Wannalancit Mills
650 Suffolk St., Suite 200
Lowell, MA 01854

978.970.5600 PHONE
978.453.1995 FAX

www.trcsolutions.com

May 23, 2016

Mr. John Radcliffe, Chairman
New Bedford Conservation Commission
133 William Street – Room 304
New Bedford, MA 02740

Attn: Sarah E. Porter, Agent

RE: Notice of Intent Application
Nemasket Street Lots
Proposed Nemasket Street Recreation Area
Nemasket and Ruggles Streets, New Bedford

Dear Mr. Radcliffe and Conservation Commissioners:

In accordance with the Massachusetts Wetlands Protection Act M.G.L. Ch.131 §40 ("WPA"), please accept the enclosed original and one (1) copy of a Notice of Intent (NOI) application package. This NOI is being submitted by TRC Environmental on behalf of the City of New Bedford (The City) for proposed site clearing, soil sampling, remediation, and development of an athletic recreation area at the referenced site.

This NOI is being filed under the WPA and accompanying regulations (310 CMR 10.00), since portions of the work will occur within the 100-foot buffer zone of a nearby Bordering Vegetated Wetland (BVW) located to the north of the Site.

TRC personnel investigated the Site on January 5, 2010, and identified one isolated vegetated wetland (IVW) on the Site and a BVW adjacent to the Site.

Isolated Vegetated Wetland

An IVW was identified on the western end of the Site. This IVW is located within a depression bound by steep slopes, which rise to meet the elevation of the surrounding properties and streets. The IVW is characterized by red maple (*Acer rubrum*), multiflora rose (*Rosa multiflora*), spicebush (*Lindera benzoin*), bittersweet (*Celastrus orbiculatus*), and poison ivy (*Toxicodendron radicans*). Soils at the site consisted of low chroma fine sandy loam, overlaying an organic layer of muck. Signs of hydrology included water stained leaves and saturated soils. The size of the IVW is approximately 2,839 square feet.

The IVW is separated from a BVW located to the north by an earthen berm located within the Nemasket Street right-of-way, which bounds the Site to the north, separating it from the adjacent Keith Middle School. A site investigation revealed that there were no hydrological connections between the IVW and the nearby BVW. In addition, no water marks were observed on rocks or

vegetation, suggesting that water does not pool within the IVW. No evidence was observed that the site functions as a vernal pool or vernal pool habitat.

Because the IVW was located within a depression, The City performed a topographical survey and drainage calculations in order to determine if the depression functioned as Isolated Land Subject to Flooding (ILSF) in accordance with 310 CMR 10.57(2)(b). As stated above, no evidence was observed suggesting that water pooled within the IVW. Based on drainage calculations performed in accordance with the WPA and the MassDEP's Wetlands Program Policy 85-2 this depression did not meet the criteria of ILSF. The included report, dated January 21, 2010 provides detailed analysis of the drainage area and calculations.

The 2,701 square foot isolated wetland (0.06 ac) will be filled with excavated top soil from site construction. A 2,159 square foot portion the total fill (0.05 ac) is also contained within a portion of the BVW 100 foot buffer zone and is accounted for within the buffer zone impacts presented below. This work is authorized under Army Corps Massachusetts Programmatic General Permit 8 (self-verification). The Project is exempt from 401 WQC Review by the MassDEP (314 CMR 9.03 (5) and (6)).

100-foot Buffer Zone

One BVW was identified north of the Site at the base of the slope from the Nemasket Street right-of-way and the Keith Middle School parking lot. The 100-foot buffer zone of BVW located at the Site consists of heavily vegetated uplands characterized by thick scrub shrub growth and the aforementioned IVW. Approximately 18,603 square feet (0.43 acres) of the 100-foot buffer zone on Site would be impacted by the proposed work. Included in this figure is the 2,159 square feet (0.05 ac) of isolated wetland fill within the 100-foot buffer zone. An additional 542 square feet of isolated wetland would be filled outside of the 100-foot buffer zone. The City is seeking concurrence that this work within the buffer zone is exempt in accordance with 310 CMR 10.01(2)(b)1g.

Proposed Work

Remedial activities include removal of soil from nine locations that exhibit elevated total polychlorinated biphenyls (PCB) concentrations in soil. To provide a significant reduction in the presence of PCBs on Site, soil with PCB concentrations greater than approximately 100 mg/kg will be targeted for removal. Soil at these locations would be excavated within a 50 square foot area to the depths of concentration reductions based on existing data and disposed of off Site at a TSCA landfill.

Construction of an exposure barrier over the remaining contaminated soils which will include up to three feet of clean fill (in landscaped areas) and two feet of clean fill (in covered areas) overlain by a soccer field, a basketball court, walkways and landscaped areas.

The proposed improvements consist of a new field turf soccer field and asphalt basketball court. A portion of the soccer field will be constructed on top of a section of the existing school parking lot. A walkway will connect the existing parking lot with the basketball court and will be constructed just to the west of the soccer field. All the improvements will be constructed on a portion of the middle school property and on parcels owned by the City of New Bedford.

