# **STORMWATER REPORT**

# FULLER FIELD TRACK & FIELD INMPROVEMENTS PHASE TWO

NEWBURYPORT, MASSACHUSETTS

Prepared For: HUNTRESS ASSOCIATES, INC.

Prepared By: Marchionda & Associates, LP

> February 10, 2020 Rev. 3/6/20

#### FULLER FIELD IMPROVEMENTS – PHASE 2 STORMWATER REPORT

February 10, 2020 Rev. 3/6/20

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### **STORMWATER REPORT NARRATIVE**

#### FULLER FIELD TRACK & FIELD IMPROVEMENTS PHASE TWO

February 10, 2020 Rev. 3/6/20

#### Introduction:

Marchionda & Associates, L.P. has completed a storm water analysis for the *Track & Field Improvement* project proposed at the Bradley Fuller Field in Newburyport, Massachusetts. The purpose of this report is to offer information on the stormwater characteristics of the site in its existing and post construction condition.

For additional information regarding the site's existing conditions and the stormwater management system reference is made to the following plans and report;

 Fuller Field Track & Field Improvements – Phase Two Owner: Town of Newburyport, MA Prepared by; Huntress Associates, Inc. Dated; 1/20/20, Rev. 2/28/20

#### Existing Conditions:

The project site is located at the track and field facility within the Bradley Fuller field complex located off of Low Street. The existing running track was recently constructed to replace and reconfigure an older track. The site also includes existing multi-purpose natural grass fields, a parking area, and supporting structures such as a bathroom and storage buildings.

The site is surrounded by the frontage on Low Street to the south, residential homes to the north and west, and a senior living facility to the east. A portion of the site is located within a buffer zone to a wetland resource area. The site is not located in a designated flood hazard area.

Stormwater from the site presently flows in two main directions. Stormwater generated from the track and field area flows into existing catch basins and a closed drainage system that runs through the site and eventually into the municipal drainage system in Low St. Stormwater from the existing parking area flows to a

bordering vegetated wetland located along the western boundary of the site. This wetland drains to a drainage way that runs parallel with Low Street and eventually into the municipal system. Refer to the existing conditions plan in project site plan set for specific information on the existing topography and features of the site.

Soils on the site have been mapped as those typically found in the Maybid, Scantic, and Buxton Silt Loam soil series. These soils are typically made up of poorly drained silts and clays. These soils fall in the Hydrologic soil groups C & D. An on-site investigation also found layers of sands located above these soils. Information on the site's soils has been included in appendix of the report.

### Project Description:

The project consists of the removal of the existing bituminous parking area and the construction of a new gravel parking area, grandstand, and concrete sidewalks.

This construction will result in approximately 9450 +/- s.f. of new impervious surfaces. The construction will require shallow excavation and surface preparation and will take place in areas of the site has been previously disturbed. The remaining open space will be made up of manicured grass and landscape areas.

A comprehensive stormwater management system will be constructed to mitigate the stormwater run-off generated from the new impervious surfaces. This system will be made up of stone infiltration trenches and a stormwater management area (sediment trap). To also help reduce run-off to the wetland, portions of the proposed parking area will be constructed of pervious pavement surfaces. These surfaces will make up the accessible parking area and the entrance driveway apron at the access to Low Street. Detailed information on the components of the system are included in the project's site plans.

#### Project Type:

The project will take place in areas previously disturbed. However, for purposes of stormwater management standards the project has not been considered a redevelopment project.

#### LID Measures:

When possible environmental sensitive site design and LID techniques have been used in the planning of the project. All of the proposed construction will be located in areas previously disturbed by the existing facility.

#### FULLER FIELD IMPROVEMENTS STORMWATER REPORT NARRATIVE

March 6, 2020

#### Stormwater Management Standards Compliance:

A description of how this project meets the DEP and City of Newburyport stormwater standards, along with supporting documentation, is provided herein:

#### Standard 1: No New Untreated Stormwater Discharges

No new point source discharges will be created. The project has been designed to recharge and contain the majority of the storm water flows within the project area.

#### Standard 2: No Increase in the Post-Development Peak Discharge Rate

Peak flow rates were analyzed to determine the performance of the proposed BMP's. The 2-year, 10-year, and 100-year, 24-hour Type III storm events were considered in the analysis. The contributing area of each BMP is shown in Figure 2 and described below.

AREA "A" represents the impervious area of the new grandstand and walkway that drains to the infiltration trench "BMP A".

AREA "B" represents the impervious area of the new walkway and storage building that drains to the underground infiltration trench "BMP B".

AREA "C" represents the impervious area of the new walkway that drains to the underground infiltration trench "BMP C".

AREA "D" represents the impervious area of the new walkways that drain to the stone trenches and stormwater management area (sediment trap) "BMP D".

In terms of the modeling methodology, Technical Release 55 (TR-55) was utilized to obtain weighted curve numbers (CNs) for each of the BMP subcatchment areas. Inputs for obtaining the weighted CNs were based on ground cover type and hydrologic soil groups (HSGs). For this analysis only the new impervious surfaces covering the existing grass areas were considered. TR-55 was also utilized to obtain times of concentration (TCs) for each of the subcatchment areas. Flow paths were generally broken into segments of sheet flow and shallow concentrated flow. Because of the small contributing areas and short flow path the minimum 5 minute time was used for each analysis.

#### March 6, 2020

CNs and TCs obtained from TR-55 were input into the *Hydraflow*<sup>®</sup> Hydrographs software package, which utilizes the National Resources Conservation Service (NRCS) method to generate and route hydrographs.

As shown in the attached modeling output and as summarized in Table 1 (below), each of the proposed BMP's will have the capacity to accept the stormwater generated by the additional impervious for of the 2, 10, & 100 year design storms:

ВМР	2-yr stor (3.1"/	rm event 24-hr)	10-yr sto (4.7"/	orm event (24-hr)	25-yr sto (5.8"/	orm event (24-hr)	100-yr storm event (8.3"/24-hr)			
AREA	Pre-Dev (cfs)	Post Dev (cfs)	Pre-Dev (cfs)	Post Dev (cfs)	Pre-Dev (cfs)	Post Dev (cfs)	Pre-Dev (cfs)	Post Dev (cfs)		
Α	0.18 0.0		0.41	0.21	0.59	0.51	1.00	1.21		
В	0.07	0.0	0.15	0.0	0.22	0.0	0.38	0.0		
С	0.03 0.0		0.08	0.0	0.11	0.0	0.19	0.0		
D	0.08	0.0	0.18	0.0	0.26	0.0	0.44 0.16			

TABLE 1: "Peak Flow	s"	
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The analysis shows that there will be a slight increase from BMP Area "A" in the 100 year event. will overtop in the 100 year event. However, with the reduction of flows from the other areas the post construction condition will not cause any off site impacts in a 100 year event.

#### Standard 3: Loss of Annual Recharge

DEP's *Stormwater Management Handbook* prescribes an infiltration volume based on the hydrologic soil group over which impervious area will be constructed as follows:

- HSG A 0.60 inches of runoff
- HSG B 0.35 inches of runoff
- HSG C 0.25 inches of runoff
- HSG D 0.10 inches of runoff

The proposed construction will include both the creation and removal of impervious surfaces. It appears from soil mapping and on-site soil observation that the entire project area is made up of soils that are considered to be in the hydrologic soil group "C & D". Due to the poorly drained soils that presently exist at the site, the project will infiltrate stormwater volumes to the extent possible.

#### FULLER FIELD IMPROVEMENTS STORMWATER REPORT NARRATIVE

#### March 6, 2020

#### Standard 4: Water Quality

The new impervious surfaces created will be walkways and roof tops. Since these surfaces will not generate pollutant laden suspended solids there will no increase in Total Suspended Solids as a result of the project.

A Long-Term Stormwater Operation and Maintenance Plan & Pollution Prevention Plan (Appendix 4) has been developed for the project to comply with this requirement and the requirements of Standard 9.

#### <u>Standard 5</u>: Land Uses with Higher Potential Pollutant Loads

Not applicable – this project does not propose a land use with a higher potential pollutant load.

#### <u>Standard 6</u>: Discharges within a Zone II or Interim Wellhead Protection Area

Based on a review of Mass GIS data. The project does not lie within a Zone II or Interim Wellhead Protection Area.

#### Standard 7: Redevelopment

This project is not considered a redevelopment project as defined in the DEP *Stormwater Management Handbook.* 

#### <u>Standard 8</u>: Construction-Related Impacts

A Site Preparation Plan has been developed for the project and is included as part of the Site Plans. In addition to this plan, the project is subject to the National Pollutant Discharge Elimination System (NPDES) program of the United States Environmental Protection Agency, as it will involve greater than one acre of land disturbance. As such, coverage under the NPDES General Permit for Stormwater Discharges from Construction Activities will be required along with a Stormwater Pollution Prevention Plan (SWPPP) prior to land disturbance.

March 6, 2020

#### Standard 9: Long-Term Operation and Maintenance

A Long-Term Stormwater Operation and Maintenance Plan & Pollution Prevention *Plan* has been developed for the project to comply with this requirement and the requirements of Standard 4. A copy of this plan has been included in the appendix of the report.

#### Standard 10: Illicit Discharges

DEP does not permit illicit discharges, defined by 310 CMR 10.04 as follows, to the stormwater management system:

"Illicit discharge means a discharge that is not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated ground water, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean buildings without detergents."

Prior to the discharge of stormwater runoff to the post-construction stormwater system it shall be the project owner's responsibility to prepare an Illicit Discharge Compliance Statement in accordance with Standard 10 certifying that no illicit discharges exist on the site.







Huntress Associates, Inc.

Landscape Architecture & Land Planning

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Project:

# FULLER FIELD Track & Field Phase Two

Newburyport, Massachusetts

Drawing Title:

# Grading & Drainage





# Marchionda & Associates, L.P.

Engineering and Planning Consultants

M. & A. NO.: 670-32

62 Montvale Avenue Suite I Stoneham, MA 02180 TEL: (781) 438-6121 FAX: (781) 438-9654 Email: engineering@marchionda.com Website: www.marchionda.com

DATE: 2/28/20

SCALE: 1"=30'

1 OF 1

#### FULLER FIELD IMPROVEMENTS – PHASE 2 STORMWATER REPORT

February 10, 2020 Rev. 3/6/20

# LIST OF APPENDICES

Appendix 1.....Standard 2 (Peak Flow)Appendix 2....Standard 3 (Recharge)Appendix 3....Operation and Maintenance Plan

# **APPENDIX 1**

# **Standard 2 (Peak Flow)**

# **SOILS INFORMATION**



USDA Natural Resources Conservation Service



Hydrologic Soil Group-Essex County, Massachusetts, Northern Part



# Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	C/D	2.6	13.1%
16A	Scantic silt loam, 0 to 3 percent slopes	C/D	14.3	71.3%
228B	Buxton silt loam, 3 to 8 percent slopes	D	2.7	13.3%
602	Urban land		0.1	0.4%
719B	Suffield silt loam, 3 to 8 percent slopes	С	0.4	1.9%
Totals for Area of Intere	st		20.1	100.0%

# Description

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.

# **Rating Options**

Aggregation Method: Dominant Condition Component Percent Cutoff: None Specified Tie-break Rule: Higher

### Essex County, Massachusetts, Northern Part

#### 12A—Maybid silt loam, 0 to 3 percent slopes

#### Map Unit Setting

National map unit symbol: vjhj Mean annual precipitation: 45 to 54 inches Mean annual air temperature: 43 to 54 degrees F Frost-free period: 145 to 240 days Farmland classification: Not prime farmland

#### **Map Unit Composition**

Maybid and similar soils: 85 percent Minor components: 15 percent Estimates are based on observations, descriptions, and transects of the mapunit.

#### **Description of Maybid**

#### Setting

Landform: Depressions, depressions Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Dip Down-slope shape: Concave Across-slope shape: Concave Parent material: Soft silty and clayey glaciolacustrine deposits and/or firm silty marine deposits

#### **Typical profile**

H1 - 0 to 7 inches: silt loam H2 - 7 to 19 inches: silty clay H3 - 19 to 60 inches: silty clay

#### **Properties and qualities**

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Moderate (about 8.8 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 6w Hydrologic Soil Group: C/D Hydric soil rating: Yes

USDA

#### Minor Components

#### Scantic

Percent of map unit: 12 percent Landform: Depressions Hydric soil rating: Yes

#### Swansea

Percent of map unit: 3 percent Landform: Bogs Hydric soil rating: Yes

### **Data Source Information**

Soil Survey Area: Essex County, Massachusetts, Northern Part Survey Area Data: Version 15, Sep 12, 2019



### Essex County, Massachusetts, Northern Part

#### 16A—Scantic silt loam, 0 to 3 percent slopes

#### Map Unit Setting

National map unit symbol: vjrl Elevation: 10 to 900 feet Mean annual precipitation: 45 to 54 inches Mean annual air temperature: 43 to 54 degrees F Frost-free period: 145 to 240 days Farmland classification: Not prime farmland

#### **Map Unit Composition**

Scantic and similar soils: 85 percent Minor components: 15 percent Estimates are based on observations, descriptions, and transects of the mapunit.

