervious Area
0.790		51.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.5000	1.20		**Sheet Flow, sheet** Fallow n= 0.050 P2= 3.00"
0.6	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 2: OffSite



Summary for Pond 1P: North of Fill

Inflow Area = 1.540 ac, 51.30% Impervious, Inflow Depth > 3.55" for 25yr event
Inflow = 6.67 cfs @ 12.07 hrs, Volume= 0.456 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

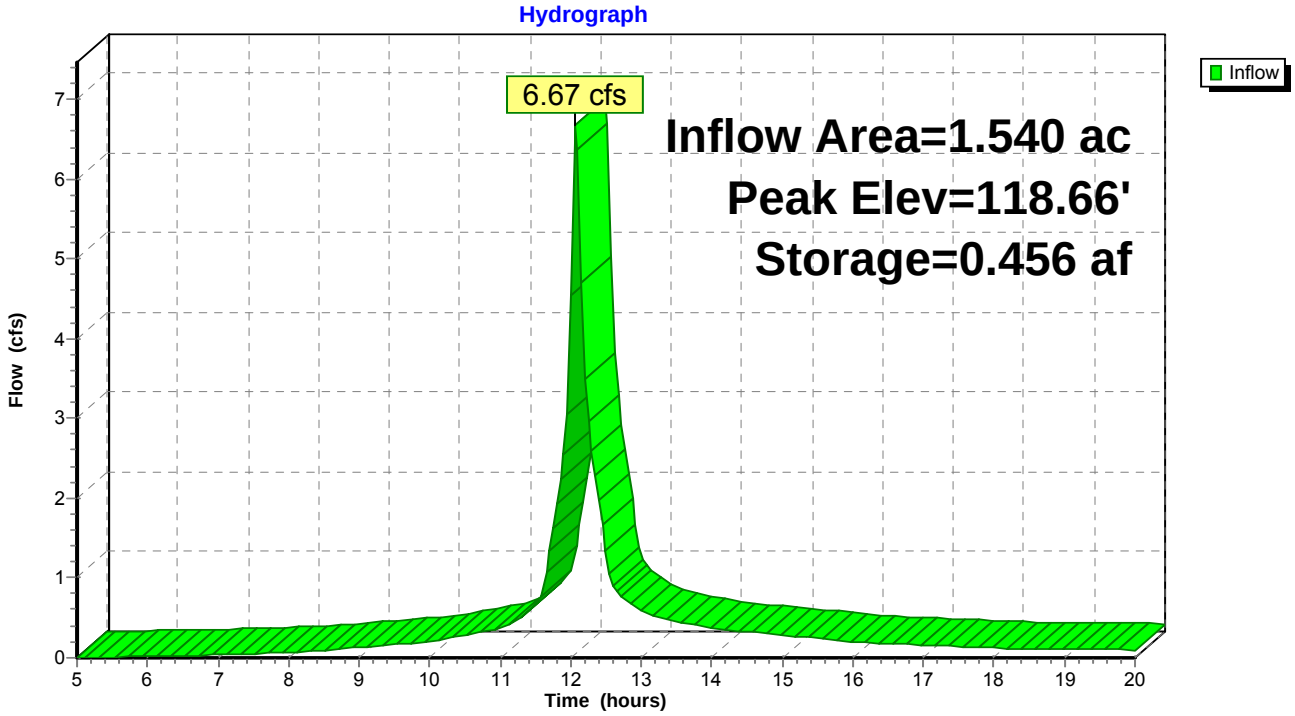
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 118.66' @ 20.00 hrs Surf.Area= 0.700 ac Storage= 0.456 af

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	1.425 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
118.00	0.680	0.000	0.000
119.00	0.710	0.695	0.695
120.00	0.750	0.730	1.425

Pond 1P: North of Fill



Summary for Pond P: Fill Area

Inflow Area = 14.440 ac, 74.24% Impervious, Inflow Depth > 4.06" for 25yr event
Inflow = 68.69 cfs @ 12.07 hrs, Volume= 4.883 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

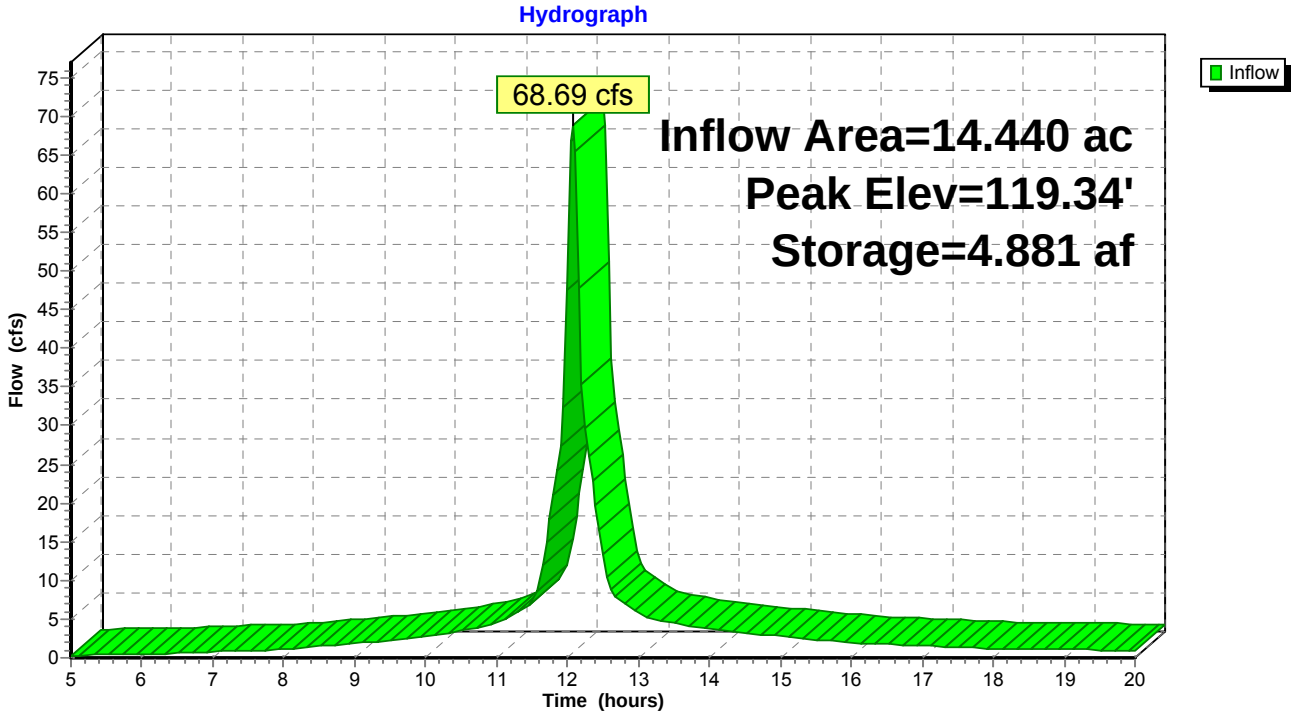
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 119.34' @ 20.00 hrs Surf.Area= 6.807 ac Storage= 4.881 af

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	10.740 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
118.00	1.120	0.000	0.000
119.00	4.750	2.935	2.935
120.00	10.860	7.805	10.740

Pond P: Fill Area



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: OnSite Runoff Area=14.440 ac 74.24% Impervious Runoff Depth>5.26"
Tc=5.0 min CN=93 Runoff=87.87 cfs 6.327 af

Subcatchment 2: OffSite Runoff Area=1.540 ac 51.30% Impervious Runoff Depth>4.74"
Flow Length=40' Slope=0.5000 '/' Tc=5.0 min CN=88 Runoff=8.76 cfs 0.608 af

Pond 1P: North of Fill Peak Elev=118.88' Storage=0.608 af Inflow=8.76 cfs 0.608 af
Outflow=0.00 cfs 0.000 af

Pond P: Fill Area Peak Elev=119.53' Storage=6.325 af Inflow=87.87 cfs 6.327 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 15.980 ac Runoff Volume = 6.935 af Average Runoff Depth = 5.21"
27.97% Pervious = 4.470 ac 72.03% Impervious = 11.510 ac

Summary for Subcatchment 1: OnSite

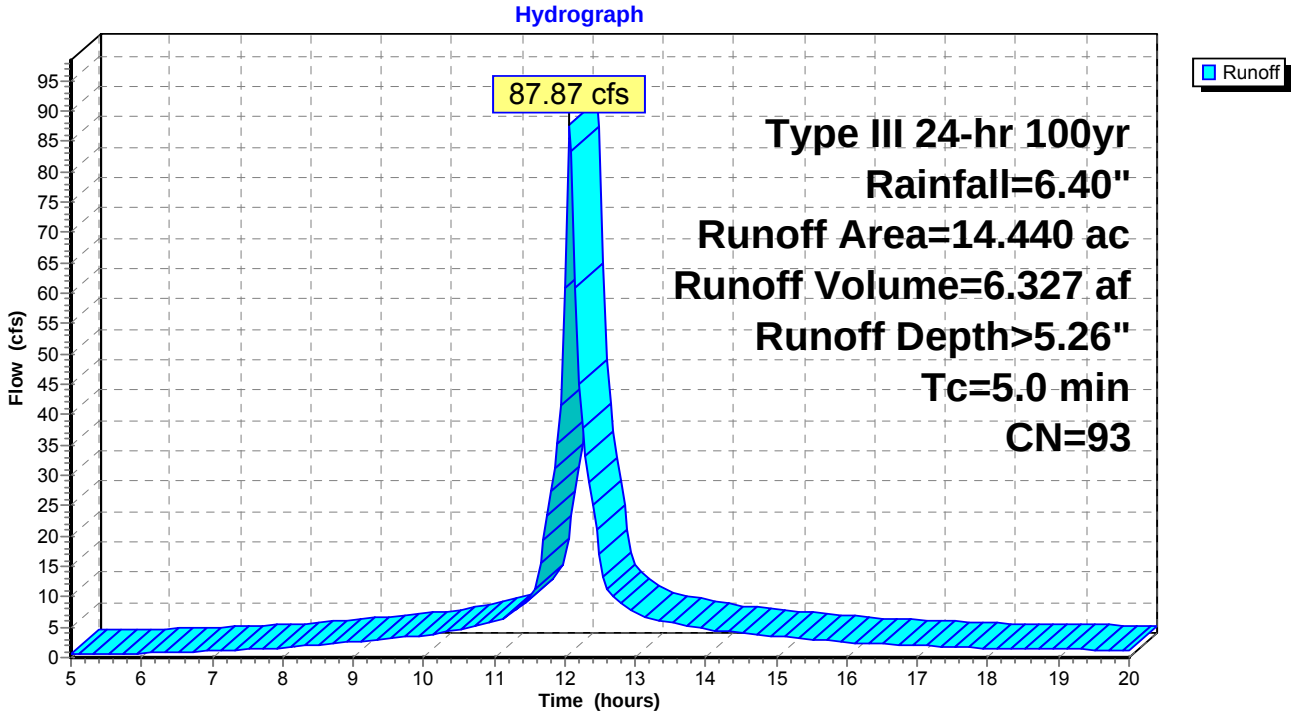
Runoff = 87.87 cfs @ 12.07 hrs, Volume= 6.327 af, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=6.40"

Area (ac)	CN	Description
10.720	98	Water Surface, HSG A
3.720	77	Newly graded area, HSG A
14.440	93	Weighted Average
3.720		25.76% Pervious Area
10.720		74.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, rainfall**