The proposed improvements will result in a net decrease of 0.24 acre of impervious area, which includes the paved basketball court and access walkway and paved parking lot surface removals.

A total of 2.61 acres of disturbed area is anticipated, including the construction activities associated with the soccer field, basketball court and access walkway. All work will take place within the proposed property limits, with minimal impact to wetlands.

Mitigation Measures

Best Management Practices ("BMPs") will be utilized to minimize the potential for sediment transport off site. Due to the known presence of elevated levels of contaminants, the Site is highly regulated and measures will be implemented to minimize the potential for off-site sediment transport or migration of airborne particulates. Mitigation measures proposed for the work at the Site include:

- Implementation of dust control measures.
- Decontamination of equipment and machinery used on Site.
- Use of erosion and sediment control practices, including straw mulch and appropriate erosion control barriers as necessary.

The City is requesting that the Commission issue an Order of Conditions so that this important project may proceed. With this submittal, we are anticipating to be placed on the public hearing agenda for June 7, 2016. One copy of this NOI has been sent to the MassDEP's Southeast Regional Office.

If you have any questions or comments on this NOI package, please do not hesitate to contact me at 978-656-3565 or via email at DSullivan@trcsolutions.com. I look forward to discussing this project with you and the Commission.

Best Regards,

TRC Environmental Corporation

David Sullivan, LSP

Enclosures

NOTICE OF INTENT

Filing Under the Massachusetts Wetlands Protection Act M.G.L. Chapter 131, Section 40 and the City of New Bedford Wetlands Protection Ordinance

Nemasket Street Recreation Area Project

New Bedford, Massachusetts

May 2016

Prepared for:

The City of New Bedford
Department of Environmental Stewardship
133 William Street
New Bedford, Massachusetts 02740

Prepared by:

TRC Environmental Corporation
650 Suffolk Street
Lowell, Massachusetts 01854

TABLE OF CONTENTS

LIST OF ATTACHMENTS

WPA FORM 3 – NOTICE OF INTENT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

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

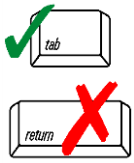
Provided by MassDEP:

MassDEP File Number

Document Transaction Number

New Bedford
City/Town

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



Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

Ruggles Street and Hathaway Blvd — a. Street Address
New Bedford — b. City/Town
02740 — c. Zip Code

Latitude and Longitude:
41.64 degrees N — d. Latitude
-70.95 degrees W — e. Longitude

69 — f. Assessors Map/Plat Number
86, 88-93, 96-100, and 125 — g. Parcel /Lot Number

2. Applicant:

Michele — a. First Name
Paul — b. Last Name
City of New Bedford — c. Organization
133 William Street — d. Street Address
New Bedford — e. City/Town
MA — f. State
02740 — g. Zip Code
508-979-7487 — h. Phone Number
i. Fax Number
michele.paul@newbedford-ma.gov — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

a. First Name
b. Last Name
c. Organization
d. Street Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

David — a. First Name
Sullivan — b. Last Name
TRC Environmental — c. Company
650 Suffolk Street — d. Street Address
Lowell — e. City/Town
MA — f. State
01854 — g. Zip Code
978-656-3565 — h. Phone Number
978-453-1995 — i. Fax Number
DSullivan@trcsolutions.com — j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

a. Total Fee Paid
b. State Fee Paid
c. City/Town Fee Paid

A. General Information (continued)

6. General Project Description:

Required remediation of land and construction activities of an athletic facility, portions of both Project phases to take place within a 100-foot buffer zone to a Bordering Vegetated Wetland (BVW).

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ☒ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☐ Yes ☒ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

a. County

b. Certificate # (if registered land)

c. Book

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☒ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☐ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☐ Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced

f. ☐ Riverfront Area

1. Name of Waterway (if available) - **specify coastal or inland**

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: _____ square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet _____ b. square feet within 100 ft. _____ c. square feet between 100 ft. and 200 ft. _____

5. Has an alternatives analysis been done and is it attached to this NOI? ☐ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☐ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Notice of Intent – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. ☐ Yes ☒ No

   If yes, include proof of mailing or hand delivery of NOI to:

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   b. Date of map

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

      1. ☐ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area _____ percentage/acreage

         (b) outside Resource Area _____ percentage/acreage

      2. ☐ Assessor's Map or right-of-way plan of site

2. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

   (a) ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

   (b) ☐ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/). Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_fee_schedule.htm). Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_exemptions.htm; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
1213 Purchase Street – 3rd Floor
New Bedford, MA 02740-6694
Email: DMF.EnvReview-South@state.ma.us

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: DMF.EnvReview-North@state.ma.us

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

C. Other Applicable Standards and Requirements (cont'd)

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

2. ☐ A portion of the site constitutes redevelopment

3. ☐ Proprietary BMPs are included in the Stormwater Management System.