#### **Description of Scantic**

#### Setting

Landform: Drainageways, depressions Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Dip Down-slope shape: Concave Across-slope shape: Concave Parent material: Soft fine-silty glaciolacustrine deposits and/or soft fine-silty glaciomarine deposits over hard fine-silty glaciolacustrine deposits and/or hard fine-silty glaciomarine deposits

#### **Typical profile**

H1 - 0 to 11 inches: silt loam H2 - 11 to 26 inches: silty clay loam H3 - 26 to 60 inches: clay

#### **Properties and qualities**

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.6 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 3w Hydrologic Soil Group: C/D Hydric soil rating: Yes

USDA

#### Minor Components

#### Maybid

Percent of map unit: 10 percent Landform: Depressions Hydric soil rating: Yes

#### **Buxton**

Percent of map unit: 5 percent Hydric soil rating: No

### **Data Source Information**

Soil Survey Area: Essex County, Massachusetts, Northern Part Survey Area Data: Version 15, Sep 12, 2019



### Essex County, Massachusetts, Northern Part

#### 228B—Buxton silt loam, 3 to 8 percent slopes

#### Map Unit Setting

National map unit symbol: vj37 Mean annual precipitation: 45 to 54 inches Mean annual air temperature: 43 to 54 degrees F Frost-free period: 145 to 240 days Farmland classification: All areas are prime farmland

#### **Map Unit Composition**

Buxton and similar soils: 80 percent Minor components: 20 percent Estimates are based on observations, descriptions, and transects of the mapunit.

#### **Description of Buxton**

#### Setting

Landform: Valleys, valleys

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Concave

*Parent material:* Soft fine-loamy glaciolacustrine deposits derived from mica schist over hard fine-loamy glaciolacustrine deposits derived from mica schist

#### **Typical profile**

H1 - 0 to 10 inches: silt loam

H2 - 10 to 30 inches: silt loam

H3 - 30 to 60 inches: silty clay

#### **Properties and qualities**

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: High (about 9.7 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 2e Hydrologic Soil Group: D Hydric soil rating: No

USDA

Minor Components

#### Suffield

*Percent of map unit:* 15 percent *Hydric soil rating:* No

Scantic

Percent of map unit: 5 percent Landform: Depressions Hydric soil rating: Yes

## **Data Source Information**

Soil Survey Area: Essex County, Massachusetts, Northern Part Survey Area Data: Version 15, Sep 12, 2019



# **GEOTECHNICAL REPORT**

# **BRADLEY FULLER FIELD NEWBURYPORT, MASSACHUSETTS**

January 5, 2016

GSI Project No. 215300

Prepared for:

Mr. Chris Huntress Huntress Associates, Inc. 17 Tewksbury Street Andover, MA 01810

#### Prepared by:

Geotechnical Services, Inc. 55 North Stark Highway Weare, NH 03281





🔺 Geotechnical Engineering 🔺 Environmental Studies 🔺 Materials Testing 🤺 Construction Monitoring 🔺

January 5, 2016

Mr. Chris Huntress Huntress Associates, Inc. 17 Tewksbury Street Andover, MA 01810

Advanced via Email: chris@huntressassociates.com

#### RE: Geotechnical Investigation Report Bradley Fuller Field Newburyport, Massachusetts GSI Project No. 215300

Dear Mr. Huntress:

Geotechnical Services, Inc. (GSI) is pleased to submit this report on the proposed design-redevelopment of the track and grass turf athletic field at the Bradley Fuller Field off of Low Street in Newburyport, MA. The report consists of the subsurface data obtained through implementation of an exploration program, evaluation of the subsurface data, a summary of our understanding of the proposed development, and the results of an assessment for earthwork design options. The content of this report is subject to the **Limitations** stated in Appendix A.

#### PROJECT UNDERSTANDING

The project site is located at 89 to 107 Low Street in Newburyport, MA (See Figure 1, Project Locus). We understand that the planned redevelopment will include the renovation of both the existing grass turf field located within the limits of the track and replace and reconfigure the existing track.

#### SUBSURFACE INVESTIGATION

Thirteen (13) soil probes, designated as GP-1 to GP-13, were performed at the site on December 14, 2015 by New England Boring Contractors, Inc. located in Derry, NH. The probes were conducted using a Geoprobe soil probing machine which collects continuous 5-ft long soil samples. Soil samples were collected to depths ranging from 5 to 10-ft below the existing grade. The Geoprobes were observed by the GSI engineer and the soils encountered were classified in accordance with the Burmister Classification system. The approximate locations of the Geoprobes are shown on Figures 2, Exploration Location Plan. The finalized logs for the Geoprobes are included in Appendix B. Representative portions of each sample retrieved were saved in plastic bags with identification, and delivered to the GSI Soils Laboratory. The samples were re-examined and field classifications were reviewed.

#### SUBSURFACE CONDITIONS

The subsurface conditions encountered in the investigation indicate that the site is underlain by the following soil units/deposits, described in order of increasing depth:

**Topsoil:** All of the probes encountered the Topsoil layer at the ground surface. The Topsoil layer generally consists of organic silty soils. The thickness of this soil unit varies from less than 6-in in proximity to the existing track to 8 to 18-in. within the limits of the grass turf field.

**Sand Fill:** The Sand Fill was encountered with all the geoprobes immediately beneath the topsoil layer. The Sand Fill generally consists of brown fine to medium SAND with varying amounts of gravel and coarse sand. The thickness of the Filter Sand layer varies from about 12-in. (GP-6) to 38-in. (GP-13) and was about 24-in. (on average) in thickness across the project site.

**Fill:** Fill soils, consisting of gray, CLAY and fine to coarse SAND with little gravel, was encountered in GP-6 between 1.8 to 5.5-ft below the existing grade.

**Silt Deposits:** An isolated pocket of Silt was encountered in GP-9 from 2.5 to 5.5-ft below the existing grade which generally consists of brown Silt.



**Marine Deposits:** Marine Deposits were encountered in all of the geoprobes beneath the Sand Fill, Fill and Silt Deposits. The Marine Deposits generally consist of gray, CLAY with varying amounts of silt or fine to medium sand. All the geoprobes were terminated within this soil unit at depth of 5 to 10-ft below the existing grade.

**Groundwater:** Groundwater was not encountered upon completion of the probes. Groundwater levels should be expected to vary with season, precipitation, snowmelt, and other factors. As a result, groundwater levels encountered during construction may differ from those encountered in the explorations. It should be anticipated that perched groundwater above the Marine Deposits should be anticipated during construction due to seasonal groundwater conditions and weather.

#### GEOTECHNICAL DESIGN RECOMMENDATIONS

#### General

As a general guideline, foundation design and construction must conform to the applicable provisions of the Massachusetts Building Code, 8<sup>th</sup> Edition (Building Code).

#### Track and Grass Field Subgrades

We anticipate that the construction of the new track and renovation of the existing grass field will involve the following; stripping off the track pavement, stripping off or amending the existing Topsoil, removing/relocating any existing utilities (irrigation, drainage pipes, electric utilities and any other utilities), grading the field to the planned rough grade, proof-rolling the subgrade and reconstructing the turf system, and construction of the re track to the planned configuration. The existing Sand Fill, Fill, Silt and Marine Deposit soils are suitable for support of the grass turf field and track provided the subgrade is prepared using the recommendation provided herein. It should be anticipated that the new track configuration will require some additional engineered fill beneath the track where the footprint of the track extends beyond the area where the geoprobe investigation was conducted where Sand Fill may not be present.

#### CONSTRUCTION CONSIDERATIONS

#### General

In general, all excavation work, any construction dewatering, and other construction activities should conform to the requirements of OSHA and all other applicable regulations. The site soils would typically be classified as Type C based on OSHA 29 CFR 1926.

#### Excavation

Construction will involve clearing and grubbing of vegetation, stripping off the Topsoil and Track Asphalt, adding or cutting fill to achieve design grades (if needed), and constructing the planned turf field and track improvements. We anticipate that most of the site grading can be accomplished with conventional earth-moving equipment.

#### **Construction Dewatering**

Based on the available subsurface data it is anticipated that during the general site work, no significant dewatering measures will be necessary to conduct the construction "in-the-dry." The Contractor should take measures to prevent stormwater from entering into excavated areas, and be prepared to remove ponded surface water by means of localized sumps and pumps. The Contractor should select whichever dewatering procedures may be effective to maintain dry, stable excavation bottoms.

#### **Existing Utilities and Foundations of Former Structures**

Unknown and/or undocumented subsurface features, structures, and utilities may be present within the project site. The unknown structures and piping, should be anticipated during excavation work, and will need to be carefully removed to limit disturbance to underlying soil deposits and backfilled with compacted Granular Fill prior to construction of the planned field and track.

#### **Preparation and Protection of Bearing Surfaces**

Final excavation should be conducted in a manner that minimizes disturbance to the subgrade soils when excavating for bearing surfaces. All final excavation and footing construction should be conducted in-the-dry. We recommend that the exposed subgrade soils be observed in the field by a geotechnical engineer to confirm the projected soil



bearing conditions. It may be necessary to over-excavate and replace weak, disturbed or otherwise unacceptable foundation bearing materials.

Following excavation to bearing grades, exposed soil surfaces should be re-compacted (proof-rolled) prior to placing engineered fill, or constructing foundations, with a minimum of four passes with a heavy vibratory roller or other heavy vibratory compaction equipment.

If subgrade protection difficulties are encountered due to surface or groundwater, various methods can be utilized:

- Leave subgrades high until immediately before forming and concreting to minimize the time the subgrade is exposed.
- Over excavate footings by 8 in. using a smooth edged bucket and backfill to the design bearing elevation using compacted Granular Fill.

Each such encounter is probably best resolved individually in the field upon observation of the subgrade conditions.

#### Compaction

Minimum compaction requirements refer to percentages of the maximum dry density determined in accordance with ASTM D1557. Recommended compaction requirements are as follows:

Location	Minimum Compaction Requirements
Beneath the track & field	95 %
Landscaped areas	90 % nominal compaction

#### Filling and Backfilling

Placement of compacted soil fills should not be conducted when air temperatures are low enough (approximately 30 degrees F, or below) to cause freezing of the moisture in the fill during or before placement. Fill materials should not be placed on snow, ice or uncompacted frozen soil. Compacted fill should not be placed on frozen soil. No fill should be allowed to freeze prior to compaction. At the end of each day's operations, the last lift of fill, after compaction, should be rolled by a smooth-wheeled roller to eliminate ridges of uncompacted soil.

#### **CONSTRUCTION MONITORING**

It is recommended that a geotechnical engineer or technician qualified by training and experience be present during construction to:

- Confirm that soils used as fill and backfill are in accordance with the contract requirements.
- Observe and test placement and compaction of Granular Fill and other compacted fills.
- Observe preparation of field and pavement bearing surfaces.

Monitoring by experienced personnel will be important to the efficiency and integrity of the geotechnical aspects of the project construction. It is recommended that GSI be retained to provide the recommended monitoring services during construction. This will enable us to observe compliance with the design concepts, help resolve construction problems and to facilitate design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

#### PLAN REVIEW

It is recommended that GSI be provided the opportunity to review the final plans in order to confirm that the recommendations made in this report were interpreted and implemented as intended.



#### CLOSURE

GSI appreciates the opportunity for participating in this early phase of the project, and looks forward to our continuing association during its subsequent phases towards its successful completion. In the mean time, please do not hesitate to contact us, if you have any questions on the content of this report.

Very truly yours,

GEOTECHNICAL SERVICES, INC.

Glen V. Zoladz, P.E.

Project Manager

Harry K. Wetherbee, P.E. *Principal Engineer* 

Figure 1.Project LocusFigure 2.Exploration Location Plan

Appendix A.LimitationsAppendix B.Geoprobe Logs







FIGURE 1-PROJECT LOCUS

BRADLEY FULLER FIELD NEWBURYPORT, MA GSI PROJECT NO. 215300



NOT TO SCALE

LEGEND:

O GP-1  $\hfill Geoprobe i.d. and approximate location$ 



FIGURE 2-EXPLORATION LOCATION PLAN

BRADLEY FULLER FIELD NEWBURYPORT, MA GSI PROJECT NO. 215300 APPENDIX A

LIMITATIONS



#### LIMITATIONS

#### Explorations

- 1. The analyses, recommendations and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.
- 2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.
- 3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

#### Review

- 4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.
- 5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Geotechnical Services, Inc.

#### Construction

6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

#### Use of Report

- 7. This report has been prepared for the exclusive use of Huntress Associates, Inc. in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
- 8. This report has been prepared for this project by Geotechnical Services, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to evaluation considerations only.