Subcatchment 1: OnSite



Summary for Subcatchment 2: OffSite

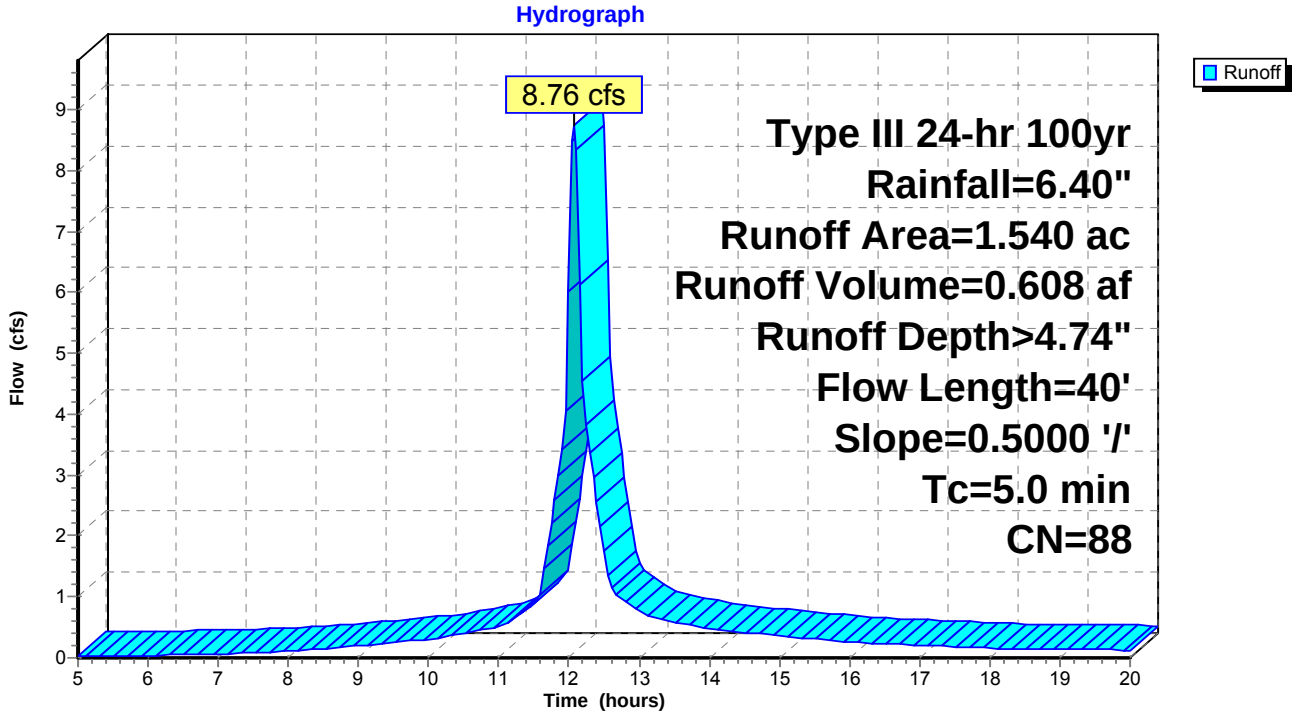
Runoff = 8.76 cfs @ 12.07 hrs, Volume= 0.608 af, Depth> 4.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=6.40"

Area (ac)	CN	Description
0.750	77	Newly graded area, HSG A
0.790	98	Water Surface, HSG A
1.540	88	Weighted Average
0.750		48.70% Pervious Area
0.790		51.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.5000	1.20		**Sheet Flow, sheet** Fallow n= 0.050 P2= 3.00"
0.6	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 2: OffSite



Summary for Pond 1P: North of Fill

Inflow Area = 1.540 ac, 51.30% Impervious, Inflow Depth > 4.74" for 100yr event
Inflow = 8.76 cfs @ 12.07 hrs, Volume= 0.608 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

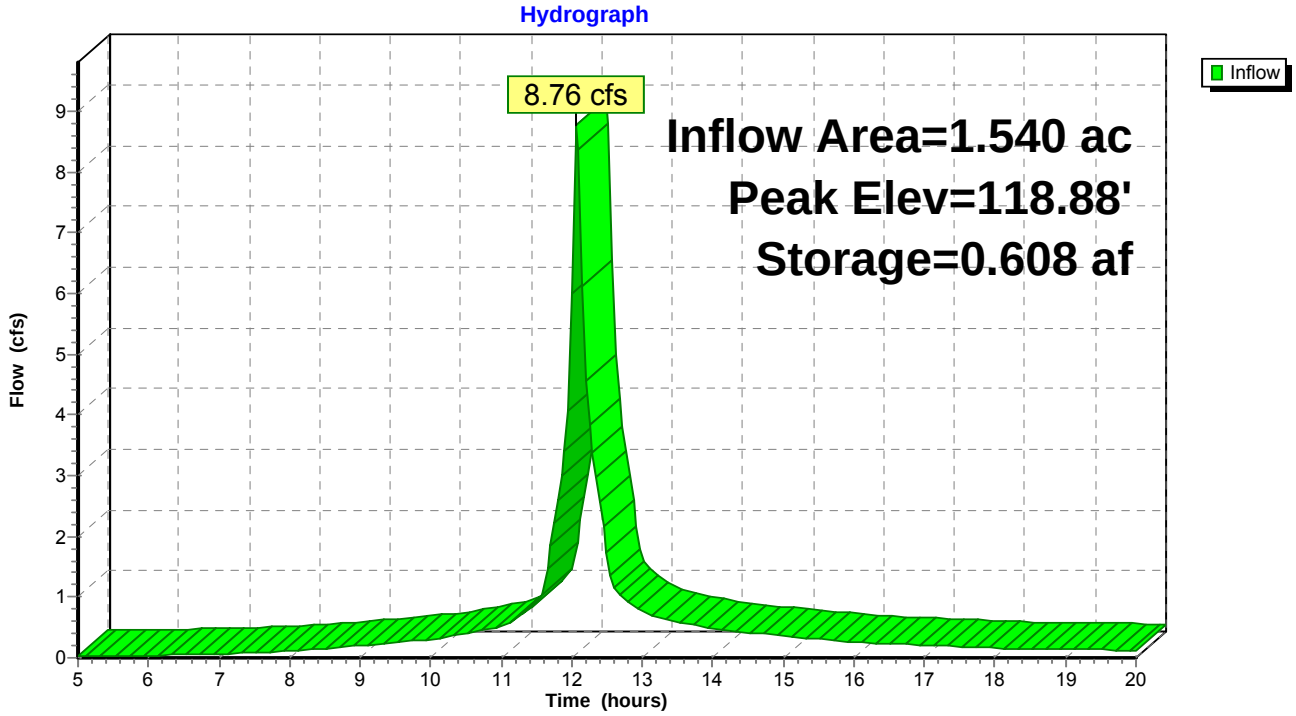
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 118.88' @ 20.00 hrs Surf.Area= 0.706 ac Storage= 0.608 af

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	1.425 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
118.00	0.680	0.000	0.000
119.00	0.710	0.695	0.695
120.00	0.750	0.730	1.425

Pond 1P: North of Fill



Summary for Pond P: Fill Area

Inflow Area = 14.440 ac, 74.24% Impervious, Inflow Depth > 5.26" for 100yr event
Inflow = 87.87 cfs @ 12.07 hrs, Volume= 6.327 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

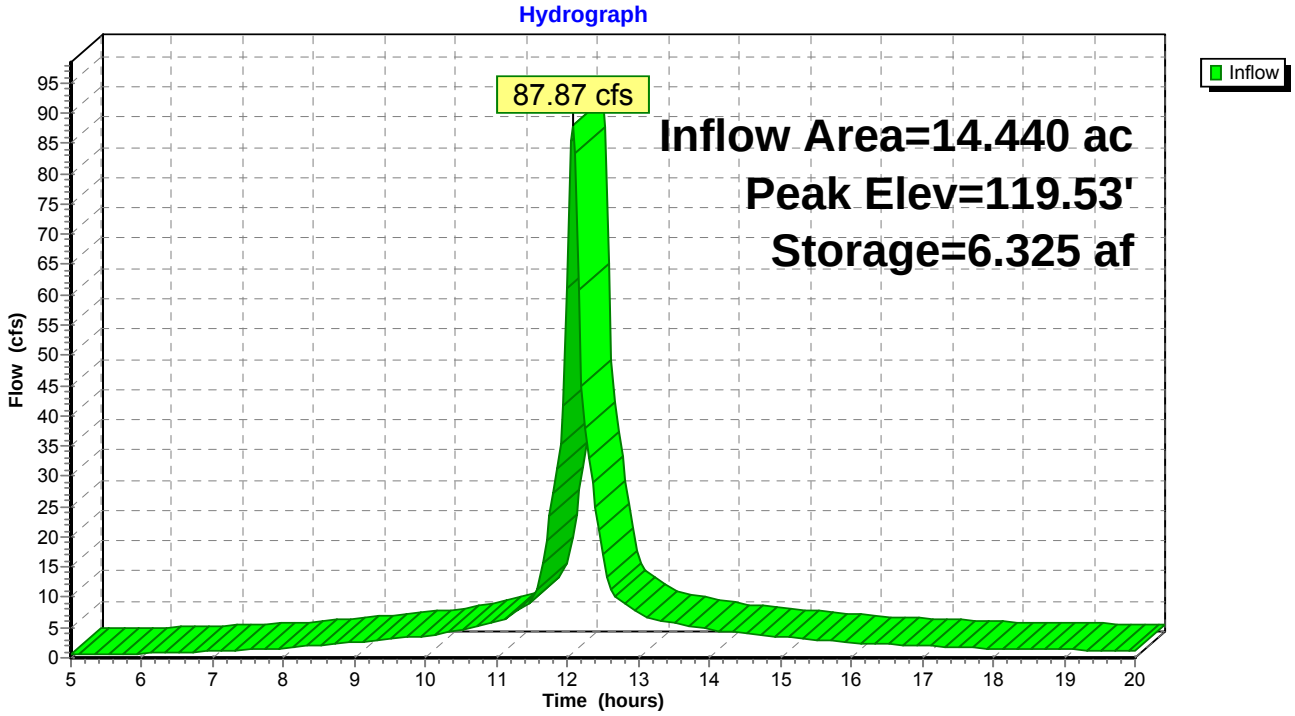
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 119.53' @ 20.00 hrs Surf.Area= 7.999 ac Storage= 6.325 af

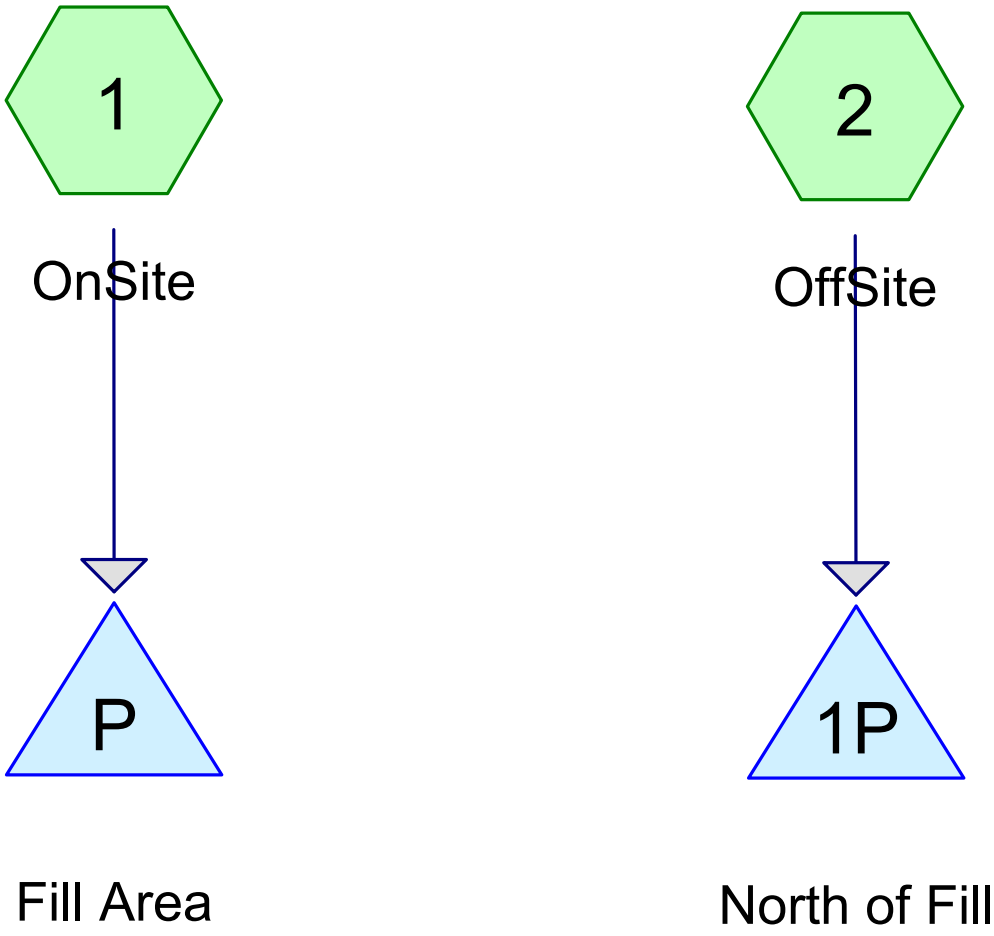
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

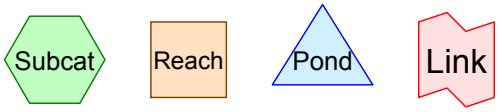
Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	10.740 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
118.00	1.120	0.000	0.000
119.00	4.750	2.935	2.935
120.00	10.860	7.805	10.740

Pond P: Fill Area







Drainage Diagram for Longa_FillStorage FINAL
Prepared by {enter your company name here}, Printed 5/26/2013
HydroCAD® 9.10 s/n 04780 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.510	77	Newly graded area, HSG A (1, 2)
11.470	98	Water Surface, 0% imp, HSG A (1, 2)
15.980		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
15.980	HSG A	1, 2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
15.980		**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: OnSite Runoff Area=14.440 ac 0.00% Impervious Runoff Depth>4.06"
Tc=5.0 min CN=93 Runoff=68.69 cfs 4.883 af