b. ☐ No. Check why the project is exempt:

1. ☐ Single-family house

2. ☐ Emergency road repair

3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

D. Additional Information (cont'd)

3. ☐ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Civil Drawing Set: C1 and C10
a. Plan Title

TRC
b. Prepared By

James Doherty
c. Signed and Stamped by

May 2016
d. Final Revision Date

e. Scale

GIS location figures
f. Additional Plan or Document Title

May 2016
g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☐ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

1. ☒ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant	2. Date: May 16,2016
3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any)	6. Date

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the “yes” box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

ABUTTER INFORMATION

City of New Bedford

REQUEST *for a* CERTIFIED ABUTTERS LIST

This information is needed so that an official abutters list as required by MA General Law may be created and used in notifying abutters. You, as applicant, are responsible for picking up and paying for the certified abutters list from the assessor's office (city hall, room #109).

SUBJECT PROPERTY			
MAP #	069	LOT(S)#	125, 96-100 except 94
ADDRESS:	~225 Hathaway		
OWNER INFORMATION			
NAME:	City of New Bedford		
MAILING ADDRESS:	133 William St - Room 304		
APPLICANT/CONTACT PERSON INFORMATION			
NAME (IF DIFFERENT):	Ray Holberger		
MAILING ADDRESS (IF DIFFERENT):			
TELEPHONE #	508-400-2967		
EMAIL ADDRESS:	ray.holberger@newbedford-ma.gov		

REASON FOR THIS REQUEST: *Check appropriate*	
	ZONING BOARD OF APPEALS APPLICATION
	PLANNING BOARD APPLICATION
X	CONSERVATION COMMISSION APPLICATION
	LICENSING BOARD APPLICATION
	OTHER (*Please explain*):

Once obtained, the Certified List of Abutters must be attached to this Certification Letter.

This sheet is NOT part of your ZBA application but you will need to submit this form to the Planning Division Room 303 in City Hall, 133 William Street. You, as applicant, are responsible for picking up and paying for the certified abutters list from the assessor's office (city hall, room #109).

Official Use Only:

As Administrative Assistant to the City of New Bedford's Board of Assessors, I do hereby certify that the names and addresses as identified on the attached "abutters list" are duly recorded and appear on the most recent tax.

Carlos Amado	Judith M Sardahl	3/28/16
Printed Name	Signature	Date

March 25, 2016
Dear Applicant,

Please find below the List of Abutters within 100 feet of the property known as 225 Hathaway Road (06-125, 86-100 except 94). The current ownership listed herein must be checked and verified by the City of New Bedford Assessor's Office. Following said verification, the list shall be considered a Certified List of Abutters.

Please note that multiple listed properties with identical owner name and mailing address shall be considered duplicates, and shall require only 1 mailing. Additionally, City of New Bedford-Owned properties shall not require mailed notice.

Parcel	Location	Owner and Mailing Address
69-92 WS	HATHAWAY BLVD	CITY OF NEW BEDFORD, 131 WILLLIAM STREET NEW BEDFORD, MA 02740
69-86 NS	RUGGLES ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
69-133	244 SUMMIT ST	GOMES DAVID JR, GOMES CHRISTIE D 244 SUMMIT STREET NEW BEDFORD, MA 02740
69-59	128 RUGGLES ST	~~DAROSA JOHN S,~~ US Bank National Association ~~128 RUGGLES ST~~ c/o 3 Point Asset Management ~~NEW BEDFORD, MA 02745~~ 7905 Irvine Center Drive Irvine, CA 92618
69-84	139 RUGGLES ST	THOMAS WAYNE, 139 RUGGLES STREET NEW BEDFORD, MA 02740
69-61 SS	RUGGLES ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
69-63 SS	RUGGLES ST	CITY OF NEW BEDFORD, 133 WILLIAM ST NEW BEDFORD, MA 02740
69-65 SS	RUGGLES ST	CITY OF NEW BEDFORD, 133 WILLIAM ST NEW BEDFORD, MA 02740
69-123	232 SUMMIT ST	REYNOLDS SHARON J "TRUSTEE", SUMMIT NOMINEE REALTY TRUST 232 SUMMIT STREET NEW BEDFORD, MA 02740
69-124	238 SUMMIT ST	PINA DIANA M, PINA STEVEN J 238 SUMMIT STREET NEW BEDFORD, MA 02740
69-57	200 SUMMIT ST	WILLIAMS LORENZO B., WILLIAMS AVIS R. 200 SUMMIT ST NEW BEDFORD, MA 02740
69-125 WS	HATHAWAY BLVD	CITY OF NEW BEDFORD, 131 WILLIAM ST NEW BEDFORD, MA 02740
69-100 SS	NEMASKET ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740

March 25, 2016
Dear Applicant,

Please find below the List of Abutters within 100 feet of the property known as 225 Hathaway Road (06-125, 86-100 except 94). The current ownership listed herein must be checked and verified by the City of New Bedford Assessor's Office. Following said verification, the list shall be considered a Certified List of Abutters.