### **APPENDIX B**

**GEOPROBE LOGS** 



		ß	, S					TE	ST BORING LOG											Boring No. GP-1				
5.4308	Pro	pject			Bradley F	Fuller Fiel	d		Pı	roject No			215300				Eleva	ation	Pag	e 1	of 1 N/A			
.74!	Loc	cation			Newbury	port, MA			In	spector			G. Zoladz				Datu	m		Se	e Plan	_		
617	Contractor NEDO								PI	roject Ma	nager	_	G. Zoladz				Start			12/1	4/2015			
ax.	Co	llor				20				necked E	sy	_	Cooprobo				Finis	n ol		12/1	4/2015	_		
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7.4!	Ins	Ide Dian	neter (in.	)	-	-		-		-		ЦВ	lomb.	Н	Geopho	one			Dou	ghnut				
61	На	mmer w	eight (ib	)	-	-		-			H				Other					matic		_		
Tel.	На	mmer Fa	all (in.)		-	- Comple D	ata	-				V	Vinch	Cat	Head		Rol	ler Bit		Cuttin	g Head			
MA 02116	Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec. (in.)	SPT (Blows/ 6-in.)	Rock RQD (%)	PI Rd (pp	D lg. m)	Stratum Change (ft)			Soil-Rock (Rock	Visı (So - U.	u <b>al Clas</b> oils - Bu S. Corp	ssific Irmist os of E	<b>ation</b> ter Sy Engin	<b>and D</b> orstem) eers Sy	escri stem	ption				
ton,	- 0 -		G1	0-5	43					0.4	Topso	oil										-		
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eet, F									•	1.7	Grav		····		-54									
Stre											Glay													
oury														-	MARIN	E DE	POS	ITS-						
Vew	5																							
30 h	- 5 -		G2	5-10	51						Gray,	CL	AY with occ	asio	nal sea	ms of	f silt							
·																								
80																								
9.70																								
3.52																								
. 60	- 10 -								F					D - 44			- 12	-1 40 (1				-		
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hnic				L	Del	th (ft) to:			00	0 = 0pe	en End	ed	0	to 2:	: Very S	oft	<u> </u>	0 te	o 4: V	ery Lo	ose			
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7.74	Cli	ant			Hun	tress	Associat	es			roject Mc	nader	.	G. Zoladz	<u>~</u> 7			Datui Start	11	$\dashv$	12	14/20	11 15	
61	Co	ntractor			NFF	BC	,				Checked F	anayei 3v	┥	U. 201802				Finiel	h	-+	12/	14/20	15	
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₽ 19 10	Iter	n:			Auc	ger	Casin	g :	Samp	ler	Core Ba	rrel [	-	Truck		Skid			н	amn	ner Tv	/pe:		
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455	Ins	ide Diar	neter (in	.)	-		-		-		-		=	Bomb.	П	Geoph	one			Dou	ahnu	t t		
17.	На	mmer V	Veight (lb	)	-		-		-					Tripod		Other				Auto	omati	C		
el. 6	На	mmer F	all (in.)		-		-		-		1	Ī		Winch	Cat	Head		Roll	ler Bit		Cutti	na Hea	ad	
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i, MA 0211	Depth (fi	Casing (Blows/fl	No.	Dep (fi	oth F	Rec. (in.)	SPT (Blows/ 6-in.)	Rock RQD (%)	P Ro (pp	ID dg. om)	Stratum Change (ft)			Soil-Rock	(So (So (So	u <b>al Cla</b> pils - Bu S. Corp	urmiste os of E	ation er Sys Engine	and Destem) eers System	stem	ptior )			
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y Street,											3					-S/	AND F	ill-						
Newbur	- 5 -														-	MARIN	IE DE	POSI	TS-					
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ech	Dat	te	Time	R/	ott of	р р	oun (III) to:				O = Ope	en Enc	bet ed	0	10 2: 2 to	very 5 4; Sof	t		U to 4	• 4: \ to 1	veryL 0:L∩	.oose ose		
ieot	Du				asing		Hole	Wat	er		S = Spli	t Spoc	n	4 to	o 8: N	Nedium	Stiff		11 to 3	80: N	lediur	n Den	se	
Ċ											C = Roc	k Ċore		8 to 15: Stiff 31 to					to 5	o 50: Dense				
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ax.										_					aba		FIII			12/	13/2015
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55.4	Iyp	e			-		-		-	-	-		$\square$	Track	Ļ				Safe	ety Ha	mmer
7.45	Insi	de Diam	neter (in.	)	-		-		-	-	-		Ц	Bomb.		] Geophone	5		Dou	ghnut	:
617	Har	nmer W	eight (lb	)	-		-		-	-	_			Tripod		Other			Auto	omatio	2
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16 ]	(t)	لڑ		1		S	ample Da	ata			1			Soil-Bo	ock Vie	sual Classi	ficatio	n and D	oscri	intion	
, MA 021 <sup>-</sup>	Depth (i	Casing (Blows/	No.	Dep (ft	oth F ;) (	Rec. (in.)	SPT (Blows/ 6-in.)	Ro RC (%	ck )D F 5) (I	PID Rdg. ppm)	Stratum Change ) (ft)	um (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)									
ston	0		G1	0-	5	41					0.3	Top	soil								
Bos												Brov	vn, i	/m SAND	), some	e c-sand, tr SANI-	. grave	 -			
et,											2										
30 Newbury Stre	- 5 -		G2	5-1	10	60						Gray Gray	y, C	LAY	f/c SA	-MARINE	<b>DEPO</b> \$	SITS-			
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ervices, Inc. <sup>-</sup> 55 North Stark Highway Tel. 603.529.7766 Fax.															Bot No	tom of Exp groundwat	loratior er encc	n at 10-ft.			
cal S	_ 25 _			Nate		Data				-	Sample Ide	entifiz	atio		hesiv	Soile NLV	alue	Gran	ilar 9	Soile N	J- Value
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	Note	es:		Tra	ice (0 t	o <u>5%</u> )	, Little	e (10	) to 20	%),	Some (2	20 to	35%	b), And	d (35 to	o 50 <u>%)</u>				C	3P-3
		G	S					ТГ	:07		2111	G		2				Bori	ng No. D_/I		
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5.4308	Proj	ect			Bradley F	uller Fiel	d		F	Project No			21530	00		Elevation	1 4	ge	N/A		
.745	Loca	ation			Newbury	port, MA			li	nspector			G. Zo	ladz		Datum		S	see Plan		
617	Cliei	nt			Huntress	Associat	es		F	Project Ma	nage	r	G. Zo	ladz		Start		12	2/14/2015		
ax.	Con	tractor				22					sy		Goon	robo		Finish		12	/14/2015		
й 8	ltom				J. DOWIII	ng Cooin		Some			rrol		Geop			woder	1	7			
424	Type	0			Auger	Gasin	y	Sam	JIEI	Cole Ba	nei		Fruck	L	Skid	<u>1</u>	lamr	ner I	<u>ype:</u>		
55.4	Incid	t do Diar	notor (in	)	-	-		-		-		Ľ	l rack	l			] Saf	ety H	ammer		
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. 61	Ham	mer Fa	all (in )	)		-				-	ŀ										
Tel	Tian		an (n.)		-	ample D	ata						Ninch		at Head	Roller Bit		Cutt	ing Head		
, MA 02116	Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec. (in.)	SPT (Blows/ 6-in.)	Ro RC (%	ock F QD F 6) (p	PID Rdg. vpm)	Stratum Change (ft)			Soil-R	<b>lock V</b> Rock -	<b>Soils - Burmis</b> (Soils - Burmis U.S. Corps of	cation and D ter System) Engineers Sy	escr /sten	<b>iptio</b> າ)	n		
ston	0		G1	0-5	42					0.2	Tops	soil									
Bo				Brown, f/m SAND, trace gravel, c-sand, silt																	
eet,				-SAND FILL-																	
Stre										2.8					-SAND						
Newbury	- 5 -										Gray	, CL	AY.		-MARINE DE	EPOSITS-					
30	Ŭ													E	Sottom of Explo	oration at 5-ft.					
•	1						Bottom of Exploration at 5-ft. No groundwater encountered.														
80														i N	o groundwater	choountereu	•				
ervices, Inc. 55 North Stark Highway Tel. 603.529.7766 Fax. 603.529.7																					
lical	20		<u>ا</u>	Vater Le	evel Data		I		S	ample Ide	entific	atio	<u>n C</u>	Cohesi	ve Soils N-Valu	ue <u>Gran</u>	ular S	Soils	N- Value		
Geotechr	Date		Time	Bott. Casi	Of E	oth (ft) to Bott. of Hole	V	Vater		O = Ope U = Und S = Split C = Roc GP = Ge	en En isturb t Spoo k Cor eopro	ded oed on re be		0 to 2 4 to 8 8 15 to 0	2 2: Very Soft 2 to 4: Soft 3: Medium Stiff to 15: Stiff o 30 Very Stiff ver 30: Hard	0 t 11 to 3 Ove	o 4: ' 4 to 1 30: N 1 to 9 er 50:	Very 0: Lo Iediu 50: D Very	Loose Dose Im Dense Iense I Dense		
	Notes	s:		Trace	(0 to 5%	), Littl	e (10	0 to 20%	%),	Some (2	20 to 3	35%	), Ar	nd (35	to 50%)				GP-4		

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8	2																		Paç	ge	1 of	1
.430	Pro	ject			Bradley F	Fuller Fiel	d		P	roject No			2153	00			EI	evation			N/A	
745	Loc	ation			Newbury	port, MA			lr	nspector			G. Zo	oladz			Da	atum		ç	See Plar	ı
317.	Clie	ent			Huntress	Associat	es		P	roject Ma	Inager	r	G. Zo	oladz			St	art		12	2/14/201	5
х. б	Co	ntractor			NEBC				C	hecked E	By						Fi	nish		12	2/14/201	5
Ea	Dril	ler			C. Downi	ng		_		orill Rig			Geop	orobe		-	Μ	odel				
1248	Iter	n:			Auger	Casin	g	Samp	ler	Core Ba	rrel	ןד	ruck			Skid			lamn	ner	ype:	
55.4	I yp			<u>\</u>	-	-		-		-		Ľ	rack		Ļ	ATV			Safe	ety F	lammer	
7.4		nmor W	lieter (III.	)	-	-		-		-		<u> </u> в	omp. Tripod		$\vdash$	] Geopnon ] Other	ie		Dou	ighn	ut	
l. 61	Hai	mmer F:	all (in )	')	-	-						<u> </u>	ripou									
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MA 02116	Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	n Rec. (in.)	SPT (Blows/ 6-in.)	Rock RQD (%)	k P Ro (pr	ID dg. om)	Stratum Change (ft)			Soil-F	Rock	<b>Vis</b> (S - U	sual Class Soils - Burr I.S. Corps	nister of En	i <b>on and D</b> System) gineers Sy	escri	iptic	'n	
ston,	- 0 -		G1	0-5	48						Tops	oil										
Bos										1.5												
eet,											1.5 Brown, f/m SAND, little c-sand -SAND FILL-											
Str										0.5								<b>-</b> -				
oury										3.5	Gray,	, CL7	τ <b>Υ</b>									
lew	F															-MARINE	DEPO	DSITS-				
30 N	- 3 -														Bo	ttom of Ex	plorat	ion at 5-ft.				
:														I	No	groundwa	ter en	countered.				
080	- 7															-						
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ete	Dat	e	lime	Bott	of E	Bott. of	Wa	ıter		U = Und	listurbe	ed		4 to	2 t 8.	o 4: Soft Medium S	Stiff	11 to 2	⊦ to 1 30• M	0:Lo 1edio	oose Im Deng	se
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										GP = Ge	eoprob	ре		15	to 3	30 Very St	tiff	Ove	r 50:	Ver	y Dense	)
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	Note	es:				,, Litt			11	(2		- , . )	, ,			/ • /					GP-5	

		ß	s,					TE	IST	г вог	RING	LOG				Bori G	ng No. <b>P-6</b>
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.43	Pro	oject		E	Bradley F	uller Fiel	d		F	Project No		215300		Elevation			N/A
745	Loc	cation		N	lewburyp	ort, MA			lı	nspector		G. Zolad	Z	Datum		S	ee Plan
317.	Clie	ent		F	luntress	Associat	tes		F	Project Ma	inager	G. Zolad	Z	Start		12	/14/2015
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щ	Dri	lier		(	. Downii	ng		0				Geoprob	e	Model			
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7.4		nde Dian	leter (In.	)	-	-		-		-		BOMD. Tripod	Geophone			ighni omot	ut ic
. 61	На	mmer E		)	-	-				-							
Tel	1 la		an (n.)		-	- ample D	ata	-				Winch	Cat Head	Roller Bit		Cutt	ing Head
, MA 02116	Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec. (in.)	SPT (Blows/ 6-in.)	Ro RC (%	ick F QD R 6) (p	PID Idg. pm)	Stratum Change (ft)		Soil-Roc	k Visual Classifie (Soils - Burmis k - U.S. Corps of	cation and Deter System) Engineers Sy	escr sterr	iptio	n
ton	0 -		G1	0-5	47						Topsoil						
Bos																	
eet,					0.8     Brown, fine SAND       1.8    SAND FILL-       Gray, CLAY and f/c SAND, little gravel       -FILL-       51												
ewbury Str											Gray, C	LAY and f/c	SAND, little grav -FIL	el L-			
Ň 0	- 5 -		G2	5-10	51					5.5							
ო :											Gray, C	LAY					
529.7080	G2 5-10 51												-MARINE DE	EPOSITS-			
Inc. 755 North Stark Highway Tel. 603.529.7766 Fax. 603	- 10 -   - 15 -      				Gray, CLAY -MARINE DEPOSITS- Bottom of Exploration at 10-ft. No groundwater encountered.												
Geotechnical Services,	_ 25 _	25 - Water Level Data Water Level Data Depth (ft) to: Date Time Bott. of Bott. of Wi Casing Hole Trace (0 to 5%), Little (10 Notes:								$\frac{\text{ample Ide}}{O = Ope}$ $U = Und$ $S = Split$ $C = Roc$ $GP = Ge$ $Some C$	entification en Endeo listurbed t Spoon k Core eoprobe	<u>on</u> <u>Coh</u> 1 ( 4 1 6) And (	esive Soils N-Vali ) to 2: Very Soft 2 to 4: Soft 8 to 15: Stiff 5 to 30 Very Stiff Over 30: Hard 35 to 50%)	<u>ue Granu</u> 0 tr 4 11 to 3 3 Ove	ular S o 4: \ to 1 30: M 1 to 5 r 50:	Soils Very 0: Lo 1ediu 50: D Very	<u>N- Value</u> Loose Jose Im Dense ense v Dense
ŀ	Note	es:		nace	10 10 0 %	/, ∟וננו		5 10 207	0),	50me (2	-0 10 30	, Anu (	00 10 00 /0)				GP-6