Subcatchment 2: OffSite Runoff Area=1.540 ac 0.00% Impervious Runoff Depth>3.45"
Flow Length=40' Slope=0.5000 '/' Tc=5.0 min CN=87 Runoff=6.52 cfs 0.443 af

Pond 1P: North of Fill Peak Elev=118.15' Storage=0.105 af Inflow=6.52 cfs 0.443 af
Outflow=1.66 cfs 0.442 af

Pond P: Fill Area Peak Elev=118.81' Storage=1.948 af Inflow=68.69 cfs 4.883 af
Outflow=9.30 cfs 4.875 af

Total Runoff Area = 15.980 ac Runoff Volume = 5.326 af Average Runoff Depth = 4.00"
100.00% Pervious = 15.980 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1: OnSite

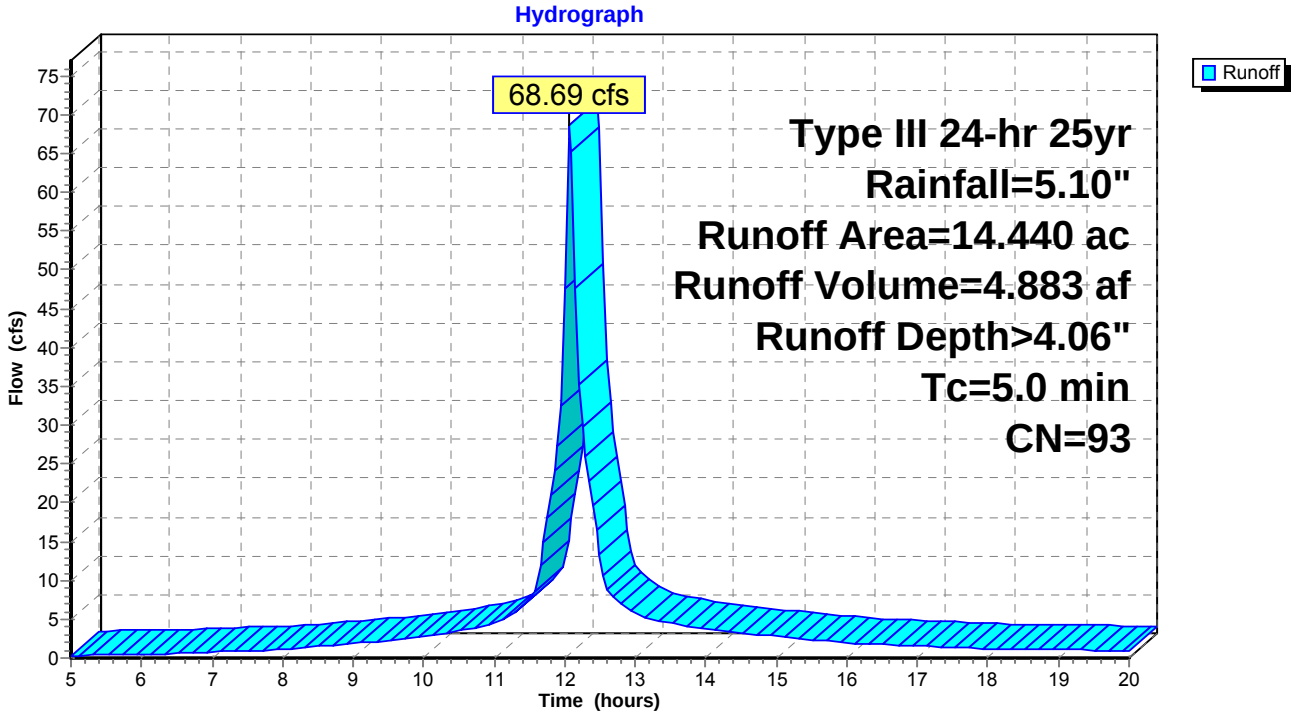
Runoff = 68.69 cfs @ 12.07 hrs, Volume= 4.883 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.10"

Area (ac)	CN	Description
10.720	98	Water Surface, 0% imp, HSG A
3.720	77	Newly graded area, HSG A
14.440	93	Weighted Average
14.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, rainfall**

Subcatchment 1: OnSite



Summary for Subcatchment 2: OffSite

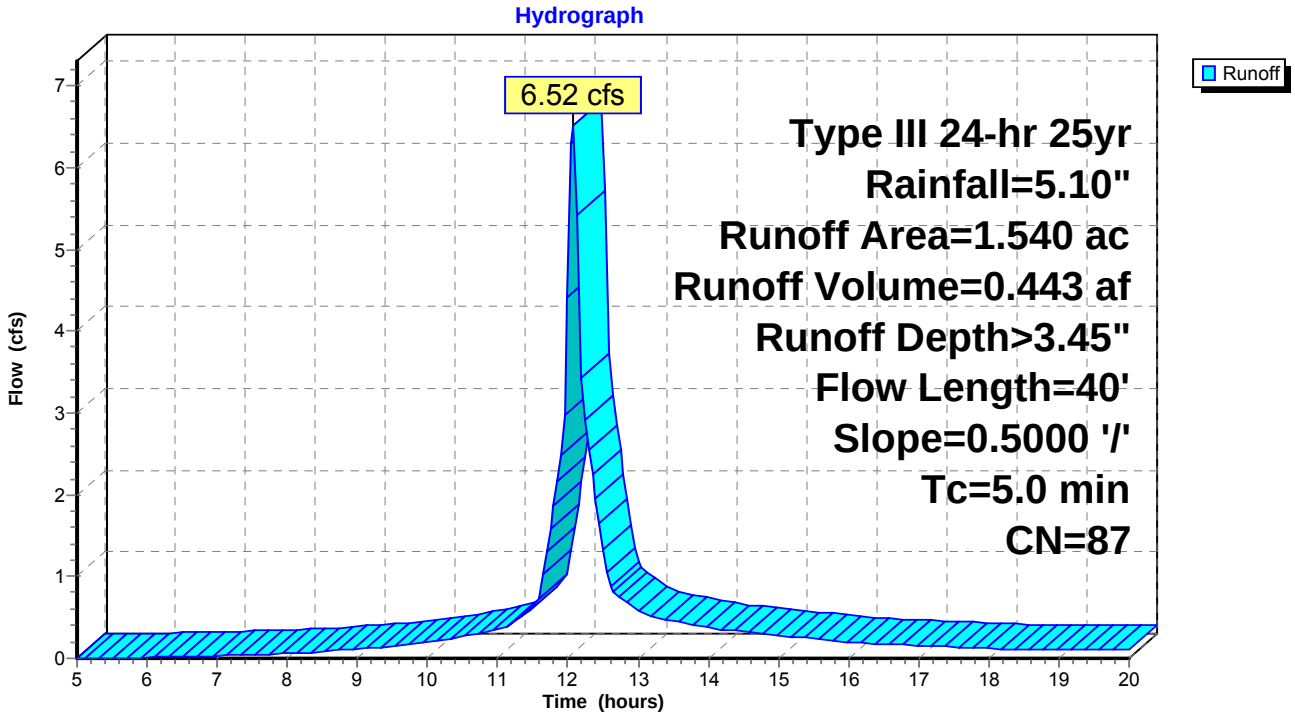
Runoff = 6.52 cfs @ 12.07 hrs, Volume= 0.443 af, Depth> 3.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.10"

Area (ac)	CN	Description
0.790	77	Newly graded area, HSG A
0.750	98	Water Surface, 0% imp, HSG A
1.540	87	Weighted Average
1.540		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.5000	1.20		**Sheet Flow, sheet** Fallow n= 0.050 P2= 3.00"
0.6	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 2: OffSite



Summary for Pond 1P: North of Fill

Inflow Area =	1.540 ac,	0.00% Impervious,	Inflow Depth >	3.45"	for 25yr event
Inflow =	6.52 cfs @	12.07 hrs,	Volume=	0.443 af	
Outflow =	1.66 cfs @	12.45 hrs,	Volume=	0.442 af,	Atten= 74%, Lag= 22.4 min
Discarded =	1.66 cfs @	12.45 hrs,	Volume=	0.442 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 118.15' @ 12.45 hrs Surf.Area= 0.685 ac Storage= 0.105 af

Plug-Flow detention time= 18.0 min calculated for 0.442 af (100% of inflow)
Center-of-Mass det. time= 17.2 min (785.5 - 768.3)

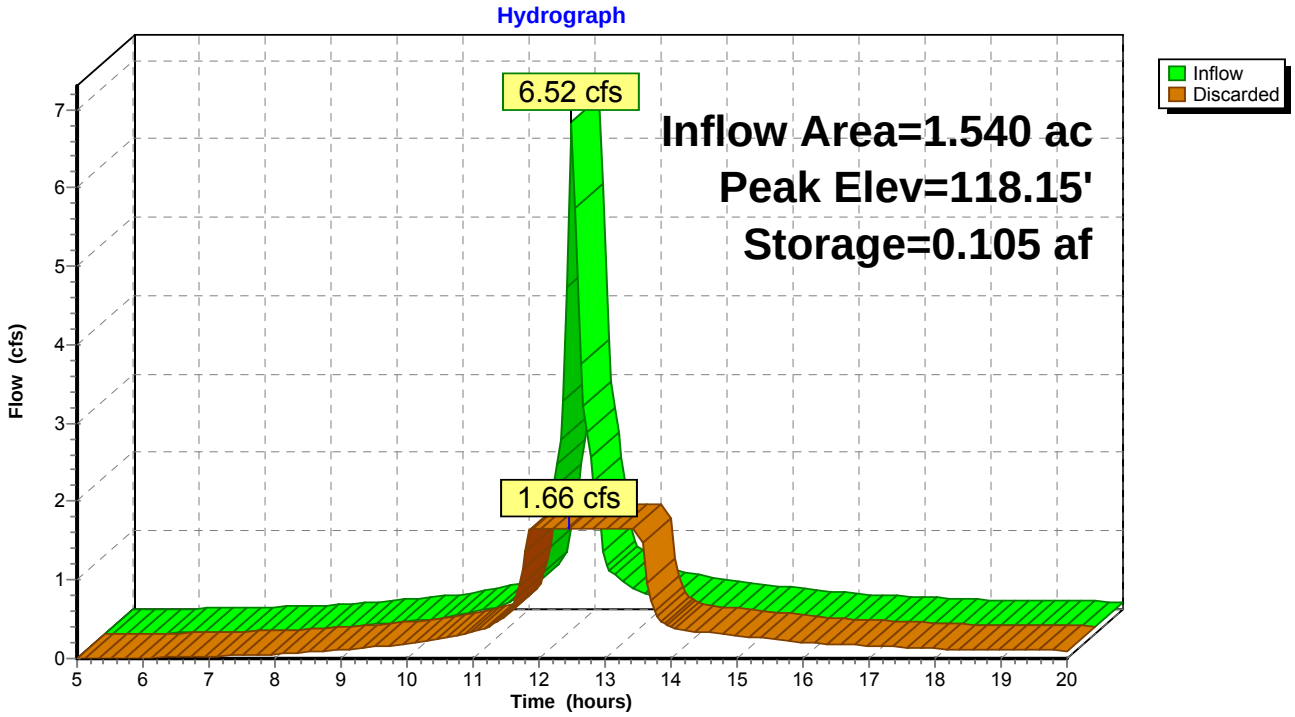
Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	1.425 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
118.00	0.680	0.000	0.000
119.00	0.710	0.695	0.695
120.00	0.750	0.730	1.425

Device	Routing	Invert	Outlet Devices
#1	Discarded	118.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.66 cfs @ 12.45 hrs HW=118.15' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.66 cfs)

Pond 1P: North of Fill



Summary for Pond P: Fill Area

Inflow Area = 14.440 ac, 0.00% Impervious, Inflow Depth > 4.06" for 25yr event
Inflow = 68.69 cfs @ 12.07 hrs, Volume= 4.883 af
Outflow = 9.30 cfs @ 12.59 hrs, Volume= 4.875 af, Atten= 86%, Lag= 31.2 min
Discarded = 9.30 cfs @ 12.59 hrs, Volume= 4.875 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 118.81' @ 12.59 hrs Surf.Area= 3.828 ac Storage= 1.948 af

Plug-Flow detention time= 88.7 min calculated for 4.859 af (100% of inflow)
Center-of-Mass det. time= 87.6 min (837.9 - 750.3)