Please note that multiple listed properties with identical owner name and mailing address shall be considered duplicates, and shall require only 1 mailing. Additionally, City of New Bedford-Owned properties shall not require mailed notice.

Parcel	Location	Owner and Mailing Address
69-93 WS	HATHAWAY BLVD	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
69-94 ES	SUMMIT ST	THOMAS DOLORES, 290 TURNPIKE ROAD SUITE 5-206 WESTBOROUGH, MA 01581
75-167	225 HATHAWAY BLVD	CITY OF NEW BEDFORD, KEITH MIDDLE SCHOOL 131 WILLIAM ST NEW BEDFORD, MA 02740
75-12 ES	HATHAWAY BLVD	CITY OF NEW BEDFORD, NEW BEDFORD HIGH SCHOOL 131 WILLIAM ST NEW BEDFORD, MA 02740
69-345	230 HATHAWAY BLVD	CITY OF NEW BEDFORD, NEW BEDFORD HIGH SCHOOL 131 WILLIAM ST NEW BEDFORD, MA 02740
69-88 NS	RUGGLES ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
69-91 NS	RUGGLES ST	CITY OF NEW BEDFORD, 133 WILLIAM ST NEW BEDFORD, MA 02740
69-97 SS	NEMASKET ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
69-99 SS	NEMASKET ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
75-165 ES	SUMMIT ST	GUBLER MICHAEL L, 156 CAMPBELL ST NEW BEDFORD, MA 02740


DURFEE ST
LIBERTY ST
NASHUA ST
SUMMIT ST
HATHAWAY BLV
AUBURN ST
MACOMBER ST
NEMASKET ST
RUGGLES ST
GREENWOOD ST
GREENWOOD
ROCKDALE
PARKER ST
75-167
75-12
75-8
76-256
76-37
70-2
70-227
70-1
69-345
69-125
75-165
63-89
63-2
63-85
63-47
63-102
63-19
Legend
Site
Abutters
N

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Street & Apt. No., or PO Box No.: c/o 3 Point Asset Management 9905 Irvine Ctr Drive
City, State, ZIP+4: Irvine, CA 92618

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PINA DIANA M, PINA STEVEN J
238 SUMMIT STREET
NEW BEDFORD, MA 02740
City, State, ZIP+4

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Sent To
GOMES DAVID JR, GOMES CHRISTIE D
244 SUMMIT STREET
NEW BEDFORD, MA 02740
City, State, ZIP+4

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THOMAS WAYNE,
139 RUGGLES STREET
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131 WILLIAM ST
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WILLIAMS LORENZO B., WILLIAMS AVIS R.
200 SUMMIT ST
NEW BEDFORD, MA 02740
City, State, ZIP+4

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Str GUBLER MICHAEL J.,
or I 156 CAMPBELL ST
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City, State, ZIP+4

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NEW BEDFORD, MA 02740
City, State, ZIP+4

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THOMAS DOLORES,
290 TURNPIKE ROAD SUITE S-206
WESTBOROUGH, MA 01581
City, State, ZIP+4

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PROPERTY DEED

Notification to Abutters under the City of New Bedford Wetlands Ordinance

In Accordance with the City of New Bedford Wetlands Ordinance (New Bedford Code of Ordinances Sections 15-101 through 15-112) you are hereby notified of the following.

The name of the applicant is: Town of New Bedford

The applicant has filed a Request for Determination of Applicability for the municipality of New Bedford, Massachsuetts seeking permission to remove, fill, dredge or alter an area subject to protection under the City of New Bedford Wetlands Ordinance (New Bedford Code of Ordinances Sections 15-101 through 15-112).

The address of the lot where the activity is proposed is: Nemasket Street parcels: map 69, blocks 86 through 93, and blocks 96 through 100
Assessor's Map _____; Lot _____

Copies of the Request for Determination of Applicability may be examined at the New Bedford Conservation Commission, City Hall, 133 William St. Room 304 New Bedford, MA 02740 between the hours of 8:00 AM and 4:00 PM, Monday through Friday. For more information call (508) 991-6188.

Copies of the Request for Determination of Applicability may be obtained from either (check one) the applicant X or the applicant's representative _____ by calling this telephone number 508-979-1529 between the hours of 8:00 AM and 4:00 PM on the following days of the week: Monday through Friday.

Information regarding the date, time and place of the public hearing may be obtained from New Bedford Conservation Commission by calling 508-991-6188 between the hours of 8:00 AM and 4:00 PM Monday through Friday.

Note: Notice of the Public hearing, including its date, time and place, will be posted in the City Hall not less than forty eight (48) hours in advance of the meeting.

Note: Notice of the Public Hearing including its date, time and place, will be published at least five (5) days in advance in the Standard Times.

Note: You may also contact the New Bedford Conservation Commission at 508-991-6188 for more information about this publication or the City of New Bedford Wetlands Ordinance

BK 9479 PG 311
08/21/09 11:44 DOC. 21740
Bristol Co. S.D.