		S	ř S						ТΕ	S1	r Bof	RINC	3	LOC	3							Bori G	ng No. <b>P-7</b>	
œ	4		I																		Pag	je	1 of	1
430	Pro	oject			Bradl	ey Fi	uller Fiel	d		Р	Project No		T	2153	00				Eleva	ation		-	N/A	
745.	Loc	cation			Newb	ouryp	ort, MA			Ir	nspector			G. Zo	oladz				Datu	m		S	ee Plai	n
17	Clie	ent			Huntr	ress	Associat	es		P	Project Ma	Inager		G. Zo	oladz				Start			12	/14/201	15
tx. 6	Co	ntractor			NEBO	<u> </u>				C	Checked E	By	_						Finis	h		12	/14/201	15
B Fa	Dri	ller			C. Do	ownin	ig				Drill Rig		_	Geop	probe				Mode	el				
124	Iter	n:			Auge	er	Casin	g t	Sampl	er	Core Ba	rrei	_  T	ruck			kid				lamn	ner I	<u>ype:</u>	
55.4	I yr	ido Dian	actor (in	)	-		-		-		-			rack			TV				Safe	ety H	ammer	
17.4	Ha	mmer W	leight (Ih	·)			-		-		-			Trinod			eopnoi ther	ne			Dou	ighni Smat	it ic	
	Ha	mmer Fa	all (in.)	')	-		-		-			l l l l l		Vinch			and			lor Bit		Cutt		
S Te		-	a ()			Sa	ample Da	ata					V	VILICIT			eau		KU			Cull		<u>u</u>
i, MA 02116	Depth (ft)	Casing (Blows/ft)	No.	Dept (ft)	th Re (ii	ec. n.)	SPT (Blows/ 6-in.)	Rock RQD (%)	PI Ro (pp	ID dg. om)	Stratum Change (ft)			Soil-F	<b>Rock</b> '	Visua (Soil - U.S	<b>ll Clas</b> s - Bur . Corps	sific rmist s of E	ation er Sy Engin	and Dorstem) eers Sy	escr sterr	iptio 1)	n	
stor	- 0 -		G1	0-5	i 3	39					0.8 Topsoil Brown, f/m SAND, little gravel, c-sand, tr. silt								а.					
, Bo						Brown, t/m SAND, little gravel, c-sand, tr. silt								IIL										
y Street					-SAND FILL-																			
Newbur					-SAND FILL- 																			
30															I	Botto	m of E	xplor	ation	at 5-ft.				
•															١	No gro	oundwa	ater e	encou	untered.				
080																Ũ								
9.70																								
3.52																								
603	- 10 -																							
ax.																								
36 F																								
.77																								
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503.																								
el (	- 15 -																							
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Hig																								
tark																								
ЧS																								
Vort	- 20 -																							
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ervi																								
al S	- 25 -		L							~					2-1							<u>.</u>		
hnic			1	vater	∟evei l	Den Den	th (ft) to:			5	$\alpha = \Omega - \Omega \alpha$	entillicat	<u>uor</u> ad	<u>'   </u>	ones_ t 0	o 2: \	oiis N- /erv Sc	<u>valu</u> oft	<u>e</u>	Granu 0 to	uar 8 5 4: \	/erv	<u>in- vali</u> Loose	16
otec	Dat	e	Time	Bo	tt. of	B	ott. of	Wat	er		U = Und	listurbe	d			2 to 4	I: Soft	_		4	to 1	0: Ĺc	ose	
Gec				Ca	sina		Hole	val			S = Split	t Spoor	n		4 to	8: Me	dium S	Stiff		11 to 3	30: N	lediu	m Den:	se
-											GP – G4	K Core	9		ہ 15 ا	5 10 13 to 30	o. Stiff Verv S	Stiff		Ove	ເບະ r 50:	Verv	ense Dense	)
													-		0	over 3	0: Har	d						
	Not			Trac	ce (0 to	o 5 <del>%</del> )	, Littl	e (10 to	20%	),	Some (2	20 to 35	5%	), Ai	nd (35	5 to 50	0%)						GP-7	
		JO.																						

	G	s,					TE	S	Г ВОР	RIN	IG	LOG					Bori G	ng No. <b>P-8</b>
Pro				Bradley	Fuller Fiel	d			Project No			215200			Elovation	Ра	ge	1 of
Loc	ation			Newbury	port. MA	ŭ			nspector	•		G Zolad	7		Datum		S	ee Plan
Clie	ent			Huntress	Associat	es		l i	Project Ma	inade	er	G. Zolad	z		Start		12	/14/2015
Cor	ntractor			NEBC				(	Checked E	3v		0.1 20.44	_		Finish		12	/14/2015
Dril	ler			C. Down	ing			[	Drill Rig	,		Geoprob	e		Model			
Iter	n:			Auger	Casin	g	Samp	oler	Core Ba	rrel		Truck		Skid		lam	mer T	vpe:
Тур	e			-	-		-		-		<u> </u>	Track				Saf	etv H	ammer
Insi	de Dian	neter (in.	.)	-	-		-		-		П	Bomb.	Ē	Geophone			uahni	it
Har	nmer W	eight (lb	)	-	-		-					Tripod		Other		Aut	omati	ic
Har	nmer Fa	all (in.)	,	-	-		-		-	F		Winch		t Head	Roller Bit	_		na Head
		( )		(	Sample D	ata								Lileau			Cutt	ng neau
Depth (ft)	Casing (Blows/ft)	No.	Dep (ft)	oth Rec. ) (in.)	SPT (Blows/ 6-in.)	Ro RC (%	ck F QD F 6) (p	PID dg. pm)	Stratum Change (ft)			Soil-Roc	k Vi (: k - l	sual Classific Soils - Burmis J.S. Corps of	cation and E ter System) Engineers S	<b>)esci</b> yster	r <b>iptio</b> n)	ı
0 -		G1	0-5	5 36					0.4	<u>Tops</u> Brov	soil vn, f	/m SAND, s	som	e c-sand, tr. g <b>-SAND</b> I	ravel FILL-			
-									2.2									
-										Gray	, Cl	AY little to	trac	e f/m sand				
-																		
5 -		00								0			4	-MARINE DE	EPOSITS-			
		G2	5-1	0 58						Gray	/, CI	AY little to	trac	e t/m sand				
_																		
-																		
-																		
- 0													Po	Hom of Evolo	ration at 10 f			
-													БО		allon at 10-1			
-													No	groundwater	encountered			
_																		
15 -																		
-																		
_																		
-																		
-																		
20 -																		
-																		
-																		
_																		
25																		
-0 -		<u>ا</u>	Nater	· Level Data	<u> </u>	I			Sample Ide	entific	atio	n Coh	esiv	e Soils N-Valı	je Gran	ular	Soils	N- Value
				De	∽ pth (ft) to:			┨╴	90 = 0	en En	ded		) to	2: Very Soft		0 4:	Very I	Loose
Dat	e .	Time	Во	ott. of	Bott. of	v	Vater	1	U = Und	listurk	bed		2	to 4: Soft		4 to	10: Ĺo	ose
			Ca	asing	Hole	Ľ	. 4.01	-	S = Spli	t Spo	on	4 1	to 8:	Medium Stiff	11 to	30: I	Mediu	m Dense
								-		K CO	re he	1	ot 5 to	30 Verv Stiff	Ove	er 50	: Verv	Dense
								1		Johio	500		Ove	er 30: Hard	010			20100
			Tra	ce (0 to 5%	5), Littl	e (10	) to 20%	6),	Some (2	20 to	35%	b), And (	35 t	o 50%)				GD-8
Note	es:																'	GE-0

		G	s,						TE	SI	r Bof	RING	LOG	à					Borin Gl	ng No. <b>P-9</b>	
308	_	1	<b>.</b>	<u> </u>													—.	Pa	ge	1 of	1
5.43	Pro	oject			Brac	lley F	uller Fiel	d		P	Project No		21530	00			Elevation			N/A	
.74	LOC	cation			New	buryp	ort, MA			Ir	nspector		G. Zo	ladz			Datum		S	ee Plan	
617	Con	atractor			NEE	iress ic	ASSOCIAL	85			roject Ma	nager	G. 20	ladz			Start		12/	/14/2013	) 
ax.	Dri					ownir	na				rill Ria	by	Geon	rohe			Model		12/	14/2013	)
ш Ю	Itor	m·			0. D	or	Casin	n	Samn		Core Ba			3001				Jomr	nor T		
424	Tvr	n. De			-	01	-	9	-		-		Truck	l I						<u>ype.</u>	
55.	Ins	ide Dian	neter (in	)	-		-		-		-	—Ë	Romh	l [		none				ammer +	
17.4	Ha	mmer W	leight (lb	)	-		-		-				Tripod	[	Other	ione		Aut	omati	ic C	
el. 6	Ha	mmer Fa	all (in.)	,	-		-		-				Winch		at Head	Г	Roller Bit		Cutti	na Hear	1
3 Te						S	ample Da	ata					winch		at neau		Koller Dit		Cutti	ng neac	<u> </u>
, MA 02110	Depth (ft	Casing (Blows/ft	No.	Dep (ft	oth F	Rec. in.)	SPT (Blows/ 6-in.)	Rock RQD (%)	P Ro (pp	ID dg. om)	Stratum Change (ft)		Soil-R (F	R <b>ock V</b> Rock -	<b>/isual Cl</b> a (Soils - E U.S. Con	escr /sten	iptior າ)	ו			
ston	- 0 -		G1	0-	5	39					0.3	Topsoil		<b>.</b>							
Bo												Brown,	/m SAN	D, tr. 9	gravel, co <b>-S</b>	arse s AND F	and ILL-				
eet,											2.5										
Stre											2.5	Brown,	SILT								
ury															-SIL	T DEP	OSITS-				
ewk																					
Z O	- 5 -		G2	5-1	10	58					5.5										
ლე :												Gray, C	LAY								
0															-MARI		POSITS-				
708																					
29.																					
03.5																					
×. 6	- 10 -													Р	ottom of	Evolor	ation at 10 ft				
Га																		•			
7766														N	o ground	water e	encountered	•			
29.7																					
33.5																					
I. 60	15																				
Te	- 13 -																				
way																					
ligh																					
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orth	20																				
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Se	_ 25 _																				
lical			<u>ا</u>	Water	r Level	Data	·			S	ample Ide	entificatio	<u>n</u> C	Cohesi	ve Soils	N-Valu	<u>e</u> <u>Gran</u>	ular (	Soils I	N- Value	;
schr	Det		Time			Dep	oth (ft) to:			4	O = Ope	n Ended		0 to	2: Very	Soft	0 t	04:'	Very L	Loose	
eote	Dat	.e	ппе	BC	ott. Of asing	B	ott. Of Hole	Wa	er		U = Und S = Split	isturbed		4 to 8	3: Mediur	n Stiff	11 to	+ 10 1 30: N	0.∟0 /lediui	ose m Dense	ə
Q										1	C = Roc	k Core		8	to 15: St	tiff	3	1 to	50: De	ense	
										4	GP = Ge	eoprobe		15 to	0 30 Very	/ Stiff ard	Ove	r 50:	Very	Dense	
				l Tra	ice (0 t	0.5%	), Littl	e (10 to	20%	),	Some (2	20 to 35%	(), Ar	nd (35	to 50%)	aru				000	
	Note	es:					,,			//	(2		-,, , , ,						(	GP-9	