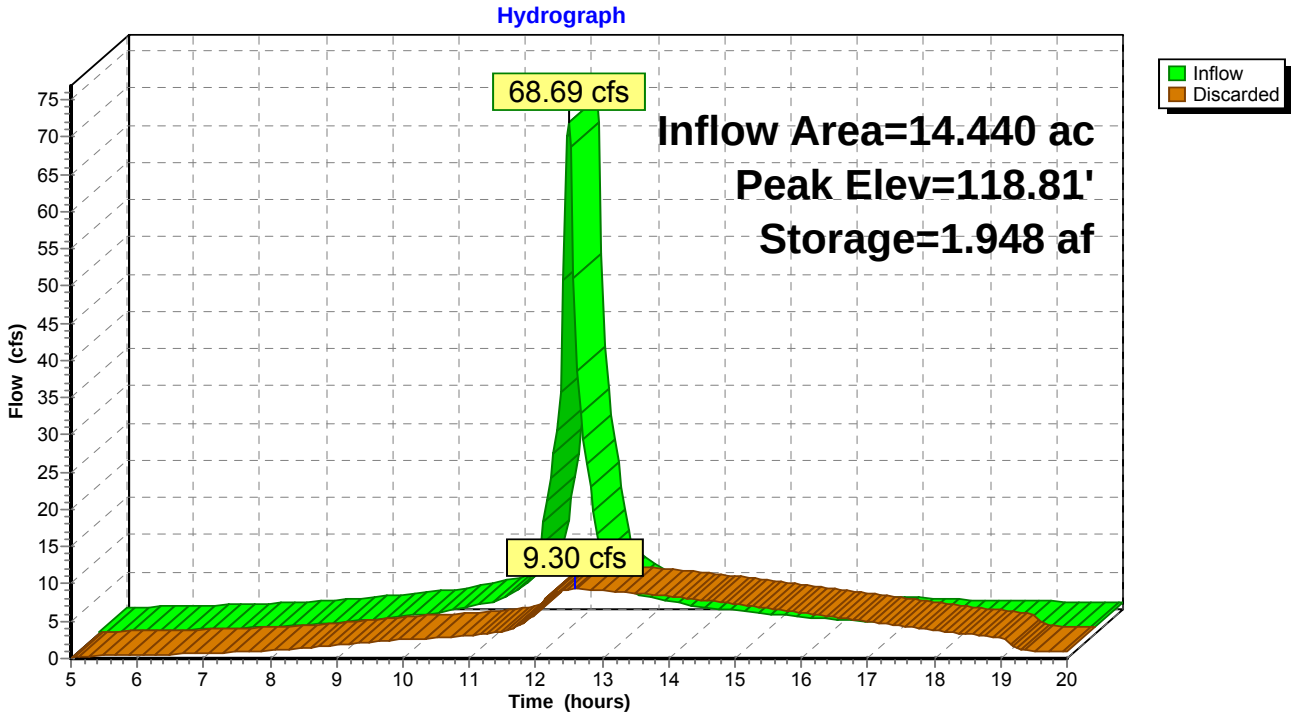
Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	10.375 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
118.00	1.010	0.000	0.000
119.00	4.510	2.760	2.760
120.00	10.720	7.615	10.375

Device	Routing	Invert	Outlet Devices
#1	Discarded	118.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=9.30 cfs @ 12.59 hrs HW=118.81' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 9.30 cfs)

Pond P: Fill Area



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: OnSite Runoff Area=14.440 ac 0.00% Impervious Runoff Depth>5.26"
Tc=5.0 min CN=93 Runoff=87.87 cfs 6.327 af

Subcatchment 2: OffSite Runoff Area=1.540 ac 0.00% Impervious Runoff Depth>4.63"
Flow Length=40' Slope=0.5000 '/' Tc=5.0 min CN=87 Runoff=8.61 cfs 0.594 af

Pond 1P: North of Fill Peak Elev=118.25' Storage=0.168 af Inflow=8.61 cfs 0.594 af
Outflow=1.67 cfs 0.593 af

Pond P: Fill Area Peak Elev=118.98' Storage=2.660 af Inflow=87.87 cfs 6.327 af
Outflow=10.77 cfs 6.243 af

Total Runoff Area = 15.980 ac Runoff Volume = 6.922 af Average Runoff Depth = 5.20"
100.00% Pervious = 15.980 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1: OnSite

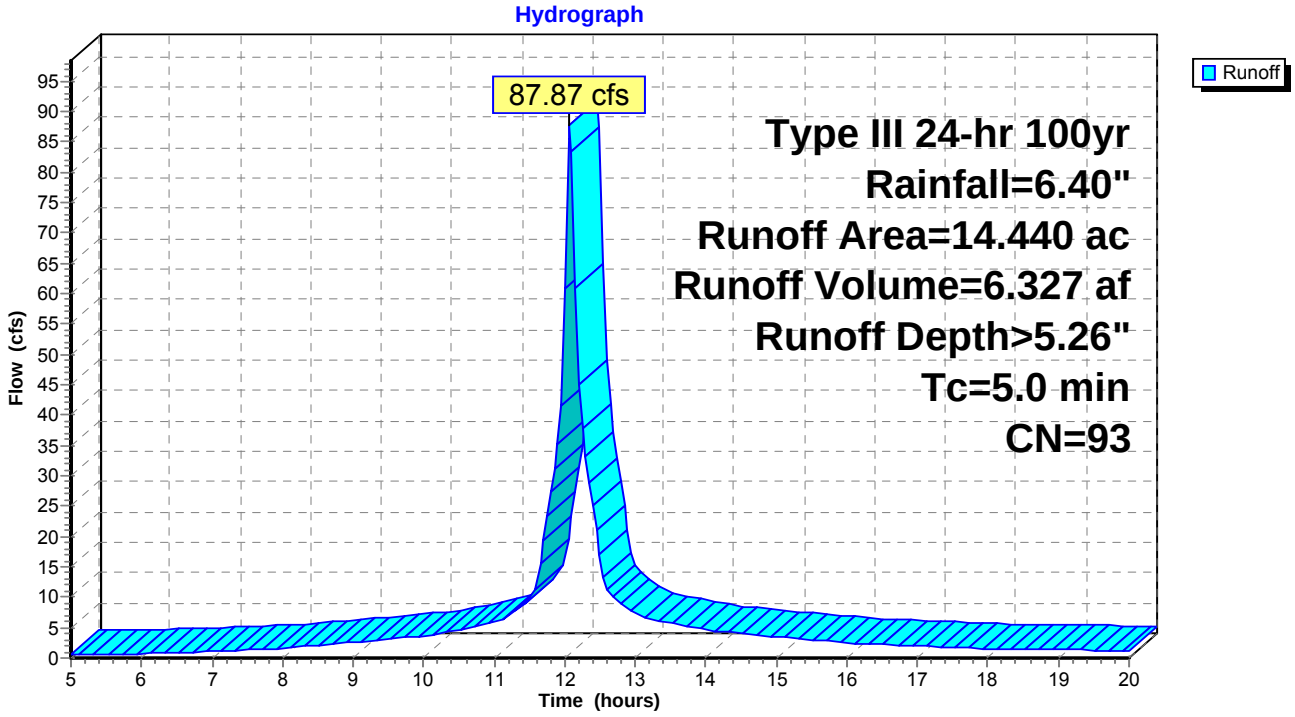
Runoff = 87.87 cfs @ 12.07 hrs, Volume= 6.327 af, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=6.40"

Area (ac)	CN	Description
10.720	98	Water Surface, 0% imp, HSG A
3.720	77	Newly graded area, HSG A
14.440	93	Weighted Average
14.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, rainfall**

Subcatchment 1: OnSite



Summary for Subcatchment 2: OffSite

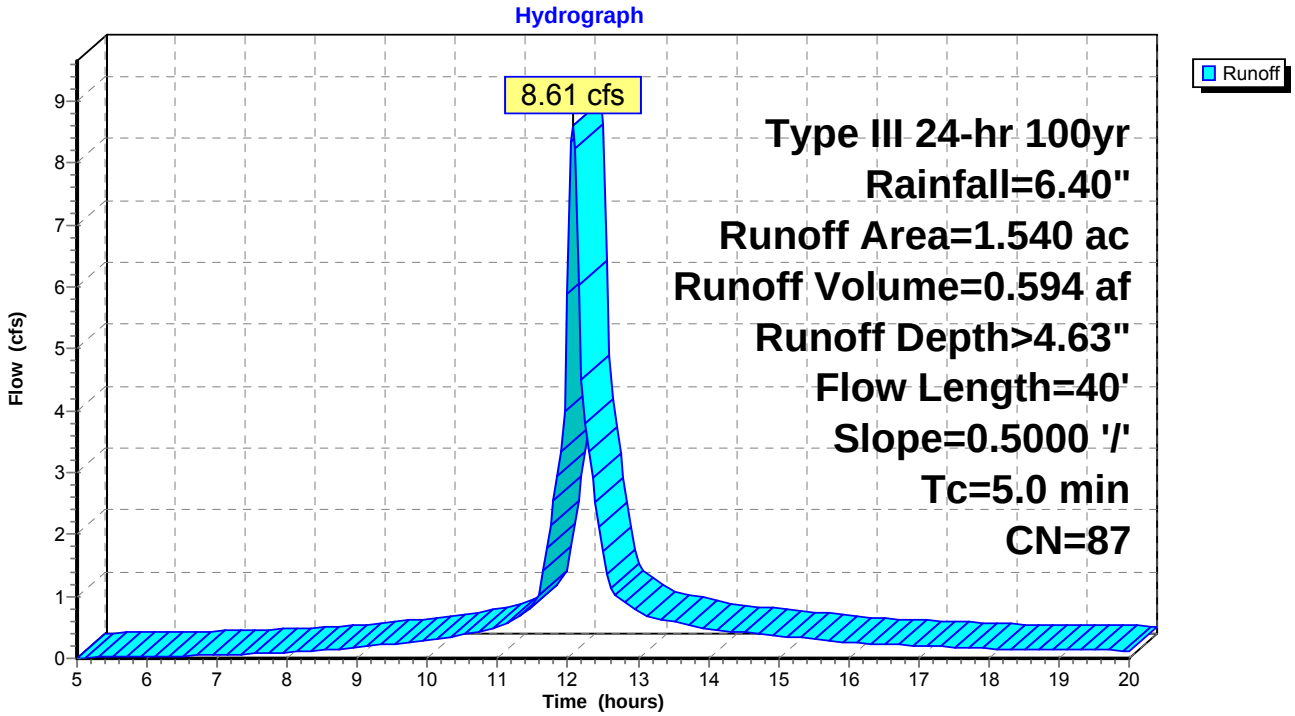
Runoff = 8.61 cfs @ 12.07 hrs, Volume= 0.594 af, Depth> 4.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=6.40"

Area (ac)	CN	Description
0.790	77	Newly graded area, HSG A
0.750	98	Water Surface, 0% imp, HSG A
1.540	87	Weighted Average
1.540		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.5000	1.20		**Sheet Flow, sheet** Fallow n= 0.050 P2= 3.00"
0.6	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 2: OffSite



Summary for Pond 1P: North of Fill

Inflow Area = 1.540 ac, 0.00% Impervious, Inflow Depth > 4.63" for 100yr event
Inflow = 8.61 cfs @ 12.07 hrs, Volume= 0.594 af
Outflow = 1.67 cfs @ 12.51 hrs, Volume= 0.593 af, Atten= 81%, Lag= 26.1 min
Discarded = 1.67 cfs @ 12.51 hrs, Volume= 0.593 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 118.25' @ 12.51 hrs Surf.Area= 0.687 ac Storage= 0.168 af

Plug-Flow detention time= 28.9 min calculated for 0.591 af (99% of inflow)
Center-of-Mass det. time= 28.0 min (789.4 - 761.4)