Vacant Land Ruggles St New Bedford ma

Quitclaim Deed

The BETHEL A.M.E. CHURCH, a Massachusetts religious institution pursuant to G.L. c. 180, of 532 County Street, New Bedford, Bristol County, Massachusetts, for consideration given and in full consideration of the forgiveness of the present outstanding real estate tax liability on the herein conveyed property. No stamps are required since this is a conveyance to the City of New Bedford.

grants to the **CITY OF NEW BEDFORD,** a municipal corporation duly existing under the laws of the Commonwealth of Massachusetts, 133 William Street, Bristol County, Massachusetts

with **Quitclaim Covenants**

the land in New Bedford, Bristol County, Massachusetts with buildings thereon described as follows:

See Exhibit "A"

Being the same premises conveyed to the Grantor by deed dated January 18, 1965 and recorded in the Bristol County (S.D.) Registry of Deeds in Book 1473, Page 45.

Bethel A.M.E. Church
By:

Rev, Mina I. Johnson, Pastor and President of
The Board of Trustees, duly authorized

6/11/09

MW 1/3 6/11/09
MARK CHARLES WEBSTER
Notary Public
Commonwealth of Massachusetts
My Commission Expires June 11, 2010

Rev. Daylan K. Greer, Sr., Vice Chairman, New England Conference Trustees, duly authorized

Dated:

COMMONWEALTH OF MASSACHUSETTS

Middlesex, ss 6/11, 2009

On this 11th day of June, before me, the undersigned Notary Public, personally appeared Mina T. Johnson proved to me by satisfactory evidence of identification, being (check whichever applies): ☒ driver's license or other state or federal governmental document bearing a photographic image, ☐ oath or affirmation of a credible witness known to me who knows the above signatory, or ☐ my own personal knowledge of the identity of the signatory, to be the person whose name is signed above, and acknowledged the foregoing to be his/her free act and deed and signed by him/her voluntarily for its stated purpose.

MARK CHARLES WEBSTER 2/3
Print Name of Notary Public: Notary Public
My Commission Expires: Commonwealth of Massachusetts
Qualified in the Commonwealth of Massachusetts My Commission Expires June 11, 2010

STATE OF CONNECTICUT

, ss 7/16, 2009

On this 16th day of July, before me, the undersigned Notary Public, personally appeared Daylan Greer proved to me by satisfactory evidence of identification, being (check whichever applies): ☐ driver's license or other state or federal governmental document bearing a photographic image, ☐ oath or affirmation of a credible witness known to me who knows the above signatory, or ☐ my own personal knowledge of the identity of the signatory, to be the person whose name is signed above, and acknowledged the foregoing to be his/her free act and deed and signed by him/her voluntarily for its stated purpose.

Print Name of Notary Public: JENNIFER LITTLE-GREER
My Commission Expires: NOTARY PUBLIC MY COMMISSION EXPIRES DEC. 31, 2012
Qualified in the State of Connecticut

EXHIBIT "A"

Beginning at a point in the northerly line of Ruggles Street, distant easterly therein ninety (90) feet more or less from the easterly line of Summit Street;

Thence continuing easterly in said northerly line of Ruggles Street, a distance of three hundred (300) feet more or less to a point;

Thence northerly by land now or formerly belonging to Nanette A. Sullivan, a distance of forty-five (45) feet more or less to a point;

Thence easterly by land of said Nanette A. Sullivan, a distance of ninety (90) feet more or less to a point in the westerly line of Hathaway Boulevard;

Thence northerly in said westerly line of Hathaway Boulevard a distance of one hundred thirty-five (135) feet more or less to a point in the southerly line of Nemasket Street;

Thence westerly in said southerly line of Nemasket Street, a distance of three hundred ninety (390) feet more or less to a point;

Thence southerly by land now or formerly belonging to Robert A. Watkins, Jr., a distance of one hundred eighty (180) feet more or less to the point of beginning, containing 243.00 square rods, more or less. Being Lots 86, 87, 88, 89, 90, 91, 93, 96, 97, 98, 99, 100, 101,102 and 103 on Plat 69 of Assessor's Plans of City of new Bedford.

For Grantor's title see Bristol County S.D. Registry of Deeds Book 1473, Page 45.

MW 3/3 6/11/09
MARK CHARLES WEBSTER
Notary Public
Commonwealth of Massachusetts
My Commission Expires June 11, 2010

PROJECT NARRATIVE

1.0 INTRODUCTION

The City of New Bedford Department of Environmental Stewardship (hereafter "the City") proposes to complete planned remedial activities and construct an athletic facility (the Nemasket Street Recreation Area) at the following Nemasket Street parcels: map 69, blocks 86, 88 through 93, blocks 96 through 100 and 125 (hereinafter "the Site" (Figure 1, Attachment A). These parcels are owned by the City and have never been residentially or commercially developed. The Site is located on the eastern end of Ruggles Street at the intersection of Hathaway Boulevard. The topography is generally level with shallow slopes leading to an Isolated Vegetated Wetland ("IVW") in the western portion and a Bordering Vegetated Wetland ("BVW") adjacent to the northern portion of the Site. The Site was initially cleared in October 2010 to facilitate environmental investigation activities but vegetation (primarily grass, weeds and small brush) has since reestablished itself. The coordinates for the Site are 41.64°N, -70.95°W Latitude/Longitude and the Site is identified on Figure 2 (Attachment A).