		G	s,				•	TE	ST	BOF	RIN	G	LOG	ĺ						Borin GF	ng No. <b>-10</b>	
308	2	1																	Pag	je	1 of	1
5.43	Pro	ject			Bradley F	uller Fiel	d		P	roject No			215300	0			Eleva	ation			N/A	
.74!	Loc	ation			Newbury	oort, MA			In	spector			G. Zola	adz			Datu	m		S	ee Plai	n . –
617	Cile	ent			Huntress	Associat	es		<u>Р</u>	roject Ma	inager		G. Zola	adz			Start	I-	_	12/	14/201	15
ЗХ.		Iracior				22				necked E	sy	_	Coopr	oho			Finis	n ol		12/	14/20	15
ш	Drii				J. DOWIII	ng Casin	~ 6	) o mol	U 		rral [		Geopre				IVIOU					
124	Tur				Auger	Gasin	y a	sample	er	Cole Da			Truck	Ļ	_ Skid				amm	ier I	<u>/pe:</u>	
55.4	i yp	ido Dion	aatar (in	)	-	-		-		-		4	l rack	Ļ					Safe	ety Ha	ammer	
7.4		mmor W	loight (In	)	-	-		-		-			SOMD. Tripod	F	_ Geopr	ione			Dou	ghnu Smati	t c	
. 61	La			)	-	-		-											Auto			<u> </u>
Tel	Tia	IIIIei I a	an (m.)		-	ample D	ata	-					Ninch	Ca	t Head		Rol	ler Bit		Cutti	ng Hea	bid
, MA 02116	Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec. (in.)	SPT (Blows/ 6-in.)	Rock RQD (%)	PI Rd (pp	D lg. m)	Stratum Change (ft)			Soil-Ro	ock Vi ( ock -	<b>sual Cl</b> a Soils - E U.S. Coi	<b>assific</b> Burmist rps of E	ation er Sy Engin	and De vstem) eers Sy	e <b>scri</b> stem	ptior )	ı	
ton	0		G1	0-5	40					0.3	Tops	oil										
Bos											Brow	n. f.	m SAND	). little	c-sand							
et,											Brown, t/m SAIND, little c-sand -SAND FILL-											
Stre								-SAND FILL-														
ewbury					-SAND FILL- Gray CLAY -MARINE DEPOSITS-																	
20 N	- 5 -													D	ottom of	Evolo	ration	ot 5 ft				
:	- 1																allon	ai J-ii.				
õ														No	ground							
708																						
529.																						
03.5	10																					
9	- 10 -																					
ц																						
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29.7																						
3.52																						
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ervic																						
al S	25																					
nice				Nater Le	evel Data	(f+) +-			S	ample Ide	entifica	atio	<u>n Co</u>	ohesiv	e Soils	N-Valu	e	Granu	$\frac{1}{2}$	Soils I	V- Valu	Je
ech	Dat	e	Time	Rott	of F	oun (III) to: Sott of				O = Ope	en End	ed ed		0 to 2	∠. very to 4: So	oft		0 to 4	to 1	veryL 0:Iი	loose	
leot		-		Casi	na	Hole	Wate	er		S = Split	t Spoo	n		4 to 8	Mediur	n Stiff		11 to 3	30: M	lediu	n Den	se
U										C = Roc	k Ċore	Э		81	to 15: St	tiff		31	to 5	0: De	ense	
										GP = Ge	eoprob	be		15 to Ovi	ou very er 30: H	ard		Over	50:	very	Dense	;
				Trace	(0 to 5%	), Littl	e (10 to	20%)	),	Some (2	2 <u>0 to</u> 3	5%	), And	d ( <u>3</u> 5 i	<u>o 50</u> %)							
ľ	Note	es:										-								C	ar-10	,

		S	, S					TE	ST	BOF	RING	i LOG					Borin GP	g No. -11
8	2															Pa	ge 1	of 1
.430	Pro	oject			Bradley F	Fuller Fiel	d		Pr	roject No		215300	)		Elevation			N/A
745	Loc	cation			Newbury	port, MA			In	spector		G. Zola	ldz		Datum		Se	e Plan
317.	Clie	ent			Huntress	Associat	es		Pr	roject Ma	nager	G. Zola	ldz		Start		12/1	4/2015
ax. 6	Co	ntractor							Cł	hecked E	By	0	h .		Finish		12/	4/2015
В Н 2 2 2 2 2 2 3 2 2 3 2 3 2 3 2 3 2 3 2	Dri	lier			C. Downi	ng Ossia			Dr			Geopro			iviodei			
t24	Iter	n:			Auger	Casin	g S	ample	er	Core Ba	rrei	Truck	Ski	d		<u>-lamr</u>	ner Ty	<u>pe:</u>
55.4	l yr	je ido Dian	notor (in	)	-	-		-	_	-		Track		V		] Saf	ety Ha	mmer
17.4	Ha	mmer W	leight (lh	·)	_	-		_	-	_		Trinod		opriorie			ignnut omatic	
l. 6	Ha	mmer Fa	all (in.)	<i>''</i>	-	-		-	-			Winch					Cuttin	
S Te	- Iu	-			5	Sample D	ata					winch			Koller Bil		Cuttir	у пеац
, MA 02116	Depth (ft	Casing (Blows/ft	No.	Depth (ft)	Rec. (in.)	SPT (Blows/ 6-in.)	Rock RQD (%)	PI Rd (pp	D lg. m)	Stratum Change (ft)		Soil-Roo (Ro	<b>ck Visual</b> (Soils ock - U.S. (	escr	<b>iption</b> າ)			
ston	- 0 -		G1	0-5	34					0.3	Topsoil							
Bos											Brown,	f/m SAND,	, little coar	se sand, f -SAND F	tr. gravel <b>ILL-</b>			
eet,										2.0				-				
Str									-	2.0	Gray C	LAY						
oury	_																	
lew	F												-MA	RINE DE	POSITS-			
30 N	- 5 -		G2	5-10	53						Gray, C	LAY with s	seams of s	ilt (wet fro	om 5 to 6-ft k	below	grade	)
:																		
8																		
.70																		
529																		
603	- 10 -								Ļ									
ax.	-												Bottom	of Explora	ation at 10-fi			
96 F													No arou	undwater e	encountered			
.77													Ū					
529																		
<u> 503.</u>																		
el.	- 15 -																	
ay T																		
ghw.																		
Ηi																		
itar																		
th 9																		
No	- 20 -																	
. 55																		
2																		
s, Ir																		
vice																		
Sen	25				1													
cal	- 23 -		L	L Water Lo	evel Data	<u> </u>		L	Sa	ample Ide	entificati	on Col	hesive Soi	ils N-Valu	e Gran	ular	Soils N	- Value
chni					De	oth (ft) to:				0 = Ope	n Ende	d <u>201</u>	0 to 2: Ve	ery Soft	01	0 4:	Very L	oose
ote	Dat	te	Time	Bott.	of E	Bott. of	Wate	er			isturbec	1	2 to 4:	Soft	11 to	4 to 1 30• №	0: Loc	
Ge				Casi	ng					C = Roc	k Core	4	8 to 15:	Stiff	3	1 to !	50: De	nse
										GP = Ge	eoprobe		15 to 30 V	ery Stiff	Ove	er 50:	Very I	Dense
				Trace	(0 to 5%	.). I ittl	e (10 to	20%	).	Some (2	20 to 35	). And	Over 30	: Hard			-	<b>-</b>
	Note	es:			,0 10 0 /0	,, <b>L</b> itti		_0/0	,,	20110 (2		, , , , , , , , , , , , , , , , , , ,		1			G	P-11

	_	<b>G</b>	s I						TE	S	r Bof	RING	i LOC	G					Pag	Borin GP	g No. -12	-
308	- Dra			<u> </u>	Brode			4					0450	00				vation:	rag	C		1
45.4		ation			Newb		ort. MA	u		P Ir	roject No		2153 G 70	00 Jadz			Dati	/ation .m	_	Se	N/A	n
7.7	Clie	ent			Huntre	ess A	Associat	es		P	Project Ma	nager	G. Zo	oladz			Star	t		12/	$\frac{14}{20}$	15
61	Co	ntractor			NEBC	)				Ċ	Checked E	3v	0.1 20				Finis	sh		12/	14/20	15
ax.	Dril	ler			C. Do	wnin	g			C	Drill Rig	,	Geop	orobe			Mod	lel				-
48	Iter	n:			Auge	r	Casin	g	Samp	ler	Core Ba	rrel	Truck	[	Skid			F	lamm	ner Ty	pe:	
42	Тур	be			-		-		-		-		Track	ĺ					Safe	tv Ha	 mmer	
455	Ins	ide Dian	neter (in.	)	-		-		-		-		Bomb.	[	Geop	hone			Dou	ahnut		
317.	Hai	mmer W	eight (lb	)	-		-		-				Tripod	[	Othe	r			Auto	matio	2	
<u>el</u> . 6	Hai	mmer Fa	all (in.)		-		-		-		1		Winch	Пс	at Head		Ro	ller Bit		Cuttir	na Hea	ad
6 T.	()	£				Sa	ample Da	ata														
, MA 0211	Depth (ft	Casing (Blows/ft	No.	Dept (ft)	th Re (ir	ec. 1.)	SPT (Blows/ 6-in.)	Rocl RQE (%)	K F D R (p	PID dg. pm)	Stratum Change (ft)	(Soils - Burmister System) (Rock - U.S. Corps of Engineers Syste .7 Topsoil Brown, f/m SAND							escri stem	ption )		
ston	0		G1	0-5	6 4	6					0.7	Topsoi	1	ID								
Bö												Brown,	t/m SAN	ID								
ury Street,											3.8	Grav C			-	SAND F	=ILL-					
ewbl												Giay O			-MAR	INE DE	POS	SITS-				
30 N	- 5 -													E	Bottom o	of Exploi	ratior	n at 5-ft.				
•												Gray CLAY -MARINE DEPOSITS- Bottom of Exploration at 5-ft. No groundwater encountered.										
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Geo				Ca	sing	ŀ	Hole	۷Ve	1101	4	S = Spli	t Spoon		4 to 8	3: Mediu	m Stiff		11 to 3	30: M	ediun	1 Den	se
<u> </u>										-	C = Roc	k Core		8 15 tr	10 15: 5 3 30 Ver	v Stiff		3 Ove	i to 5 r 50	u: De Verv	rise Dense	÷
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17.	Clie	nt		H	luntress	Associat	es		F	Project Ma	nager	•	G. Zoladz			Start		12	2/14/	2015
. 6	Con	ntractor		Ν	<b>JEBC</b>				C	Checked E	Зу					Finish		12	2/14/	2015
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248	Item	า:			Auger	Casin	g	Samp	ler	Core Ba	rrel		Truck	Skid			Ham	imer T	ype	<u>:</u>
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317	Han	nmer W	leight (lb	)	-	-		-					Tripod	Other			🗌 Au	itomat	ic	
el. 6	Han	nmer Fa	all (in.)		-	-		-		1	Γ	1	Winch 🗌 🔿	at Head	Γ	Roller E	it	Cutt	ina	Head
6 T.		(			S	ample Da	ata													
, MA 0211	Depth (ft	Casing (Blows/ft	No.	Depth (ft)	Rec. (in.)	SPT (Blows/ 6-in.)	Roc RQ (%	k F D R ) (p	PID dg. pm)	Stratum Change (ft)			Soil-Rock	/isual Cla (Soils - B · U.S. Cor	urmist ps of l	eation and ter Systen Engineers	ו <b>Desc</b> ו) Syste	m)	n	
ston	0		G1	0-5	47					0.7	Tops	oil								
ury Street, Bos	 							- 0.7 Topsoil Brown, f/m SAND 												
Newbi	- 5 -										Glay			-MARIN	NE DE	POSITS-				
30													I	Bottom of	Explo	ration at 5	-ft.			
:													Ν		water	encounter	ed			
cal Services, Inc. <sup>–</sup> 55 North Stark Highway Tel. 603.529.7766 Fax. 603.529.708	- 10			Nator L						amole Ide	antifica		n I Cobes	ive Soils N	Exploration at 5-ft. Iwater encountered.					
chnic				valei Le	Dep	oth (ft) to:			<u> </u>	0 = Ope	en Enc	ded	0 to	2: Very \$	Soft		0 to 4:	Very	Loo	Se
Geotec	Date	e .	Time	Bott. Casir Trace	of B 10 (0 to 5%	iott. of Hole ), Littl	W e (10	ater to 20%	6),	U = Und S = Split C = Roc GP = Ge Some (2)	listurb t Spoc k Core eoprot 20 to 3	ed on e be 85%	4 to 8 15 t 0 5), And (35	2 to 4: Sof 8: Medium 8 to 15: Sti o 30 Very ver 30: Ha to 50%)	ft n Stiff iff Stiff ard	11 (	4 to to 30: 31 to over 50	10: Lo Mediu 50: D ): Very	oose ens De GP-	ense nse -13

# CURVE NUMBER COMPUTATIONS

Project	ER FIELD (PHASE	=2	By J	3,			Date	0/20
Location	BURYPORT, MA		Checked				Date	
Check one:	Present Developed	FR	EA "	4 4				
A Runoi du	rye (um <u>be</u> r							
Soil name	Cover descri	iption			CN <sup>1</sup>	/	Area	Product
and hydrologic							10000	CN x area
group	(cover type, treatment, and hydrold	ogic con	dition; percent	9 2-2	e 2-3	re 2-4	Macres	
(appendix A)	impervious; unconnected/connected	ed imper	vious area ratio)	Table	Figur	Figu		
9	IMPERVI	00	is	28		2	0,16	
<sup>1</sup> / Use only one C	N source per line		- 1,	1	otals	5 🗭	0.16	
CN (weighted) =	total product =	=	;	Use	CN		98	
2. Runoff								
			Storm #1		Storr	n #2		Storm #3
Frec	quency	yr						
Rair	nfall, P (24-hour)	in						
Run	off, Q	in						
(U: eq	se P and CN with table 2-1, figure 2-1, or uation 2-3 and 2-4)	·	6					7