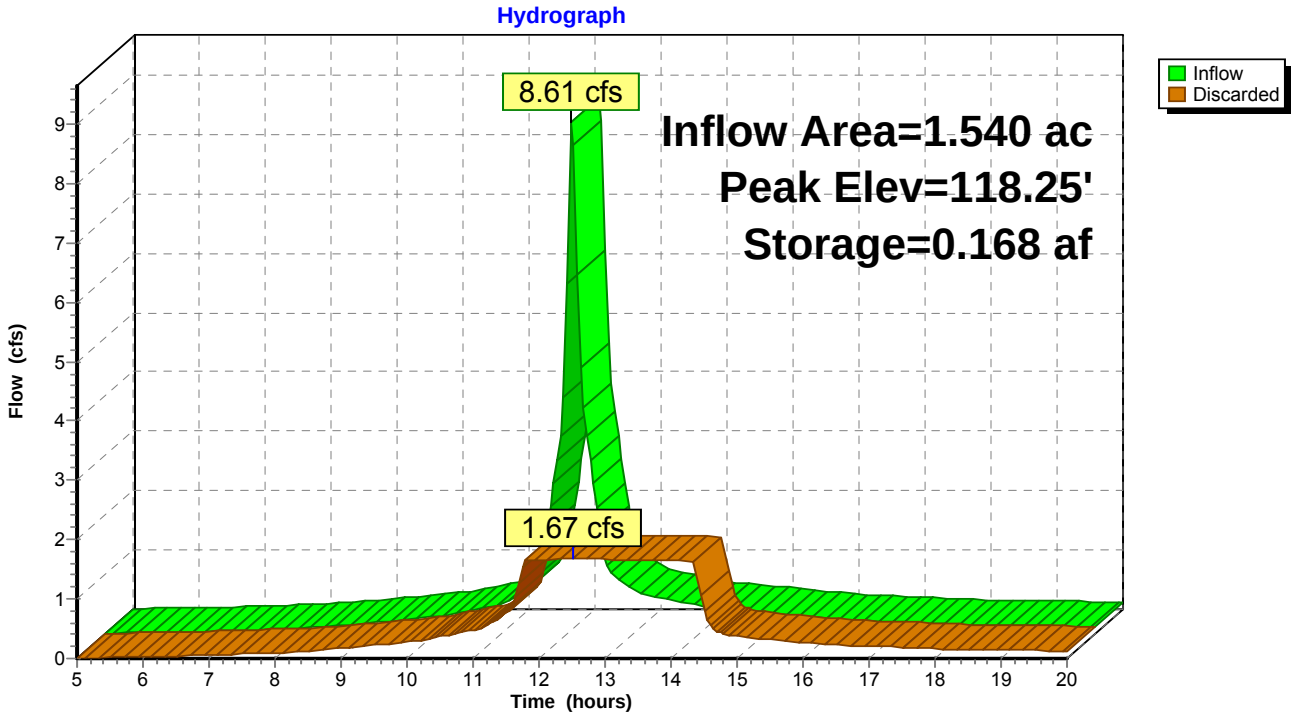
Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	1.425 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
118.00	0.680	0.000	0.000
119.00	0.710	0.695	0.695
120.00	0.750	0.730	1.425

Device	Routing	Invert	Outlet Devices
#1	Discarded	118.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.67 cfs @ 12.51 hrs HW=118.25' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.67 cfs)

Pond 1P: North of Fill



Summary for Pond P: Fill Area

Inflow Area = 14.440 ac, 0.00% Impervious, Inflow Depth > 5.26" for 100yr event
Inflow = 87.87 cfs @ 12.07 hrs, Volume= 6.327 af
Outflow = 10.77 cfs @ 12.63 hrs, Volume= 6.243 af, Atten= 88%, Lag= 33.3 min
Discarded = 10.77 cfs @ 12.63 hrs, Volume= 6.243 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 118.98' @ 12.63 hrs Surf.Area= 4.431 ac Storage= 2.660 af

Plug-Flow detention time= 110.0 min calculated for 6.221 af (98% of inflow)
Center-of-Mass det. time= 103.8 min (849.8 - 746.0)

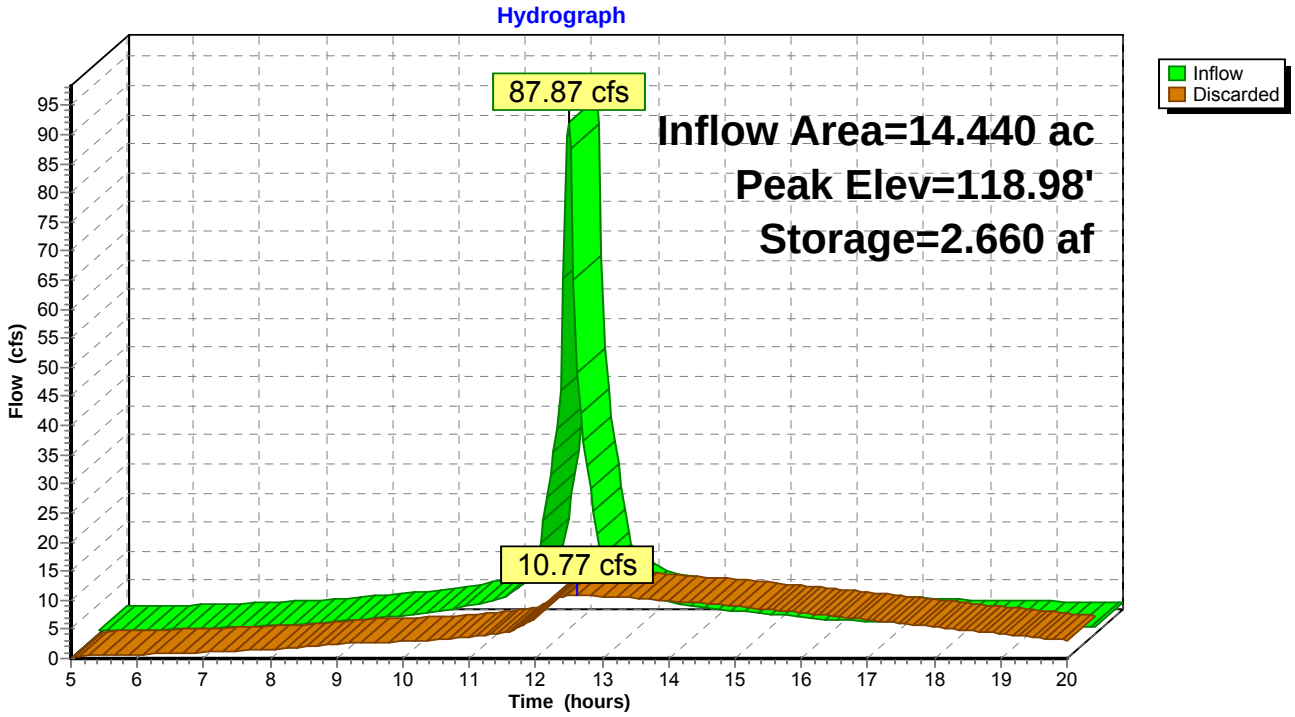
Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	10.375 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
118.00	1.010	0.000	0.000
119.00	4.510	2.760	2.760
120.00	10.720	7.615	10.375

Device	Routing	Invert	Outlet Devices
#1	Discarded	118.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=10.77 cfs @ 12.63 hrs HW=118.98' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 10.77 cfs)

Pond P: Fill Area



DRAINAGE ANALYSIS FIGURE 1

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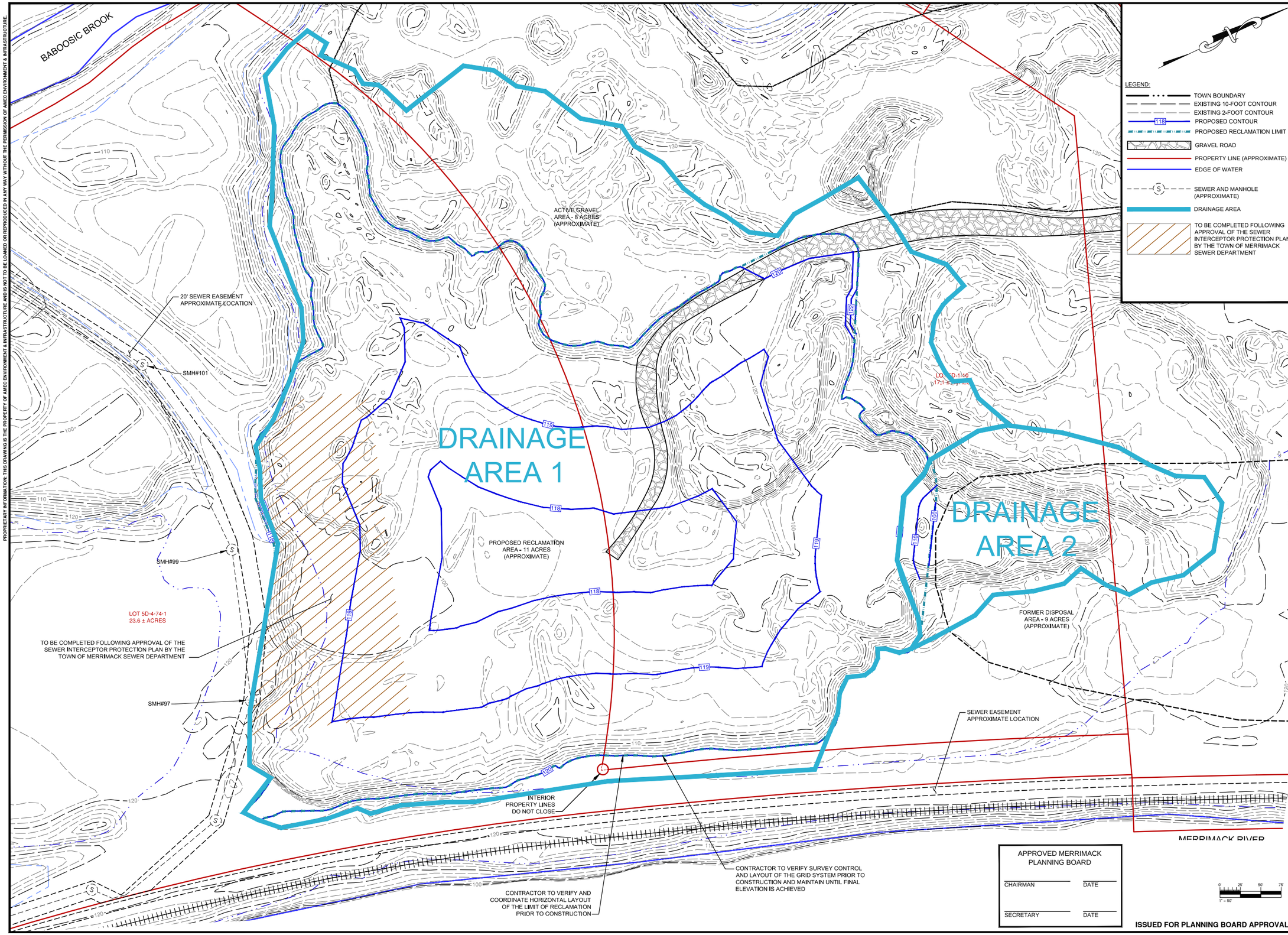

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PROJECT: SOIL REUSE AND PARTIAL RECLAMATION LONGA SAND AND GRAVEL PIT

TITLE: DRAINAGE FIGURE

CLIENT: BRIGHTER HORIZONS ENVIRONMENTAL, INC. 4 COURTHOUSE LANE CHELMSFORD, MA

SEAL:

DESIGNED BY: DAA	DRAWN BY: DED
CHECKED BY: KH / RN	DATE: MAY 2013
SCALE: AS SHOWN	REVISION: 0
PROJECT NUMBER: 365212001 7	
FIGURE NUMBER: FIGURE 1	
SHEET NUMBER: 1 OF 1	

C:\Users\dana.dempsey\Documents\Longa\CAD\Drainage Figure.dwg - Drainage Plan - May, 20, 2013 11:15pm - dana.dempsey

SUPPORT

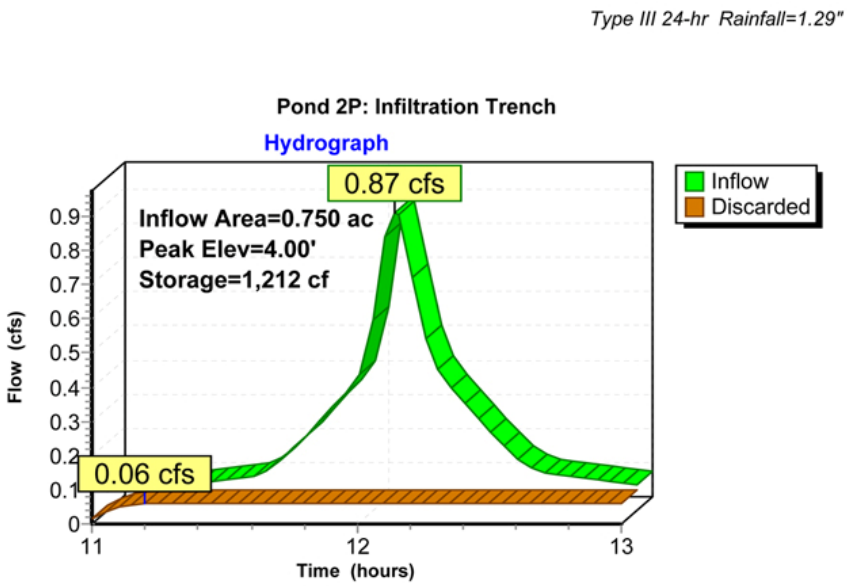


Table 2.3.3. 1982 Rawls Rates[18]