The selected remedial action includes a handful of small, targeted excavations of soils that exhibit total PCB concentrations greater than 100 mg/kg and tree clearing within the 100-foot wetland buffer zone. Site remediation includes construction of three exposure barriers (synthetic turf system, pavement, and soil, depending on location at the Site) and implementation of an Activity and Use Limitation (AUL). This alternative would employ a §761.61(c) approach under TSCA regulations and would require review and approval by the EPA.

The remediation activities at the Site incorporate the City's plan to develop the Nemasket Street Lots and a portion of the adjacent Keith Middle School (KMS) property into an athletic complex. The current plans for the complex will include a synthetic turf soccer field, a basketball court and landscaped areas. The athletic complex will extend onto the KMS property, requiring removal of a portion of the KMS southern parking lot, removal of lighting and fencing in the area, grading, and restoration of KMS areas not part of the athletic complex.

This Notice of Intent ("NOI") is being filed with the City of New Bedford Conservation Commission pursuant to the Massachusetts Wetlands Protection Act ("WPA") M.G.L.C. 131, § 40 and its implementing regulations at 310 CMR 10.00, and the New Bedford Wetland Protection Ordinance (Section 15-101), for remedial and construction activities associated with the development of an athletic facility (described herein) that will partially take place within the 100-foot buffer zone to a BVW (Figures 3 and 4, Attachment A).

1.1 Purpose and Need

The Project is designed to address both necessary remedial activities adjacent to the Keith Middle School (KMS) and to develop an athletic facility that enhances the athletic potential of KMS students and members of the public, as well as improve community aesthetics.

2.0 EXISTING RESOURCES

The following section provides a summary of resource areas in and adjacent to the Site in New Bedford. Proposed impacts to wetland buffer zones associated with remedial and construction activities are discussed in Section 3.0.

2.1 Wetland Resources and Surface Waters

Prior to conducting a field investigation, wetland scientists from TRC Environmental Corporation ("TRC") reviewed data sources including U.S. Geological Survey ("USGS") topographic mapping, aerial photographs, and Massachusetts Geographic Information System ("MassGIS") data layers for the presence of wetlands, streams, 100-year floodplain, hydric soils, certified or potential vernal pools, priority and estimated habitats of rare species, and historic properties. Following the database review, TRC conducted field surveys in the vicinity of the Nemasket Street Lots to delineate and map federal, state, and local jurisdictional wetlands and waterways. The field surveys were conducted in accordance with the U.S. Army Corps of Engineers ("USACE") *North Central and Northeast Regional Supplement* (2009) and *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act*. Please see Attachment B for the 2010 Wetland Determination of Applicability and Attachment C for wetland photographs.

TRC personnel identified one IVW on the Site and a BVW adjacent to the Site.

Isolated Vegetated Wetland

TRC identified one IVW on the western end of the Site (Figure 3, Attachment A). This IVW is located within a depression bound by steep slopes, which rise to meet the elevation of the surrounding properties and streets. The IVW is characterized by red maple (*Acer rubrum*), multiflora rose (*Rosa multiflora*), spicebush (*Lindera benzoin*), bittersweet (*Celastrus orbiculatus*), and poison ivy (*Toxicodendron radicans*). Soils within the IVW consist of low chroma fine sandy loam, overlaying an organic layer of muck. Signs of hydrology include water-stained leaves and saturated soils. The size of the IVW is approximately 2,700 square feet.

The IVW is separated from a BVW located to the north by an earthen berm located within the Nemasket Street right-of-way that bounds the Site to the north, separating it from the adjacent Keith Middle School. A site investigation revealed that there were no hydrological connections between the IVW and the nearby BVW (Attachment B). In addition, no water marks were observed on rocks or vegetation, suggesting that water does not pool within the IVW. No evidence was observed that the IVW functions as a vernal pool or vernal pool habitat. Because the IVW was located within a depression, The City performed a topographical survey and drainage calculations in order to determine if the depression functioned as Isolated Land Subject to Flooding ("ILSF") in accordance with 310 CMR 10.57(2)(b). As stated above, no evidence was observed suggesting that water pooled within the IVW. Based on drainage calculations performed in accordance with the WPA and the MassDEP's Wetlands Program Policy 85-2 this depression did not meet the criteria of ILSF (Attachment B).