Project	2 FIELD (FHASE	=2	By JA	3,			Date	0/20
Location	IR'TPORT, MA	1	Checked				Date	-1
Check one:	ent Developed	HRE	=A "	3 4				
A Runoiteners	number							
Soil name	Cover descr	iption	an ann a na an an an an an an an an an a		CN <sup>1</sup>	/	Area	Product of
hydrologic								CN x area
(appendix A)	(cover type, treatment, and hydrole impervious; unconnected/connected	ogic con ed imper	dition; percent vious area ratio)	Table 2-2	Figure 2-3	Figure 2-4	⊠acres □mi <sup>2</sup> □%	
	IMPERV	10	us	92			0.04	>
							· · · · · · · · · · · · · · · · · · ·	
1/ Use only one CN sour	ce per line			•	Fotal	s 🗭	0.06	
CN (weighted) = <u>tota</u> to	al product _=tal area	_=_		Use	e CN			
2. Runoff								
			Storm #1		Stor	m #2		Storm #3
Frequenc	у	yr						
Rainfall, F	9 (24-hour)	in						
Runoff, Q (Use P ar	nd CN with table 2-1, figure 2-1, or	in						
equation	2-3 and 2-4)							

Project FULLE	ERFI	EDI	PHASE	=2)	By J	B,			Date 2	0/20
Location	SUR	POPT	-, MA	1	Checked				Date	1
Check one:	Present	Developed	A	RE	=A "	0	4			
Hamoliteur	vs (dun)o	)i								
Soil name			Cover descr	ription			CN <sup>1</sup>	J	Area	Product
and hvdrologic										CN x area
group					111	5-2	2-3	2-4	acres	
(appendix A)	(Ci im	over type, treat pervious; unco	ment, and hydrol nnected/connect	iogic cond ied imperv	ittion; percent <i>r</i> ious area ratio)	Table 3	Figure	Figure	□mi <sup>2</sup> □%	
		MP	ERV	100	vs	2	3		.03	
						_				
						_				
1/ Use only one CN	A source per line	3		110	<u>.</u> 8041-44					
							Total	s 🗭	0,05	
CN (weighted) =	total produ total area	<u>ct</u> =		=	;	Us	e CN		98	5
2. Renoff										
					Storm #	1	Stor	m #2		Storm #3
Freq	uency			yr						
Rain	fall, P (24-ho	ur)		in						
Runo (Us	off, Q se P and CN wit	h table 2-1, figu	ure 2-1, or	in						
equ	uation 2-3 and 2	-4)	·							

Project	ER FIELD (PHASE	=2	By J	3,			Date	0/20
Location	BURYPORT, MA	1	Checked				Date	1
Check one:	Present Developed	R	5A "	D	4			
4 Runoilou	ve number				0			
Soil name	Cover descri	iption			CN <sup>1</sup>	/	Area	Product of
hydrologic								CN x area
(appendix A)	(cover type, treatment, and hydrolo impervious; unconnected/connecte	(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)						
	IAAPENIA	~		20			007	
	INTERVI		>	P	<b>P</b>		0.07	
<sup>1</sup> / Use only one C	N source per line			٦	Fotals	s 🗼	OZ	
							· · · · · · · · · · · · · · · · · · ·	
CN (weighted) =	total product =	_=_	· · · · · · · · · · · · · · · · · · ·	Use	CN		98	
2. Runoff								····
		an i de Alfred	Storm #1		Stori	m #2		Storm #3
Fred	luency	yr						
Rain	ıfali, P (24-hour)	in					E	
Run	off, Q	in						
(U: eq:	se P and CN with table 2-1, figure 2-1, or uation 2-3 and 2-4)		100.00					

Project	FIELD (PHASE 2	By TR	3,		Date 2	0/20
Location	RYPOPT, MA	Checked			Date	1
Check one: Check one:	nt Developed					
1. Runoff curve n	umber					
Soil name and	Cover description			CN <sup>1/</sup>	Area	Product of
hydrologic group	(cover type treatment and hydrologic cor	ndition: percent	2-2	e 2-3 e 2-4	acres	CIN X area
(appendix A)	impervious; unconnected/connected impe	rvious area ratio)	Table	Figure Figur	□ mi≁ □ %	
						P
	2.45					
						ž
<sup>1</sup> / Use only one CN source	per line		То	otals Þ		
CN (weighted) = _total	product _==	;	اعدا			
tota	al area		030			
2. Runoff						
		Storm #1		Storm #2		Storm #3
Frequency	yr		_			
Rainfall, P	(24-hour) in				_	
Runoff, Q (Use P and	I CN with table 2-1, figure 2-1, or					
equation 2-	3 and 2-4)					

Project	FIELD (FHASE	2	By J	3,			Date	0/20
Location	RIPORT, MA		Checked				Date 3/4	/20
Check one: Prese		2毛	A "A	A.				
1. Runoff curve n	umber							
Soil name	Cover descript	tion			CN <sup>1</sup>	1	Area	Product
and hydrologic								CN x area
group	leaver type, treatment, and hydrolog	ie con	dition percent	2-2	2-3	92-4	Dacres	
(appendix A)	impervious; unconnected/connected	imper	rvious area ratio)	Table	Figure	Figure	□ mi² □ %	
С	OPEN SPACE	(	(400)	74			). Le	
1/ Use only one CN source	e per line				Totals	5	2/1	,
CN (weighted) = <u>total</u> tota	productal area	_ = _	ĵ	Use	e CN		74	
2. Runoff							March	
			Storm #1		Storr	n #2		Storm #3
Frequency		yr						
Rainfall, P	(24-hour)	in						
Runoff, Q		in						
(Use P and equation 2·	I GN with table 2-1, figure 2-1, or 3 and 2-4)							

FULLER	FIELD (FHASE 2	By JR	3,	Date	10/20
Location NEWBU	RYPORT, MA	Checked		Date 3	6/20
Check one: Preser		REA B	4	1	/
1. Runoff curve n	umber				
Soil name and	Cover description		CN <sup>1</sup>	/ Area	Product of
hydrologic group			N P	1 Pacres	UN X area
(appendix A)	(cover type, treatment, and hydrologic cor impervious; unconnected/connected impe	ndition; percent rvious area ratio)	Table 2+ Figure 2	Eigure 2 Eigure 2 Eigure 2	
С	OPENSPAC	E	74	0,00	2
		28			
<sup>1/</sup> Use only one CN source	per line	<u></u> ,	Totals	s <b>▶∂.0</b> 6	>
					·
CN (weighted) = total tota	product == _	;	Use CN	▶ 74	
2. Runoff			1		
		Storm #1	Storr	n #2	Storm #3
Frequency	yr				
Rainfall, P (	24-hour) in				
Runoff, Q .					
ouse P and equation 2-	3 and 2-4)			2	

Project	R FIELD (FHASE	=2	By JR	3,			Date	0/20
Location	RYPORT, MA	/	Checked				Date 3	5/20
Check one: Prese	ent Developed 4	RE	AC"					/
1. Runoff curve n	umber	13						
Soil name and	Cover descri	iption			CN <sup>1</sup>	J	Area	Product of
hydrologic group	(awar tupo, tractment, and hudrala	ania ana	dition: porcont	2-2	2-3	2-4	Cacres	CN x area
(appendix A)	impervious; unconnected/connecte	ed imper	ivious area ratio)	Table	Figure	Figure	□ mi² □ %	
6	OPENSPA	tc	E	74			0.03	
		_						
<sup>1/</sup> Use only one CN sourc	e per line			٦	otals	s 🕨	0.03	
CN (weighted) = total	product =	=	·		0.11		7/	
tot	al area		Y	Use	CN		+4	
2. Runoff				a and		Sec. Co		
			Storm #1		Stor	m #2		Storm #3
Frequency		yr	fended-1					
Rainfall, P	(24-hour)	in						
Runoff, Q (Use Plan	d CN with table 2-1, figure 2-1, or	in						
equation 2	-3 and 2-4)							

Project	FIELD (FHASE	=2)	By	B,			Date	0/20
Location	RYPORT, MA		Checked				3/6	/20
Check one: Prese	nt Developed	LEE	AD	61			/	
1. Runoff curve n	umber							
Soil name and	Cover descri	iption			CN <sup>1</sup>		Area	Product of
hydrologic group						4	- CTAS	CN x area
(appendix A)	(cover type, treatment, and hydrok impervious; unconnected/connecte	ogic condi ed impervi	tion; percent ious area ratio)	Table 2-	Figure 2.	Figure 2		
C	OPEN ST	AL	E	74			0.07	
				_				
•								
				_				
<sup>⊥/</sup> Use only one CN source	per line			1	otals	s 🗭	0,07	τ <sup>1</sup>
CN (weighted) = total tota	product	-7		Use	CN		74	
2. Runoff		F						
			Storm #	1	Storr	m #2		Storm #3
Frequency		yr _		_				
Rainfall, P	(24-hour)	in						
Runoff, Q (Use P and equation 2-	CN with table 2-1, figure 2-1, or 3 and 2-4)	in						
	2							

# **HYDROGRAPHS**

# Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.2

Hyd.	Hydrograph	Inflow	Inflow Peak Outflow (cfs)								Hydrograph		
No.	type (origin)	Hyd(s)	1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	description		
1	SCS Runoff			0.179			0.411	0.587		1.004	AREA A (Pre)		
2	SCS Runoff			0.498			0.761	0.941		1.349	AREA A (Post)		
3	SCS Runoff			0.067			0.154	0.220		0.377	AREA B (Pre)		
4	SCS Runoff			0.187			0.285	0.353		0.506	AREA B (Post)		
5	SCS Runoff			0.034			0.077	0.110		0.188	AREA C (Pre)		
6	SCS Runoff			0.093			0.143	0.176		0.253	AREA C (Post)		
7	SCS Runoff			0.078			0.180	0.257		0.439	AREA D (Pre)		
8	SCS Runoff			0.218			0.333	0.412		0.590	AREA D (Post)		
9	Reservoir	2		0.000			0.207	0.512		1.205	BMP - A (Outflow)		
10	Reservoir	4		0.000			0.000	0.000		0.000	BMP - B (Outflow)		
11	Reservoir	6		0.000			0.000	0.000		0.000	BMP - C (Outflow)		
12	Reservoir	8		0.000			0.000	0.000		0.161	BMP - D (Outflow)		

# Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	0.179	1	725	582				AREA A (Pre)
2	SCS Runoff	0.498	1	724	1,718				AREA A (Post)
3	SCS Runoff	0.067	1	725	218				AREA B (Pre)
4	SCS Runoff	0.187	1	724	644				AREA B (Post)
5	SCS Runoff	0.034	1	725	109				AREA C (Pre)
6	SCS Runoff	0.093	1	724	322				AREA C (Post)
7	SCS Runoff	0.078	1	725	255				AREA D (Pre)
8	SCS Runoff	0.218	1	724	751				AREA D (Post)
9	Reservoir	0.000	1	345	0	2	18.75	1,465	BMP - A (Outflow)
10	Reservoir	0.000	1	n/a	0	4	18.31	644	BMP - B (Outflow)
11	Reservoir	0.000	1	n/a	0	6	18.14	322	BMP - C (Outflow)
12	Reservoir	0.000	1	735	0	8	16.35	536	BMP - D (Outflow)
hyd	ro.gpw				Return P	eriod: 2 Ye	ar	Monday, Ma	ar 9, 2020

Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 1

AREA A (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.179 cfs
Storm frequency	= 2 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 582 cuft
Drainage area	= 0.160 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 2

AREA A (Post)

Hydrograph type Storm frequency Time interval Drainage area	= SCS Runoff = 2 yrs = 1 min = 0.160 ac	Peak discharge Time to peak Hyd. volume Curve number Hydraulia longth	= 0.498 cfs = 724 min = 1,718 cuft = 98 = 0.ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 3

AREA B (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.067 cfs
Storm frequency	= 2 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 218 cuft
Drainage area	= 0.060 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 4

AREA B (Post)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.187 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 644 cuft
Drainage area	= 0.060 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 5

AREA C (Pre)

Hydrograph type Storm frequency Time interval Drainage area Basin Slope Tc method	= SCS Runoff = 2 yrs = 1 min = 0.030 ac = 0.0 % = USER = 2 10 in	Peak discharge Time to peak Hyd. volume Curve number Hydraulic length Time of conc. (Tc)	= 0.034 cfs = 725 min = 109 cuft = 74 = 0 ft = 6.00 min
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 6

AREA C (Post)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.093 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 322 cuft
Drainage area	= 0.030 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 7

AREA D (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.078 cfs
Storm frequency	= 2 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 255 cuft
Drainage area	= 0.070 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484





Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 8

AREA D (Post)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.218 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 751 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 9

BMP - A (Outflow)

= Reservoir	Peak discharge	= 0.000 cfs
= 2 yrs	Time to peak	= 345 min
= 1 min	Hyd. volume	= 0 cuft
= 2 - AREA A (Post)	Max. Elevation	= 18.75 ft
= BMP - A (Trench)	Max. Storage	= 1,465 cuft
	<ul> <li>Reservoir</li> <li>2 yrs</li> <li>1 min</li> <li>2 - AREA A (Post)</li> <li>BMP - A (Trench)</li> </ul>	= ReservoirPeak discharge= 2 yrsTime to peak= 1 minHyd. volume= 2 - AREA A (Post)Max. Elevation= BMP - A (Trench)Max. Storage

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 10

BMP - B (Outflow)

Storage Indication method used. Exfiltration extracted from Outflow.