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

[18] Rawls, Brakensiek and Saxton, 1982

TOWN	24-hour SCS Rainfall*					
	1 yr	2 yr	10 yr	25 yr	50 yr	100 yr
LANCASTER	2.4	2.6	4.0	4.9	5.2	5.9
LANDAFF	2.4	2.5	3.9	4.8	5.1	5.8
LANGDON	2.3	2.7	4.1	4.8	5.4	6.1
LEBANON	2.3	2.6	4.0	4.7	5.2	5.8
LEE	2.5	3.0	4.3	5.2	5.7	6.4
LEMPSTER	2.3	2.7	4.1	4.9	5.4	6.1
LINCOLN	2.5	3.0	4.5	5.1	5.6	6.2
LISBON	2.4	2.5	3.9	4.8	5.1	5.7
LITCHFIELD	2.5	3.0	4.3	5.1	5.7	6.4
LITTLETON	2.4	2.5	3.9	4.8	5.1	5.8
LIVERMORE	2.6	3.3	4.7	5.4	6.1	6.5
LONDONDERRY	2.5	3.0	4.3	5.1	5.7	6.4
LOUDON	2.4	2.9	4.2	5.0	5.6	6.2
LOW & BURBANK'S GRANT	3.0	3.5	4.8	5.6	6.2	6.8
LYMAN	2.4	2.5	3.8	4.7	5.0	5.7
LYME	2.3	2.5	4.0	4.7	5.2	5.8
LYNDEBOROUGH	2.4	2.9	4.2	5.0	5.7	6.3
MADBURY	2.5	3.0	4.3	5.2	5.7	6.4
MADISON	2.7	3.1	4.7	5.2	6.1	6.2
MANCHESTER	2.5	2.9	4.3	5.1	5.7	6.4
MARLBOROUGH	2.4	2.8	4.2	5.0	5.6	6.3
MARLOW	2.3	2.7	4.1	4.9	5.5	6.1
MARTIN'S LOCATION	3.0	3.6	5.1	5.9	6.4	7.1
MASON	2.5	2.9	4.3	5.1	5.7	6.4
MEREDITH	2.4	2.8	4.1	5.0	5.4	6.0
MERRIMACK	2.5	3.0	4.3	5.1	5.7	6.4
MIDDLETON	2.5	2.9	4.2	5.1	5.5	6.2
MILAN	2.4	3.0	4.2	4.9	5.3	6.1
MILFORD	2.5	2.9	4.3	5.1	5.7	6.4
MILLSFIELD	2.4	2.5	3.9	4.8	5.0	5.7
MILTON	2.5	2.9	4.3	5.1	5.6	6.2
MONROE	2.4	2.5	3.8	4.6	5.0	5.6
MONT VERNON	2.5	2.9	4.3	5.1	5.7	6.3
MOULTONBOROUGH	2.5	2.9	4.3	5.1	5.5	6.2
NASHUA	2.6	3.0	4.3	5.2	5.8	6.4
NELSON	2.4	2.8	4.2	4.9	5.6	6.3
NEW BOSTON	2.5	2.9	4.2	5.0	5.7	6.3
NEW CASTLE	2.6	3.1	4.4	5.2	5.8	6.5
NEW DURHAM	2.5	2.9	4.2	5.1	5.5	6.2
NEW HAMPTON	2.4	2.8	4.1	4.9	5.4	6.0
NEW IPSWICH	2.5	2.9	4.3	5.1	5.7	6.4
NEW LONDON	2.3	2.7	4.1	4.8	5.4	6.0
NEWBURY	2.3	2.7	4.1	4.9	5.4	6.1

*Rainfall data is interpolated from *Technical Paper No. 40 (TP40) Rainfall Frequency Atlas of the Eastern United States* . Other data may be used (e.g., *Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada* by Cornell University, Northeast Regional Climate Center, September, 1993.)

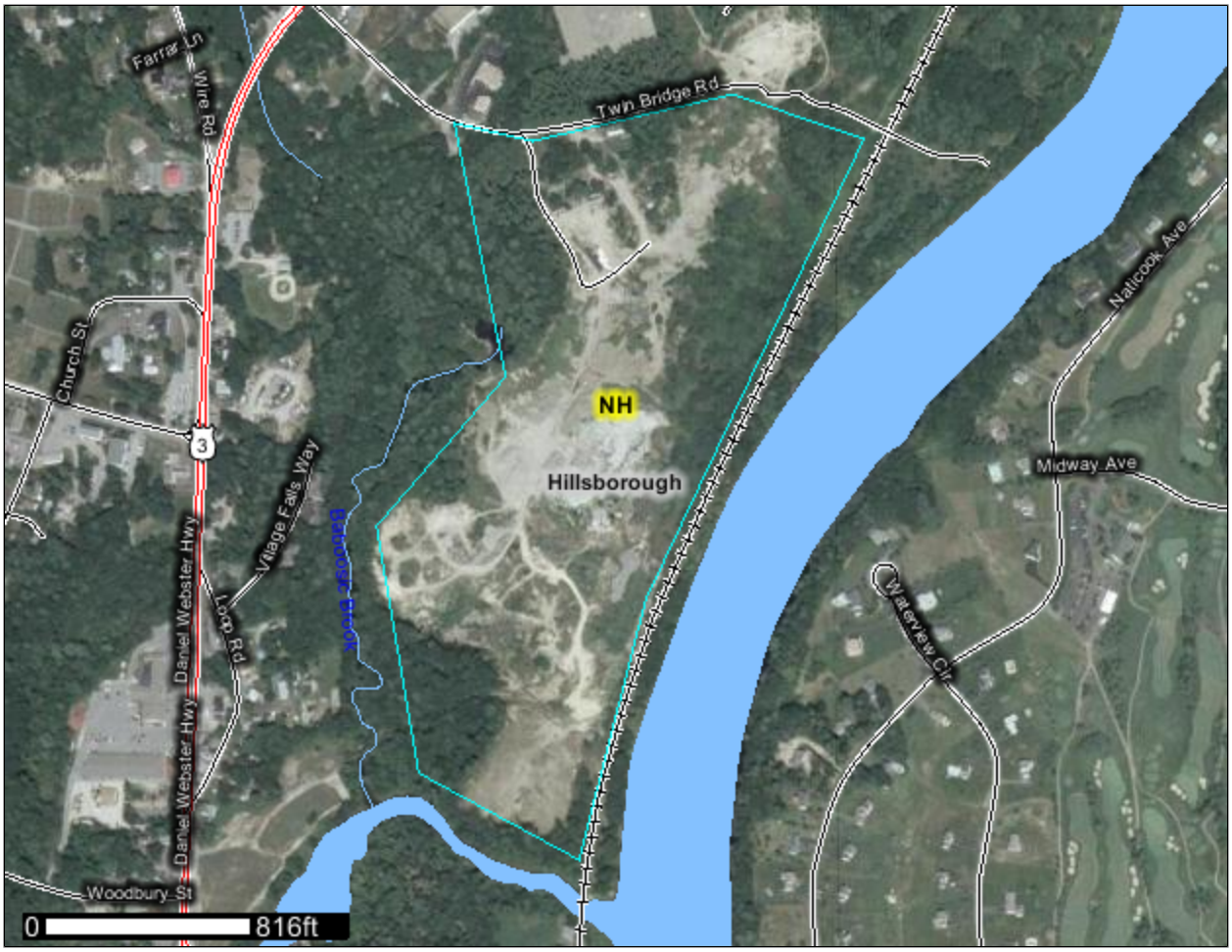
United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Hillsborough County, New Hampshire, Eastern Part

Longa Soil



March 18, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....7
Soil Map (Longa Soil).....8
Legend.....9
Map Unit Legend (Longa Soil).....10
Map Unit Descriptions (Longa Soil).....10
Hillsborough County, New Hampshire, Eastern Part.....12
HsD—Hinckley loamy sand, 15 to 35 percent slopes.....12
Om—Occum fine sandy loam, high bottom.....13
UdA—Udipsamments, nearly level.....13
WdA—Windsor loamy sand, 0 to 3 percent slopes.....14
WdB—Windsor loamy sand, 3 to 8 percent slopes.....15
WdC—Windsor loamy sand, 8 to 15 percent slopes.....16
WdD—Windsor loamy sand, 15 to 35 percent slopes.....17
Soil Information for All Uses.....19
Soil Properties and Qualities.....19
Soil Qualities and Features.....19
Hydrologic Soil Group (Longa Soil).....19
References.....24

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Longa Soil)

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:4,920 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hillsborough County, New Hampshire, Eastern Part
Survey Area Data: Version 14, Jul 25, 2012

Date(s) aerial images were photographed: 8/28/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Longa Soil)

Hillsborough County, New Hampshire, Eastern Part (NH601)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
HsD	Hinckley loamy sand, 15 to 35 percent slopes	4.1	6.0%
Om	Occum fine sandy loam, high bottom	1.8	2.6%
UdA	Udipsamments, nearly level	5.0	7.4%
WdA	Windsor loamy sand, 0 to 3 percent slopes	20.5	29.9%
WdB	Windsor loamy sand, 3 to 8 percent slopes	25.8	37.6%
WdC	Windsor loamy sand, 8 to 15 percent slopes	9.8	14.3%
WdD	Windsor loamy sand, 15 to 35 percent slopes	1.5	2.2%
Totals for Area of Interest		**68.5**	**100.0%**

Map Unit Descriptions (Longa Soil)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Hillsborough County, New Hampshire, Eastern Part

HsD—Hinckley loamy sand, 15 to 35 percent slopes

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 200 days

Map Unit Composition

Hinckley and similar soils: 90 percent
Minor components: 10 percent

Description of Hinckley

Setting

Parent material: Stratified sandy and gravelly outwash

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 3.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: A

Typical profile

0 to 3 inches: Loamy sand
3 to 21 inches: Gravelly loamy sand
21 to 60 inches: Very gravelly coarse sand

Minor Components

Not named

Percent of map unit: 5 percent

Windsor

Percent of map unit: 5 percent

Om—Occum fine sandy loam, high bottom

Map Unit Composition

Occum and similar soils: 85 percent
Minor components: 15 percent

Description of Occum

Setting

Parent material: Sandy and/or coarse-loamy alluvium derived from granite, gneiss or schist

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: Low (about 5.7 inches)

Interpretive groups

Farmland classification: Prime farmland if protected from flooding or not frequently flooded during the growing season
Land capability (nonirrigated): 1
Hydrologic Soil Group: B

Typical profile

0 to 9 inches: Fine sandy loam
9 to 25 inches: Fine sandy loam
25 to 60 inches: Loamy fine sand

Minor Components

Pootatuck

Percent of map unit: 15 percent

UdA—Udipsamments, nearly level

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 200 days

Map Unit Composition

Udipsamments and similar soils: 80 percent
Minor components: 20 percent

Description of Udipsamments

Setting

Parent material: Outwash

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Typical profile

0 to 60 inches: Sand

Minor Components

Not soil

Percent of map unit: 10 percent

Hinckley

Percent of map unit: 5 percent

Windsor

Percent of map unit: 5 percent

WdA—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual precipitation: 28 to 55 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 200 days

Map Unit Composition

Windsor and similar soils: 90 percent
Minor components: 10 percent

Description of Windsor

Setting

Parent material: Outwash derived from granite and gneiss

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability (nonirrigated): 3s
Hydrologic Soil Group: A

Typical profile

0 to 4 inches: Loamy sand
4 to 12 inches: Loamy sand
12 to 60 inches: Sand

Minor Components

Deerfield

Percent of map unit: 4 percent

Hinckley

Percent of map unit: 4 percent

Not named

Percent of map unit: 2 percent

WdB—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual precipitation: 28 to 55 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 200 days

Map Unit Composition

Windsor and similar soils: 90 percent
Minor components: 10 percent

Description of Windsor

Setting

Parent material: Outwash derived from granite and gneiss

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups
Farmland classification: Farmland of local importance
Land capability (nonirrigated): 3s
Hydrologic Soil Group: A

Typical profile
0 to 4 inches: Loamy sand
4 to 12 inches: Loamy sand
12 to 60 inches: Sand

Minor Components

Deerfield
Percent of map unit: 4 percent

Hinckley
Percent of map unit: 4 percent

Not named
Percent of map unit: 2 percent

WdC—Windsor loamy sand, 8 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 200 days

Map Unit Composition
Windsor and similar soils: 90 percent
Minor components: 10 percent

Description of Windsor

Setting
Parent material: Outwash derived from granite and gneiss

Properties and qualities
Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 4s
Hydrologic Soil Group: A

Typical profile
0 to 4 inches: Loamy sand
4 to 12 inches: Loamy sand
12 to 60 inches: Sand

Minor Components

Hinckley
Percent of map unit: 6 percent

Not named
Percent of map unit: 4 percent

WdD—Windsor loamy sand, 15 to 35 percent slopes

Map Unit Setting
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 200 days

Map Unit Composition
Windsor and similar soils: 90 percent
Minor components: 10 percent

Description of Windsor

Setting
Parent material: Outwash derived from granite and gneiss

Properties and qualities
Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: A