100-foot Buffer Zone

One red maple (*Acer rubrum*) palustrine forested wetland BVW was identified north of the Site at the base of the slope from the Nemasket Street right-of-way and the Keith Middle School parking lot (Figure 3, Attachment A). The 100-foot buffer zone of the BVW on-site consists of heavily vegetated uplands characterized by thick scrub-shrub growth and the aforementioned IVW across Nemasket Street to the south.

2.2 Massachusetts Natural Heritage and Endangered Species Program

During TRC's investigative activities, no designated Massachusetts Natural Heritage and Endangered Species Program ("MassNHESP") priority or estimated habitats of rare species, nor potential or certified vernal pools, have been identified in or near the work area. Additionally, the Project is not located within an Outstanding Resource Water ("ORW") or Area of Critical Environmental Concern ("ACEC").

3.0 AFFECTED RESOURCE AREAS AND IMPACTS

Construction of the proposed Project in the City of New Bedford will involve activities within jurisdictional buffer zones protected under the WPA and the New Bedford Wetlands Protection Ordinance. Due to the Site's location near existing wetland resource areas, construction of the proposed Project will result in unavoidable permanent alterations of the buffer zone necessary for remedial and construction activities.

3.1 Wetland Buffer Zone Impacts

Approximately 18,603 square feet (0.43 ac) of total disturbance will take place within the 100-foot wetland buffer to the BVW (Figure 4, Attachment A).

3.2 Filling of Isolated Vegetated Wetland

The 2,701 square foot isolated wetland (0.06 ac) will be filled with excavated or imported clean soil from site construction. A 2,159 square foot portion the total fill (0.05 ac) is also contained within a portion of the BVW 100-foot buffer zone and is accounted for within the buffer zone impacts present above (Figure 4, Attachment A). This work is authorized under Army Corps Massachusetts Programmatic General Permit 8 (self-verification, Attachment D). The Project is exempt from 401 WQC Review by the MassDEP (314 CMR 9.03 (5) and (6)).

4.0 CONSTRUCTION SEQUENCE, AVOIDANCE AND MINIMIZATION, AND MITIGATION

As work is contained completely within wetland buffer zones and uplands, Proper Best Management Practices (BMPs) and erosion controls will be in place for the duration of construction and the effect of disturbance associated with construction of the Project is expected to be minimal. Remediation and construction will occur in phases following the general procedures listed below, including methods to avoid and minimize disturbance to the extent practicable.

- Field flag wetland boundary prior to construction (completed);
- Install erosion control devices, such as straw bales and siltation fencing, as shown on approved plans and permit conditions specified by the City of New Bedford Conservation Commission in their Order of Conditions.
- Establish equipment staging and laydown areas outside of the wetland boundary and buffer zone;
- Soil Removal:
    1. Targeted soil excavation (approximately 140 yards);
    2. General excavation of the estimated top 6 inches of topsoil (vegetative matter will be removed by screening and disposed of off-site);
    3. Import of soils and grading for exposure barrier construction (excavated soils would be utilized for sub-grading the Site).
- Exposed soils will be wetted and stabilized as necessary to suppress dust generation during construction;
- Install synthetic turf system for a soccer field, asphalt basketball court, and concrete walkways.
- Following construction, restore the buffer zones in compliance with applicable permit conditions and in accordance with applicable BMPs.
    - Restoration efforts following construction generally will include removing temporary erosion control devices following the stabilization of disturbed areas, re-grading of ruts, and seeding and mulching as necessary. All construction debris will be removed from the Project site and disposed of properly. All disturbed areas around structures and other graded locations will be covered with a maintenance free surface (e.g. gravel underlain by a permeable weed barrier) and/or mulched to stabilize the soils. Pre-existing fences will generally be restored to their former condition.

4.1 Vegetation Clearing

Existing vegetation shall be cleared and grubbed at the Site in areas targeted for remediation or the facility construction. Above-grade parts of the vegetation will likely be able to be disposed of off-site without treatment; the Contractor shall determine requirements. Stumps and other vegetative matter will be separated from the soil by screening. The vegetative matter shall be stockpiled on site and cleaned and tested as necessary for off-site disposal.

4.2 Soil Management

Soil shall be properly managed from point of excavation through disposal or reuse. To optimize disposal/reuse considerations, excavated soil shall be segregated based on currently available in situ soil data for the Site. It is anticipated that the soil will be live loaded and transported off site during excavation although some soil may be segregated and stored on Site (i.e. within the area of contamination) in both lined and covered stockpiles or in covered roll-off containers. Soil shall be transported off site under a hazardous waste manifest or a Massachusetts Contingency Plan (MCP) Bill of Lading to a licensed disposal facility.

4.3 Groundwater Management

Groundwater is not anticipated to be encountered during remedial or construction activities onsite. Test pits results indicated groundwater is located at least nine (9) feet below the surface. If groundwater is encountered extracted during excavation it will be discharged to a lined dewatering pit located in upland and will be sent off site for disposal. Groundwater shall not be recharged to an open excavation or a groundwater monitoring well without LSP approval and treatment to remove constituents of concern.