![](_page_68_Figure_6.jpeg)

Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 11

BMP - C (Outflow)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - AREA C (Post)	Max. Elevation	= 18.14 ft
Reservoir name	= BMP - C (Trench)	Max. Storage	= 322 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

![](_page_69_Figure_6.jpeg)

Hydraflow Hydrographs by Intelisolve v9.2

#### Hyd. No. 12

BMP - D (Outflow)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 8 - AREA D (Post)	Max. Elevation	= 16.35 ft
Reservoir name	= BMP - D (SWMA)	Max. Storage	= 536 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

![](_page_70_Figure_6.jpeg)

# Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	0.411	1	725	1,274				AREA A (Pre)
2	SCS Runoff	0.761	1	724	2,674				AREA A (Post)
3	SCS Runoff	0.154	1	725	478				AREA B (Pre)
4	SCS Runoff	0.285	1	724	1,003				AREA B (Post)
5	SCS Runoff	0.077	1	725	239				AREA C (Pre)
6	SCS Runoff	0.143	1	724	501				AREA C (Post)
7	SCS Runoff	0.180	1	725	557				AREA D (Pre)
8	SCS Runoff	0.333	1	724	1,170				AREA D (Post)
9	Reservoir	0.207	1	744	921	2	18.76	1,541	BMP - A (Outflow)
10	Reservoir	0.000	1	n/a	0	4	18.50	1,003	BMP - B (Outflow)
11	Reservoir	0.000	1	n/a	0	6	18.23	501	BMP - C (Outflow)
12	Reservoir	0.000	1	718	0	8	16.53	834	BMP - D (Outflow)
hydro.gpw					Return P	eriod: 10 Y	<i>ear</i>	Monday, Ma	ar 9, 2020
Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 1

AREA A (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.411 cfs
Storm frequency	= 10 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 1,274 cuft
Drainage area	= 0.160 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 2

AREA A (Post)



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 3

AREA B (Pre)

Drainage area $= 0.$ Basin Slope $= 0.$	060 ac	Curve number = Hydraulic length =	74 0 ft
Basin Slope $= 0.1$	0 %	Hydraulic length =	0 ft
Basin Slope $= 0.$ Tc method $= US$ Total precip. $= 4.$	0 % SER .70 in 4 brs	Hydraulic length = Time of conc. (Tc) = Distribution = Shape factor	0 ft 6.00 min Type III 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 4

AREA B (Post)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.285 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 1,003 cuft
Drainage area	= 0.060 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 5

AREA C (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.077 cfs
Storm frequency	= 10 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 239 cuft
Drainage area	= 0.030 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 6

AREA C (Post)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.143 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 501 cuft
Drainage area	= 0.030 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 7

AREA D (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.180 cfs
Storm frequency	= 10 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 557 cuft
Drainage area	= 0.070 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 8

AREA D (Post)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.333 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 1,170 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 9

BMP - A (Outflow)

Hydrograph type	= Reservoir	Peak discharge	= 0.207 cfs
Storm frequency	= 10 yrs	Time to peak	= 744 min
Time interval	= 1 min	Hyd. volume	= 921 cuft
Inflow hyd. No.	= 2 - AREA A (Post)	Max. Elevation	= 18.76 ft
Reservoir name	= BMP - A (Trench)	Max. Storage	= 1,541 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 10

BMP - B (Outflow)

= Reservoir	Peak discharge	= 0.000 cfs
= 10 yrs	Time to peak	= n/a
= 1 min	Hyd. volume	= 0 cuft
= 4 - AREA B (Post)	Max. Elevation	= 18.50 ft
= BMP - B (Trench)	Max. Storage	= 1,003 cuft
	<ul> <li>Reservoir</li> <li>10 yrs</li> <li>1 min</li> <li>4 - AREA B (Post)</li> <li>BMP - B (Trench)</li> </ul>	= ReservoirPeak discharge= 10 yrsTime to peak= 1 minHyd. volume= 4 - AREA B (Post)Max. Elevation= BMP - B (Trench)Max. Storage

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Hydrographs by Intelisolve v9.2

### Hyd. No. 11

BMP - C (Outflow)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - AREA C (Post)	Max. Elevation	= 18.23 ft
Reservoir name	= BMP - C (Trench)	Max. Storage	= 501 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 12

BMP - D (Outflow)

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 8 - AREA D (Post)	Max. Elevation	= 16.53 ft
Reservoir name	= BMP - D (SWMA)	Max. Storage	= 834 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



## Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	0.587	1	725	1,807				AREA A (Pre)
2	SCS Runoff	0.941	1	724	3,331				AREA A (Post)
3	SCS Runoff	0.220	1	725	678				AREA B (Pre)
4	SCS Runoff	0.353	1	724	1,249				AREA B (Post)
5	SCS Runoff	0.110	1	725	339				AREA C (Pre)
6	SCS Runoff	0.176	1	724	625				AREA C (Post)
7	SCS Runoff	0.257	1	725	791				AREA D (Pre)
8	SCS Runoff	0.412	1	724	1,457				AREA D (Post)
9	Reservoir	0.512	1	731	1,569	2	18.77	1,632	BMP - A (Outflow)
10	Reservoir	0.000	1	n/a	0	4	18.64	1,249	BMP - B (Outflow)
11	Reservoir	0.000	1	n/a	0	6	18.30	625	BMP - C (Outflow)
12	Reservoir	0.000	1	706	0	8	16.65	1,060	BMP - D (Outflow)
hyd	ro.gpw				Return P	eriod: 25 Y	<i>'</i> ear	Monday, Ma	ar 9, 2020

Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 1

AREA A (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.587 cfs
Storm frequency	= 25 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 1,807 cuft
Drainage area	= 0.160 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 2

AREA A (Post)

Storm frequency= 25 yrsTime interval= 1 minDrainage area= 0.160 acBasin Slope= $0.0 \%$ Tc method= USERTotal precip.= $5.80$ inStorm duration= 24 hrs	Hyd. volume Curve number Hydraulic length Time of conc. (Tc) Distribution Shape factor	= 3,331 cuft = 98 = 0 ft = 6.00 min = Type III = 484
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Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 3

AREA B (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.220 cfs
Storm frequency	= 25 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 678 cuft
Drainage area	= 0.060 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 4

AREA B (Post)

Hydrograph type Storm frequency Time interval Drainage area Basin Slope Tc method Total precip.	= SCS Runoff = 25 yrs = 1 min = 0.060 ac = 0.0 % = USER = 5.80 in = 24 brs	Peak discharge Time to peak Hyd. volume Curve number Hydraulic length Time of conc. (Tc) Distribution	= 0.353 cfs = 724 min = 1,249 cuft = 98 = 0 ft = 6.00 min = Type III = 484
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 5

AREA C (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.110 cfs
Storm frequency	= 25 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 339 cuft
Drainage area	= 0.030 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 6

AREA C (Post)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.176 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 625 cuft
Drainage area	= 0.030 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 7

AREA D (Pre)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.257 cfs
Storm frequency	= 25 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 791 cuft
Drainage area	= 0.070 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 8

AREA D (Post)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.412 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 1,457 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydraflow Hydrographs by Intelisolve v9.2

## Hyd. No. 9

BMP - A (Outflow)

Hydrograph type	= Reservoir	Peak discharge	= 0.512 cfs
Storm frequency	= 25 yrs	Time to peak	= 731 min
Time interval	= 1 min	Hyd. volume	= 1,569 cuft
Inflow hyd. No.	= 2 - AREA A (Post)	Max. Elevation	= 18.77 ft
Reservoir name	= BMP - A (Trench)	Max. Storage	= 1,632 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



# BMP

# **CHARACTERISTICS**

Hydraflow Hydrographs by Intelisolve v9.2

#### Pond No. 1 - BMP - A (Trench)

#### **Pond Data**

UG Chambers - Invert elev. = 17.00 ft, Rise x Span = 1.00 x 1.00 ft, Barrel Len = 300.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No Encasement - Invert elev. = 16.00 ft, Width = 2.00 ft, Height = 2.50 ft, Voids = 40.00% Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 18.51 ft

#### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	16.00	n/a	0	0
0.25	16.25	n/a	60	60
0.50	16.50	n/a	60	120
0.75	16.75	n/a	60	180
1.00	17.00	n/a	60	240
1.25	17.25	n/a	88	328
1.50	17.50	n/a	103	431
1.75	17.75	n/a	103	534
2.00	18.00	n/a	88	621
2.25	18.25	n/a	60	682
2.50	18.50	n/a	60	742
2.51	18.51	600	2	744
2.75	18.75	6,600	735	1,479
3.00	19.00	11,300	2,211	3,690

#### **Culvert / Orifice Structures**

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	Inactive	Inactive	Inactive	Inactive	Crest Len (ft)	= 72.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00	Crest El. (ft)	= 18.75	0.00	0.00	0.00
No. Barrels	= 0	0	0	0	Weir Coeff.	= 2.60	3.33	3.33	3.33
Invert El. (ft)	= 0.00	0.00	0.00	0.00	Weir Type	= Broad			
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.00	0.00	0.00	n/a	-				
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.270 (by	Contour)		
Multi-Stage	= n/a	No	No	No	TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

**Weir Structures** 

#### Stage (ft)

#### Stage / Discharge



Hydraflow Hydrographs by Intelisolve v9.2

#### Pond No. 2 - BMP - B (Trench)

#### **Pond Data**

**UG Chambers -** Invert elev. = 17.00 ft, Rise x Span = 0.67 x 0.67 ft, Barrel Len = 45.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No **Encasement -** Invert elev. = 16.50 ft, Width = 2.50 ft, Height = 1.50 ft, Voids = 40.00% **Contours -** User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 18.01 ft

#### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	16.50	n/a	0	0
0.15	16.65	n/a	7	7
0.30	16.80	n/a	7	14
0.45	16.95	n/a	7	20
0.60	17.10	n/a	8	28
0.75	17.25	n/a	9	37
0.90	17.40	n/a	9	46
1.05	17.55	n/a	9	56
1.20	17.70	n/a	8	64
1.35	17.85	n/a	7	70
1.50	18.00	n/a	7	77
1.51	18.01	1,300	4	81
2.50	19.00	2,500	1,849	1,930
2.80	19.30	2,900	809	2,739

#### **Culvert / Orifice Structures**

#### [A] [B] [C] [PrfRsr] [A] [B] [C] [D] Rise (in) = 0.00 0.00 0.00 0.00 Crest Len (ft) = 10.00 0.00 0.00 0.00 0.00 0.00 Crest El. (ft) 0.00 Span (in) = 0.00 0.00 = 100.22 0.00 0.00 No. Barrels = 0 0 0 0 Weir Coeff. 2.60 3.33 3.33 3.33 = Invert El. (ft) = 0.00 0.00 0.00 0.00 Weir Type = Broad ----------= 0.000.00 0.00 0.00 Multi-Stage = No Length (ft) No No No = 0.00 0.00 0.00 n/a Slope (%) N-Value = .013 .013 .013 n/a **Orifice Coeff.** = 0.60 0.60 0.60 0.60 Exfil.(in/hr) = 0.270 (by Contour) Multi-Stage No TW Elev. (ft) = 0.00 = n/a No No

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

**Weir Structures** 

#### Stage (ft)

#### Stage / Discharge



Hydraflow Hydrographs by Intelisolve v9.2

#### Pond No. 3 - BMP - C (Trench)

#### **Pond Data**

**UG Chambers -** Invert elev. = 17.00 ft, Rise x Span = 0.67 x 0.67 ft, Barrel Len = 45.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No **Encasement -** Invert elev. = 16.50 ft, Width = 2.50 ft, Height = 1.50 ft, Voids = 40.00% **Contours -** User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 18.01 ft

#### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	16.50	n/a	0	0
0.15	16.65	n/a	7	7
0.30	16.80	n/a	7	14
0.45	16.95	n/a	7	20
0.60	17.10	n/a	8	28
0.75	17.25	n/a	9	37
0.90	17.40	n/a	9	46
1.05	17.55	n/a	9	56
1.20	17.70	n/a	8	64
1.35	17.85	n/a	7	70
1.50	18.00	n/a	7	77
1.51	18.01	1,300	4	81
2.50	19.00	2,500	1,849	1,930
2.80	19.30	2,900	809	2,739

#### **Culvert / Orifice Structures**

#### [A] [B] [C] [PrfRsr] [A] [B] [C] [D] Rise (in) = 0.00 0.00 0.00 0.00 Crest Len (ft) = 10.00 0.00 0.00 0.00 0.00 0.00 Crest El. (ft) 0.00 Span (in) = 0.00 0.00 = 100.22 0.00 0.00 No. Barrels = 0 0 0 0 Weir Coeff. 2.60 3.33 3.33 3.33 = Invert El. (ft) = 0.00 0.00 0.00 0.00 Weir Type = Broad ----------= 0.000.00 0.00 0.00 Multi-Stage = No Length (ft) No No No = 0.00 0.00 0.00 n/a Slope (%) N-Value = .013 .013 .013 n/a **Orifice Coeff.** = 0.60 0.60 0.60 0.60 Exfil.(in/hr) = 0.270 (by Contour) Multi-Stage No TW Elev. (ft) = 0.00 = n/a No No

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

**Weir Structures** 

#### Stage (ft)

#### Stage / Discharge



Hydraflow Hydrographs by Intelisolve v9.2

#### Pond No. 4 - BMP - D (SWMA)

#### **Pond Data**

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 16.00 ft

#### Stage / Storage Table

Stage (ft)	Elevation	(ft)	Contour a	rea (sqft)	Incr. Storage (cuft)	Total sto	rage (cuft)			
0.00 0.50 1.00	16.00 16.50 17.00		1,320 1,750 2,300	)	0 765 1,009	1,	0 765 774			
1.20	17.20		2,600		490	2,	264			
Culvert / Orif	ice Structu	res			Weir Structu	res				
	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]	
Rise (in)	= 0.00	0.00	0.00	0.00	Crest Len (ft)	= 10.00	0.00	0.00	0.00	
Span (in)	= 0.00	0.00	0.00	0.00	Crest El. (ft)	= 16.70	0.00	0.00	0.00	
No. Barrels	= 0	0	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33	
Invert El. (ft)	= 0.00	0.00	0.00	0.00	Weir Type	= Rect				
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No	
Slope (%)	= 0.00	0.00	0.00	n/a						
N-Value	= .013	.013	.013	n/a						
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.270 (b	y Contour)			
Multi-Stage	= n/a	No	No	No	TW Elev. (ft)	= 0.00				

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



# **APPENDIX 2**

# **Standard 3 (Recharge)**

Marchionda & Associates, LP 62 Montvale Ave, Suite I Stoneham, MA 02180 781-438-6121 Fax 781-438-9654

108 670-32 FULLER FIELD SHEET NO. JB



SCALE .