Typical profile

0 to 4 inches: Loamy sand
4 to 12 inches: Loamy sand
12 to 60 inches: Sand

Minor Components

Hinckley

Percent of map unit: 6 percent

Not named

Percent of map unit: 4 percent

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (Longa Soil)

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

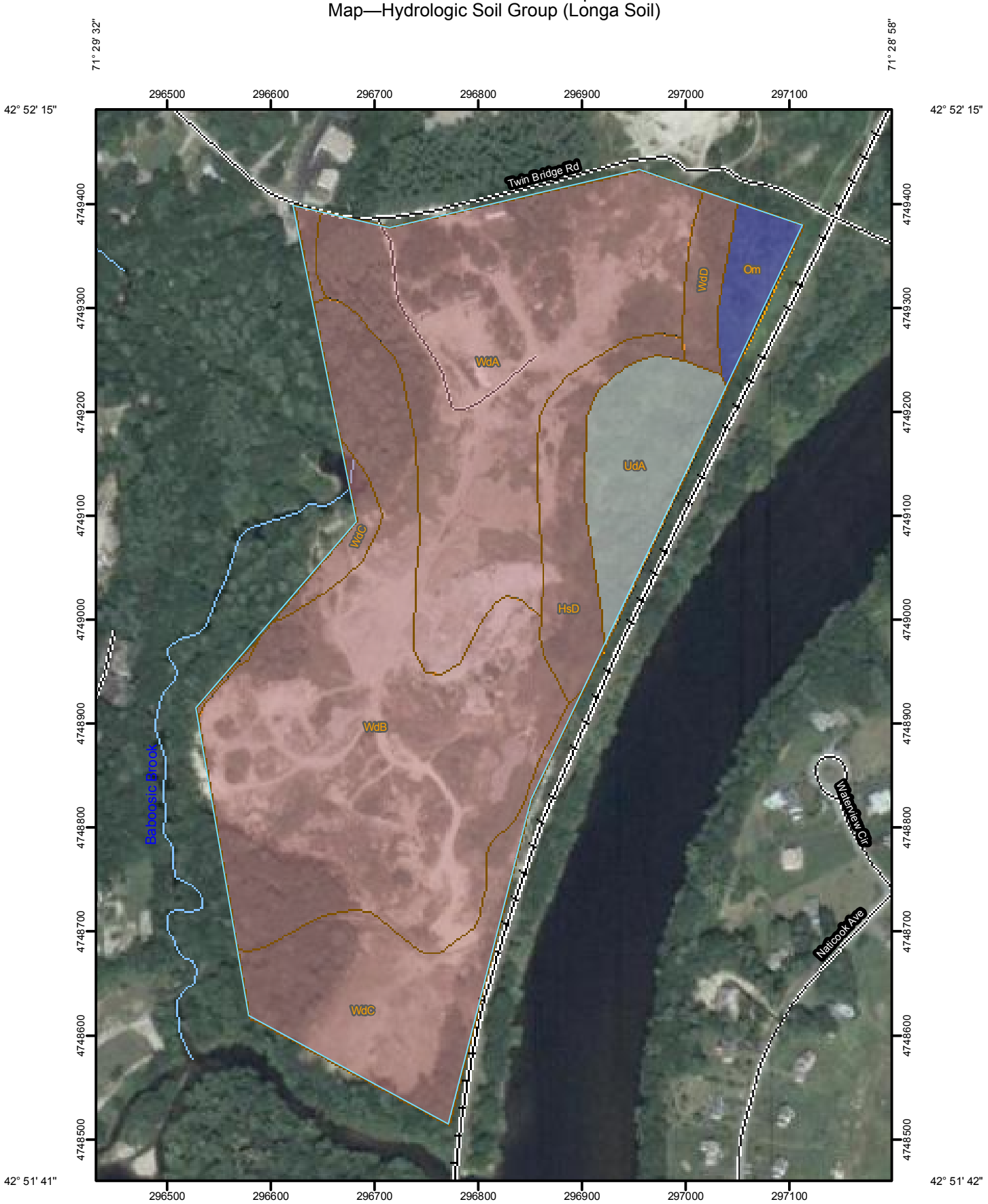
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group (Longa Soil)



Map Scale: 1:4,920 if printed on A size (8.5" x 11") sheet.

N

Meters
0 45 90 180 270

Feet
0 150 300 600 900

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:4,920 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hillsborough County, New Hampshire, Eastern Part
Survey Area Data: Version 14, Jul 25, 2012

Date(s) aerial images were photographed: 8/28/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group (Longa Soil)

Hydrologic Soil Group— Summary by Map Unit — Hillsborough County, New Hampshire, Eastern Part (NH601)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HsD	Hinckley loamy sand, 15 to 35 percent slopes	A	4.1	6.0%
Om	Occum fine sandy loam, high bottom	B	1.8	2.6%
UdA	Udipsamments, nearly level		5.0	7.4%
WdA	Windsor loamy sand, 0 to 3 percent slopes	A	20.5	29.9%
WdB	Windsor loamy sand, 3 to 8 percent slopes	A	25.8	37.6%
WdC	Windsor loamy sand, 8 to 15 percent slopes	A	9.8	14.3%
WdD	Windsor loamy sand, 15 to 35 percent slopes	A	1.5	2.2%
Totals for Area of Interest			**68.5**	**100.0%**

Rating Options—Hydrologic Soil Group (Longa Soil)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

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American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

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Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

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Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://soils.usda.gov/

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://soils.usda.gov/

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://soils.usda.gov/

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.glti.nrcs.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://soils.usda.gov/

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

Appendix F

Spill Response Guideline and Emergency Contact List

EMERGENCY SPILL RESPONSE GUIDELINE

In the event of a spill or emergency involving oil, hazardous materials or hazardous wastes, **contact the following people**.

SITE EMERGENCY COORDINATORS

Primary Contact: Shane Duval Work Phone: 978-970-0500
Cell Phone: 978-375-4611

Alternate Contact: Jason Squeglia Work Phone: 978-970-0500
Cell Phone: 978-866-4136

Alternate Contact: Jack Longa Work Phone: 603-424-9210
Cell Phone: 603-533-1107

During work hours, first call **Primary Contact** at work number. If primary contact is not available, call **Alternate Contacts** at work numbers. After work hours, first call Primary Contact at cell number. If Primary Contact is not available, call Alternate Contacts at cell numbers.

Any discharge of oil, hazardous materials, or hazardous waste that poses a threat to human health or the environment must be reported immediately to **Merrimack Fire Department and NHDES, not to exceed one hour** from the discovery of the release. See the **Emergency Contact List**.

INITIAL SPILL RESPONSE PROCEDURES

If a spill occurs, the first person on the scene will:

1. First, determine if there is an immediate danger. If there is, quickly leave the area using the fastest route shown on site map.

2. If there is no immediate danger, identify the material spilled and start the appropriate containment and safety procedures for which you have been trained to perform, including putting on protective gear.

3. Cut off the source of the spill and contain the flow, if possible.

4. Reduce the danger to human life. For example, by removing ignition sources near flammable liquid spills if possible without further assistance.

EMERGENCY SPILL RESPONSE GUIDELINE

5. Notify your emergency coordinator or alternate coordinators.

6. Utilizing the spill kit or other appropriate materials, contain and clean up the spill in accordance with your training. Obtain the assistance of others, if necessary to contain and clean up the spill.

SPILL CONTAINMENT PROCEDURES

1. Find the source of spill and take action to stop the source. For example, if the source is a tipped over drum, right the drum and seal it. If the source of the leak is a punctured tank, pump the fluid into another container.

2. Using spill absorbents or other suitable materials, construct a berm to prevent the spill from entering storm drains, drainage ditches, etc.

3. Apply absorbent materials to contain and recover small amounts of spilled materials.

4. Collect all spilled material and contaminated materials and store them in an appropriate container for disposal.

SPILL REPORTING PROCEDURES

If a spill occurs and any one of the following is **true**:

- 25 gallons or greater
- Is not contained
- Is not completely removed within 24 hours
- There is impact to groundwater or surface water
- Vapors have been emitted that cause an immediate threat to human health

1. Immediately (**within one hour of discovery**), contact the Merrimack Fire Department.

2. Immediately (**within one hour of discovery**) contact the NHDES Spill Response and Complaint Investigation Section:
   a. Monday – Friday, 8am to 4pm, 603-271-3899
   b. Weekends and Evenings, Call the State Police 603-223-4381.

3. If the spill has been released to surface water, immediately notify the

National Response Center (NRC). Provide information listed in item #6 below, and any additional information requested.

4. Follow up the call to NHDES by submitting a completed spill reporting form. Email the completed form to orcb.wmd@des.nh.gov .

5. If a spill of oil occurs where all 5 of the circumstances listed above are **false**, notification beyond the Site is not required.

6. Document the incident including the following details:
   - Names and phone numbers of all involved (parties responsible, witnesses, etc.).
   - Location of spill/release
   - Date and time of discovery
   - Type and amount of oil spilled/released
   - How close to surface water the discharge occurred;
   - Whether a clean-up contractor has been contacted or hired, and if so, the name, address, and telephone number of the contractor
   - The cause of the incident.

7. If the spill/release cannot be cleaned up within 24 hours, submit a cleanup plan to NHDES within five (5) days of the discharge.

EMERGENCY SPILL RESPONSE GUIDELINE

EMERGENCY CONTACT LIST

Organization	Contact Number
LOCAL	
Merrimack Fire Department	**911** or 603-424-3690
Merrimack Police Department	**911** or 603-424-3774
STATE	
State Emergency Response NHDES Spill Response and Complaint Investigation Section Mon. – Fri. 8 am – 4 pm	**603-271-3899**
NH State Police (24 hours)	**603-223-4381**
FEDERAL	
Office of Emergency Management -National Response Center (24 hours)	**800-424-8802**
USEPA Region 1 Emergency Response Team (24 hours)	**617-918-1279**
EMERGENCY SPILL RESPONSE/CLEAN-UP CONTRACTOR	
Cyn Environmental Services 8 Progress Drive Dover, NH (58 mi NE of site)	**603-749-4969**
OTHER	
Southern NH Regional Medical Center Southern New Hampshire Medical Center 8 Prospect Street Nashua, NH 03061	**603-577-2000**
Poison Control – National	**800-222-1222**

ATTACHMENT 1

NHDES HAZARDOUS WASTE OR PETROLEUM SPILL REPORTING FORM

WMD Site No: _____
Project No: _____
Project Type: _____

DEPARTMENT OF ENVIRONMENTAL SERVICES
WASTE MANAGEMENT DIVISION
Hazardous Waste or Petroleum
Spill Reporting Form

GUIDELINES FOR REPORTING A SPILL

1. Report the spill to your local 911responder or fire department.
2. Call DES Spill Response & Complaint Section and provide as much of information listed below as possible.
   Monday – Friday, 8 am to 4 pm (603) 271-3899
   Weekend and Evenings (603) 223-4381 State Police Dispatch
3. Follow up the call to DES by submitting a completed spill reporting form. Email the completed form to orcb.wmd@des.nh.gov by highlighting, copying and paste the information onto the email.

Date Spill Reported to DES: _____ Time:_____

Your Name:_____

Mailing Address:_____

Town: _____State: _____Zip:_____

Home Telephone #:_____Work Telephone #:_____Email :_____

Company or Person Responsible

Business or Individual Name:_____

Mailing Address:_____

Town: _____State:_____ Zip:_____ Telephone #:_____

Spiller Contact Information - Name:_____ Title:_____

Telephone #:_____ Email:_____

Spill Location

Site Name: _____

Town:_____

Street Address:_____

Directions to Site:_____

Spill Information

Substance spilled : _____ Amount:_____ Units:(gallons):_____

Date of Spill:_____ Time of Spill:_____

Cause of Spill:_____

How was Spill Detected:_____

Areas Impacted or Will Be Impacted
(Soil, Surface Water, Wetlands, Drinking Water Well)

Impacted Areas: _____ Distance from Spill: _____

_____ _____

Potentially Impacted Areas: _____ Distance from Spill_____

_____ _____

Attached sampling results, if any.

Response Company

Company Name:_____

Mailing Address:_____

Town: _____State:_____ Zip:_____ Telephone #:_____

Contact Information – Name: _____ Title:_____

Telephone #:_____ Email:_____

Response Action

_____

_____

_____

Attach response reports, if any.

Others Notified

Have you notified the person or party you believe is responsible? Yes ___ No ___

Have you reported this spill to local officials? Yes ___ No ___

If Yes, Town:_____ Department:_____

Representative's Name:_____

Spill Site Property Owner Information (Optional)

Property Owner Name:_____ -

Mailing Address:_____

Town: _____State: _____Zip:_____

Telephone #:_____

Appendix G

Approvals and Permits

Record of Changes/Amendments

Town of Merrimack, New Hampshire

Community Development Department 603 424-3531
6 Baboosic Lake Road Fax 603 424-1408
Town Hall - Lower level - East Wing www.merrimacknh.gov
Planning - Zoning - Economic Development - Conservation

June 21, 2013

Rich Niles
AMEC Environment & Infrastructure, Inc.
2 Robbins Road
Westford, MA 01886

Re: Brighter Horizons Environmental Corp. (applicant) and James Longa & Son, Inc. and James E. Longa Revocable Trust (owners) – Review for Acceptance and consideration of Final Approval of a waiver of full site plan for an application proposing partial reclamation of a sand and gravel pit located at 17 Twin Bridge Road in the I-1 (Industrial) & Aquifer Conservation Districts. Tax Map 5D-1, Lot 010 and Tax Map 5D-4, Lot 074-1.

Dear Mr. Niles:

The Planning Board, at its meeting on June 18, 2013, voted 7-0-0 to accept jurisdiction of the application. The Board next voted 7-0-0 to grant a waiver of full site plan review and lastly voted 5-1-1 to **grant conditional final approval of the application, subject to the following precedent conditions to be fulfilled within 1 year and prior to signing of the plan, unless otherwise specified:**

1. A note to be added to the plan stating that, prior to commencement of reclamation activities within Grids A-2 through A-5 and B-2 through B-5, grid cells shall be marked in the field and inspected to the satisfaction of the Public Works Department, Wastewater Division;

2. Final reclamation plan to include erosion/sedimentation control and slope stabilization notes, including the sequence for filling of grids;

3. Community Development Department to receive in writing (e-mail is sufficient) confirmation from the Public Works Department, Wastewater Division that they have reviewed and approved the Sewer Interceptor Protection Plan and are in agreement with the methods described in Section 6.4 of the "…Partial Reclamation Operations Plan";

4. Community Development Department to receive written confirmation (e-mail is sufficient) from the Merrimack Fire Department that the proposed Emergency Spill Response Guideline is satisfactory. Applicant to make any necessary changes to the Guideline as required and re-submit to the Fire Department for review and approval;

5. Prior to review and approval of the Stormwater Management Plan by the Community Development and Public Works Departments, the final stormwater analysis to be submitted to CLD for review and approval (at the applicant's expense);

6. All permit numbers to be added to the final reclamation plan and Operations Plan;

7. Final review comments received from the Lower Merrimack River Local Advisory Committee (LMRLAC), Souhegan River Local Advisory Committee (SORLAC), and the Merrimack Conservation Commission to be satisfactorily addressed;

8. All permits granted to be noted in Appendix G, including expiration dates as applicable. Any changes required as a result of permit reviews are to be incorporated into the final Operations Plan and a copy of final sign-off from each of the permitting agencies be forwarded to the Community Development Department for confirmation;

9. All record plans (including HCRD Plan #'s) used in the development of the partial reclamation plan to be added by reference to the reclamation plan.

10. Address the Planning Staff Technical Comments (see below).

Planning Staff Technical Comments

1. Clarify the following notes in the document entitled "...Partial Reclamation Operations Plan":

    - Section 1.0, Pg. 1-1: Please clarify between "Site" and "Reclamation Area". Both are claiming to share the reference of "Site" but it appears that one reference to "Site" applies to the greater Longa "proper" (approximately 81 acres) which includes a parcel not subject to the proposed reclamation plan (Map 5D-2, Lot 010). A second reference appears to refer to the approximately 10.85 acres of proposed reclamation area (Map 5D-4, Lot 074-1 & Map 5D-1, Lot 010);

    - Section 3.3, Pg. 3-2: Please clarify that the base flood elevation of 118 ft. for the southern portion of the proposed reclamation area is for the 100-yr. flood plain;

    - Section 6.4, Pg. 6-4: Correct, if necessary, the reference to SMH 95 & SMH 96 with respect to replacement of the sewer utility as a result of the 2006 flood;

2. Add a detail to the plan illustrating that slopes greater than 3:1 (horizontal:vertical) will be stabilized with an erosion control blanket or straw mat;

June 21, 2013

3. Tax Map 5D-1, Lot 010 and Tax Map 5D-4, Lot 074-1 to be added to the final reclamation plan.

Please be advised that any party to the action or proceedings, or any party directly affected thereby, may appeal the Board's decision within 30 days, in accordance with RSA 677:15.

If you have any questions, please feel free to call me at 424-3531.

Sincerely,

Nancy Larson
Planning & Zoning Administrator

ec: Rich Niles, AMEC Environment & Infrastructure, Inc.
Gregory Michael, Esq., Bernstein Shur
Ken Conaty, Collections Manager, Merrimack Public Works, Wastewater Division
Carol Miner & Fred Kelley, Building Department
Roger Bergeron, Pan Am Railways
Pan Am Railways Marketing Division

cc: File
Jack Longa, Longa Sand & Gravel
B&M Railroad/PanAm

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
LAND RESOURCES MANAGEMENT
WETLANDS BUREAU
29 Hazen Drive, PO Box 95, Concord, NH 03302-0095
Phone: (603) 271-2147 Fax: (603) 271-6588
Website: http://des.nh.gov/organization/divisions/water/wetlands/cspa/index.htm
Permit Application Status: http://www2.des.state.nh.us/OneStop/Wetland_Permits_Query.aspx

SHORELAND PERMIT BY NOTIFICATION (PBN)[1]

$100.00

Office use only: Accepted ☒ Rejected ☐
Check No. 31022 Initials: EMK Date: 7/8/13

Shoreland File Number 2013 - 01822 Reviewed Date: 7/8/13 Initials: DCF

A. PROJECT AND OWNER INFORMATION					
1. Project Property Address		Town/City		State	Zip code
17 Twin Bridge Road		Merrimack		NH	03054
2. Waterbody Name		Tax Map	Lot	Block	Unit
Merrimack River		5D-1, 5D-4	10, 74-1	,	,
3. Property Owner Name (last, first, MI)	Phone No.	Fax No.		An email address authorizes electronic communication	
Longa, Jack	(603) 424-9210				
Mailing address		Town/City		State	Zip code
17 Twin Bridge Road		Merrimack		NH	03054

B. PROPOSED PROJECT DETAILS: (NOTE: This process cannot be used: a) for impacts to areas under the jurisdiction of RSA 482-A including surface waters and their banks, wetlands, tidal areas including the 100 ft tidal buffer zone, sand dunes and beaches , and; b) to expand the footprint of nonconforming primary structures within the waterfront buffer.)

TOTAL PROPOSED IMPACT AREA:	NEW IMPERVIOUS AREA PROPOSED:
84,000 square feet	0 square feet

DESCRIPTION: Provide a brief description of the proposed project including all temporary and permanent impacts, new pervious and impervious areas, and structures.

The property owner (Longa family), proposes to develop, operate, and maintain a sand and gravel pit reclamation project for a 10.8 acre portion of the overall 81 acre site. A portion of the proposed reclamation area is within the 250-foot shoreland zone to the Merrimack River. Currently, the site does not drain towards the Merrimack River and infiltrates on-site. The reclamation will take place within a previously mined portion of the site and will restore the area to an elevation of 118-120 with a vegetative cover. The proposed soil reuse at the site is to import soil and fill materials that meet residential standards and do not restrict future site use.

There are no wetlands within the proposed reclamation area and there will be no new impervious area or structures added to the site. The proposed grading will be up to elevation 120 and will drain to the interior from all sides such that there is no stormwater run-off from the site. The restored area will be stabilized with a vegetative support soil and native grass species (e.g., conservation seed mix). Stormwater controls will be implemented to ensure soils are stabilized and/or protected against erosion during periods outside of the growing season.

[1] Form is not valid unless shoreland file number is assigned and notification is accepted, dated and initialed by DES.

C. CONDITIONS: Agree to the following Permit by Notification conditions by initialing each one:	
JGL Env-Wq 1406.17(a)	Erosion and siltation control measures shall (1) Be installed prior to the start of work; (2) Be maintained throughout the project; and (3) Remain in place until all disturbed surfaces are stabilized.
JGL Env-Wq 1406.17(b)	Erosion and siltation controls shall be appropriate to the size and nature of the project and to the physical characteristics of the site, including slope, soil type, vegetative cover, and proximity to wetlands or surface waters.
JGL Env-Wq 1406.17(c)	No person undertaking any activity in the protected Shoreland shall cause or contribute to, or allow the activity to cause or contribute to, any violations of the surface water quality standards established in Env-Ws 1700 or successor rules in Env-Wq 1700.
JGL Env-Wq 1406.17(d)	Any fill used shall be clean sand, gravel, rock, or other suitable material.
JGL Env-Wq 1406.05	Upon receiving acceptance of this Permit by Notification, a copy of page one of this form shall be posted on site prior to the start of work.

D. PBN CRITERIA: In addition to meeting all requirements of RSA 483-B and Rule Chapter Env-Ws1400 the project must meet one of the following. Please check the appropriate qualifying criteria per RSA 483-B:5-b:	
☐	1. This project will result in less than 1,500 sq ft of total impact area, of which no more than 900 square feet will be added impervious area (*excluding public infrastructure projects*); **or**
☐	2. This is a public infrastructure maintenance or repair project (public utilities, public roadways and access facilities); **or**
☒	3. This project is directly related to stormwater management improvements, erosion control projects or environmental restoration or enhancement; **or**
☐	4. This project is an activity defined as qualified for a permit by notification under Env-Wq 1406.05. Identify the specific paragraph under Env-Wq 1406.05 qualifying this project: ☐ Env-Wq 1406.05(a) ☐ Env-Wq 1406.05(b) ☐ Env-Wq 1406.05(c) ☐ Env-Wq 1406.05(d)

E. IMPACT AREA AND APPLICATION FEE: Indicate the project type, impact area and fee by checking the appropriate box below.		
☐	1. The proposed project will temporarily impact _____ square feet and permanently impact _____ square feet for a total of _____ square feet of impact within 250 feet of the reference line. Total Impact area_____ x $0.10 per square foot + $100 =_____ **This is the project filing fee. If the result is more the $250 you cannot use this form.**	(Max $250) $ _____
☐	2. The proposed project is a public infrastructure maintenance or repair project.	Fee Exempt
☒	3. The proposed project meets the criteria of Section D.3. above.	$100.00

F. REQUIRED CERTIFICATIONS: By initialing by hand within the blank before each of the following statements, and signing below, you are certifying that the information provided is true, complete and not misleading.	
JEL	1. I understand that any impacts completed under a Permit by Notification filed and accepted based on false, incomplete, or misleading information on the application, plans or attachments shall be subject to enforcement action.
JEL	2. I am aware that an accepted Shoreland Permit by Notification will not exempt the work I am proposing from other state, local or federal approvals.
JEL	3. I am aware of the requirements regarding impervious area thresholds and have provided all necessary materials necessary to clearly demonstrate this project meets at least the minimum standards of RSA 483:B:9, V(g) 1,2 and 3.
JEL	4. I understand that project proposals that do not meet the minimum standards of RSA 483-B and Administrative Rules Chapter Env-Wq 1400 shall be rejected.
JEL	5. I understand that failure to conduct the work in accordance with the plans and materials submitted with this Notification shall be considered work without a permit and subject to enforcement action. I agree to conduct all work under this Permit by Notification in accordance with the conditions specified in Section C, above.
JEL	6. I understand that incomplete notifications will be rejected and the notification fee will be forfeited.

G. REQUIRED SIGNATURE	
Signature of Owner: John E Ronge *(agent may not sign on owner's behalf)*	**Date:** 6/18/13

H. AGENT INFORMATION: If this form has been completed by an agent or any person acting on behalf of the owner, said person shall provide the following information: (*Signature of owner must be present on in Section G*)			
1. Agent Name(last, first, MI)	Phone No.	Fax No.	An email address authorizes electronic communication
Niles, Rich	978.692.9090	978.692.6633	rich.niles@amec.com
Mailing address	Town/City	State	Zip code
2 Robbins Road	Westford	MA	01886

Gravel Pit Partial Reclamation Operations Plan

Amendment No.	Date	Significant Changes/Updates	Person Recording Change	Signature
1	27-Sep-13	1) Incorporate the following permits/approvals: NHDES Accepted Shoreland PBN, File No. 2013-01822; Merrimack Planning Board Review for Acceptance & Consideration of Final Approval for a Waiver of Full Site Plan Review, dated June 21, 2013; and NH DES Application to Certify a Waste Derived Product for Distribution and Use. 2) Changes to address the Merrimack Planning Staff Technical Comment #1 from the letter dated June 21, 2013. 3) Update Section 5.0 to incorporate catch basin cleanings and update Table 3 based on the NH DES Application to Certify a Waste Derived Product for Distribution and Use. 4) Update start schedule in Section 8.0.	Rich Niles, AMEC	
2				
3				
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