CHECKED BY

CALCULATED BY.

STANDARD IMPERVIOUS COVER TO BE ADDED TO THE SITE ; NEW IMPERVIOUS 12,067SF EXISTING IMPERVIOUS TO BE REMOVED 2,023 SF 9,444 SE REQUIRED VOLUME TO RECHARGE : NOTE: BASED ON D.E.P. TARGET DEPTH FOR "C" SOILS (0:25"/S.F.) REQ. = 0.25 / 12 × 9,444 197 de -VOLUME PROVIDED: = 1,479 BMP "B" BMP "B" = 2,739 = 2,789 BMP "D" = 1,774 TOTAL = 8,73/00 8731 ce> 197ce STANDARD MET

10B 670-32 FRIERFIELD Marchionda & Associates, LP SHEET NO. 62 Montvale Ave, Suite I Stoneham, MA 02180 CALCULATED BY. DATE REV. 24 781-438-6121 Fax 781-438-9654 CHECKED BY\_ SCALE STANDARD#3 (CONT.) RECHARGE BMP DRAW DOWN CALCULATIONS BMP "A" (TRENCH) NOTE: ASSUME SUT LOAMRANLERATE = 0:27 IN/HR TIME = VOLUME RAWLS RATE X BASIN AREA 1,479 CE . 0,27 W/12× 1/2× 6,6005= = 10,0 HR < 72 HOURS : OK BMP"B" (DEWELL) NOTE; ASSUME SILF LOAM BAWL'S RATE = 0,27 H/HR = 3,739 CF 0,27 1N/HR × /12 × 2,900 SF = 42,0 × 72 Houps :. OK

670-32 Filles Field Marchionda & Associates, LP SHEET NO. 62 Montvale Ave, Suite I Stoneham, MA 02180 CALCULATED BY\_ DATE 201, 2/28/20 781-438-6121 Fax 781-438-9654 CHECKED BY\_ SCALE STANDARD#3 (CONT.) BMP "C" (DRYNELL) NOTE: ASSUME SILT LOAM PAWL'S PATE = 0,27 'N/HR 2,739 CF 0,27 W/HR × 1/12 × 2,900 SP = 42.0 HPS + 72 HPS :. 04 BMP "D" (SW.M.A.) NOTE: ASSUME SILT LOOM RAWL'S PATE = 0.27 IN/NR 1,774, CE 0,27 "/HRX 1/12×2,300 5F = 34,3. ~ 72HE :. OK

# **APPENDIX 3**

# **Operation & Maintenance Plan**

Marchionda & Associates, L.P.

## OPERATION AND MAINTENANCE <u>&</u> LONG TERM POLLUTION PREVENTION PLAN FOR POST-CONSTRUCTION STORM WATER CONTROLS

#### FULLER FIELD IMPROVEMENTS (PHASE 2) NEWBURYPORT, MASSACHUSETTS

February 10, 2020 Rev. 3/6/20

#### **GENERAL**

The Best Management Practices (BMPs) used in the design of the Fuller Field project were chosen for their effectiveness at reducing peak discharge, treating the required Water Quality Volume for total suspended solids (TSS), and infiltrating groundwater. Routine maintenance is required for the BMPs, as proper maintenance is essential in achieving the desired result of improved water quality. This Operations and Maintenance (O&M) and Long Term Pollution Prevention Plan (LTPPP) is intended to cover the post-construction maintenance of the permanent BMPs<sup>1</sup> and site specific pollution prevention.

#### MAINTENANCE REQUIREMENTS

Qualified personnel shall inspect all components of the stormwater management system as outlined below. To be considered "qualified", personnel should have a working knowledge of the maintenance requirements of storm water BMP's and must be approved by the Newburyport DPW. Qualified personnel shall be responsible for overseeing the required inspections and shall file annual reports with the town of Newburyport officials. Additionally, a copy of the Inspection/Maintenance Log, as further described herein, shall be provided to City of Newburyport officials on an annual basis.

BMP	MIN. FREQUENCY	<b>RESPONSIBLE PARTY</b>
Trash Removal	Inspect once/month	TOWN OF
	Clean as necessary	NEWBURYPORT
Catch Basins	Inspect 4x/year	TOWN OF
	Clean once/year	NEWBURYPORT
Infiltration Trenches	Inspect 4x/year	TOWN OF
	Clean once/year	NEWBURYPORT
S.W.M. Area	Inspect 4x/year	TOWN OF
(Sediment Trap)	Clean once/year	NEWBURYPORT

#### SUMMARY OF MAINTENANCE REQUIREMENTS

<sup>&</sup>lt;sup>1</sup> Operations and maintenance of temporary erosion and sedimentation controls utilized during construction will be covered by a *Stormwater Pollution Prevention Plan* as required by the National Pollutant Discharge Elimination System program of the Environmental Protection Agency, and is not part of this O&M Plan.

#### OPERATION AND MAINTENANCE AND LONG POLLUTION PREVENTION PLAN FOR POST-CONSTRUCTION STORMWATER CONTROLS FULLER FIELD IMPROVEMENTS

February 10, 2020 Rev. 3/6/20

#### RESPONSIBILITY TO ADMINISTER O&M PLAN

During construction, the general contractor will be responsible for maintaining the stormwater management system in accordance with this O&M Plan until such time that ownership of the project or phases thereof are turned over to the owner. The owner is then responsible for maintaining the portions of the stormwater management system under their ownership in accordance with this O&M Plan. This section below (names and signatures) shall be updated with every change in ownership and/or person(s) responsible for administering/financing the O&M of the system.

Owner(s) of the stormwater management system:

Name:	Name:
Signature:	Signature:

Person(s) responsible for financing maintenance and emergency repairs:

#### **INSPECTION AND MAINTENANCE LOG**

A sample inspection and maintenance log to be used is attached to the end of this O&M Plan. At a minimum, any inspection and maintenance log used shall include the following items:

- Date activity performed
- Specific inspection/maintenance task
- Structural components inspected/maintained
- Staff person or contractor performing activity
- Supervisor verification of maintenance activity
- Recommended additional maintenance tasks

An Annual Report shall be submitted to the City of Newburyport to meet the requirements of the town's Stormwater Management and Erosion Control Regulations.

#### OPERATION AND MAINTENANCE AND LONG POLLUTION PREVENTION PLAN FOR POST-CONSTRUCTION STORMWATER CONTROLS FULLER FIELD IMPROVEMENTS

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#### PROPOSED BMPS AND CORRESPONDING O&M REQUIREMENTS:

#### TRASH REMOVAL:

The parking areas shall be inspected for litter and trash monthly as part of overall site maintenance. Any accumulated trash, litter and discarded materials in these areas shall be removed.

No disposal of materials will be permitted within the landscaped areas or wooded areas on the Site. This prohibition applies to trash, fill material, construction debris, grass clippings, collected leaves and cut branches.

#### CATCH BASINS:

The catch basins shall be inspected four times per year for build-up of sediment, oil, and/or other debris which could decrease the effectiveness of the sumps. A qualified company specializing in the cleaning of catch basins shall perform the inspection of catch basins.

Typically a dipstick tube equipped with a ball valve, such as a Sludge Judge<sup>®</sup>, is used to measure the approximate oil and sediment depth, and a vacuum truck is used to clean out the catch basin. Catch basins shall be cleaned once per year, or sooner if the depth of sediment is found to reach 12 inches. If visual inspection observes any evidence of hydrocarbons, the material shall be immediately cleaned and disposed in accordance with all applicable local, state and federal guidelines and regulations.

Frames and grates should be inspected and repaired or replaced as necessary to ensure proper operation.

#### INFILTRATION TRENCHES:

The project includes four (6) subsurface infiltration trenches. The trenches consist of a perforated pipe encased in crushed stone. Each trench should be inspected four times per year. It is important to inspect the surface stone and basins to ensure that they remain clear of any debris and sediment, which will help to ensure that trenches will continue to function efficiently for the long term.

If the inspection determines that the trench fails to fully drain within 72 hours of a storm event, the responsible party shall retain a qualified engineer to assess the reason for infiltration failure and to recommend corrective action for restoring infiltration function.

#### OPERATION AND MAINTENANCE AND LONG POLLUTION PREVENTION PLAN FOR POST-CONSTRUCTION STORMWATER CONTROLS FULLER FIELD IMPROVEMENTS

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#### STORMWATER MANAGEMENT AREA (SEDIMENT TRAP):

The stormwater management system includes an above-ground stormwater sediment trap. This area shall be inspected four times per year for erosion, accumulated sediment, and debris that could affect the capacity of the pipes. Any concerns shall be addressed as soon as practicable to ensure free flow. Sediment shall be removed once it has accumulated to a depth of six (6) inches in the trap or within three (3) inches of the lowest outlet. Sediment shall be disposed in accordance with all applicable local, state and federal guidelines and regulations.

#### LONG TERM POLLUTION PREVENTION:

#### MAINTENANCE OF LANDSCAPED AREAS:

Fertilizers used for landscaping and lawn areas shall be slow release, low-nitrogen types (<5%) and shall not be used within 25 feet of a wetland resource area, and pesticides/herbicides shall not be used within 100 feet of a wetland resource area. Furthermore, the use of any fertilizers, pesticides, and herbicides shall be in accordance with the manufacturer's recommendations.

#### WINTER MAINTENANCE OF WALKS AND DRIVES:

Snow storage shall take place on pervious surfaces to the extent practicable to allow the snowmelt to filter through the soil, leaving behind sand and debris that can be removed in the springtime. Snow shall not be stockpiled in drainage collection areas or conveyance channels as this may block the system causing flooding. Furthermore, snow shall not be stored in or within 25 feet of a wetland resource area. No road salt, sodium chloride, or other deicing chemicals shall be used on paved surfaces within 25 feet of a wetland resource area.

#### STORAGE OF WASTE PRODUCTS:

Any outdoor storage of waste products shall be covered to prevent rainfall from picking up contaminants from the waste. This requirement shall include any dumpster(s) which shall have the lid(s) closed when not being loaded or unloaded.
## OPERATION AND MAINTENANCE AND LONG POLLUTION PREVENTION PLAN FOR POST-CONSTRUCTION STORMWATER CONTROLS FULLER FIELD IMPROVEMENTS

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## ILLICIT DISCHARGES:

There shall be no illicit discharges to the stormwater management system. Illicit discharges are defined by 310 CMR 10.04 as follows:

"Illicit discharge means a discharge that is not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated ground water, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents."

Prior to the discharge of stormwater runoff to the post-construction stormwater best management practices, an Illicit Discharge Compliance Statement shall be submitted to the Newburyport Planning Board verifying that no illicit discharges exist on the site.

## **EMERGENCY SPILLS**

The owner shall provide personnel with a list of emergency contact phone numbers to use to report a spill. At a minimum the list should include the DEP Emergency Response Section, an environmental cleanup contractor such as Clean Harbors, Inc., the Newburyport Fire Department, and a contact person/phone number for the owner:

- DEP Emergency Response
- Clean Harbors, Inc.
- Newburyport Fire Department
- Owner (Town of Newburyport)

(888)304-1133 (800)645-8265 911 or (978)-465-4427 978-465-4464 ext. 1701

While the above-listed phone numbers are current as of the writing of this O&M Plan, the owner shall be responsible for verifying these numbers prior to distribution to the homeowners. Additionally, the owner shall update and redistribute a list of emergency contact phone numbers to the homeowners every other year, or sooner should any changes occur.