4.4 Erosion and Sedimentation Control Measures

Erosion and sedimentation control measures shall be installed as shown in Figure 4. The sedimentation and erosion controls shall be constructed prior to commencement of remedial activities. Areas in need of repair during the course of remedial activities shall be repaired and shall be maintained for the duration of the project. Sedimentation areas shall be inspected daily to maintain compliance and to avoid siltation of surface water. Erosion and sediment controls for temporary on-site soil stockpiles shall include perimeter hay bales or straw waddles and covers and liners. At the completion of remedial activities, all sedimentation and erosion control measures shall be removed and the area restored to its existing condition.

The following describes installation of the erosion and sedimentation control measures.

Filter Fabric
The filter fabric shall be constructed of a non-rotting, ultraviolet light resistant woven polyester geotextile with sufficient strength for their intended purpose. For catch basins, the filter fabric shall be placed just beneath the catch basin grate. The catch basin grate will be used to secure the filter fabric in place.

Straw Bale Barrier
Straw bales shall be placed in a single row with the ends of adjacent bales tightly abutting one another. The bales shall be securely anchored (except in the parking lot) by driving at least two stakes through each bale. For straw bale barriers placed in the parking lot, the bales shall be fastened together with wooden stakes, rebar, wire or other acceptable means.

The straw bales shall consist of straw from acceptable grasses and legumes, free from weeds, reeds, twigs, chaff, debris and other objectionable material or excessive amounts of seeds and grains. Straw waddles or logs may also be used.

4.5 Environmental Compliance and Monitoring

The TRC will conduct construction oversight and will be responsible for daily inspections of work areas during the both the remediation and construction period and will address potential concerns related to the environment (i.e., erosion and sediment control, spill prevention and control, etc.). The Construction Supervisor will be on-site daily to perform inspections and will have “stop work” authority to address observed or reported infractions of the standards and procedures. Construction crews also will be trained

prior to the start of work to recognize and respond to changing field conditions protecting resource areas, and preventing sedimentation and stormwater runoff.

A level of construction oversight will be provided by the Project's Environmental Monitor, a qualified environmental professional, designated by TRC to monitor on-site construction conditions and compliance with permit and other regulatory requirements. At a minimum, weekly inspections will be performed by the Environmental Monitor to evaluate potential erosion and/or sedimentation hazards until "final stabilization" has been achieved (i.e., 75 percent vegetative cover within the disturbed areas). Photographic documentation of wetlands, buffer zone, and Project progress will also be performed. The Environmental Monitor will provide weekly inspection reports to TRC and the Construction Supervisor, and will also have "stop work" authority. The Project is expected to start in July of 2016 and last approximately two (2) months.

4.6 Stormwater Management

State and local regulations state that post-development peak discharge runoff rates should not exceed pre-development peak discharge rates at development sites. Impervious finish surface cover would be added under this remedial alternative for the construction of paved areas (asphalt basketball court and concrete walkways). However, more than half of the southern end of the existing, paved parking lot at KMS to the north of the Site would be redeveloped and included in the proposed athletic facility (as part of the soccer field); therefore, there would be a net decrease in the total amount of impervious cover for the project area as a whole. The existing KMS stormwater retention system located beneath the southern portion of the KMS parking lot planned to be redeveloped as part of the soccer field would remain in place and mostly unaffected by the Site improvements. One drainage access manhole top will be modified as a result of the soccer field finish grade elevations. Activities performed on the KMS property would need to comport with obligations under the existing AUL for that parcel, the MCP, and MassDEP's January 2000 policy regarding the Construction of Buildings in Contaminated Areas (WSC-00-425).

A preliminary stormwater analysis of pre-development and post-development conditions using the same cover-type comparison method indicates a new stormwater management detention system would not be necessary at the Site. Using the gravel fill layers underneath the field turf provides adequate storage and infiltration for the site improvements. Should it be determined that a detention system is needed, it would require additional excavation for installation and the intent would be to reuse the excavated soil as fill on the Site. Please see Attachment E for the Stormwater Management Report.

A Stormwater Pollution Prevention Plan (SWPPP) will be required during remedy implementation to comply with the EPA's National Pollutant Discharge Elimination System (NPDES) regulations. A Notice of Intent (NOI) will be filed with the EPA prior to construction to obtain coverage under EPA's NPDES General Permit for Stormwater Discharges from Construction Activities.

The selected contractor will implement the erosion control measures to prevent impacts to wetland resource areas as a result of stormwater runoff during construction.

ATTACHMENT A

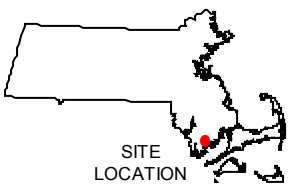
Figures and Plans

0 50 100 Feet

N

Base map: ESRI I3 Imagery Prime World 2D

MASSACHUSETTS

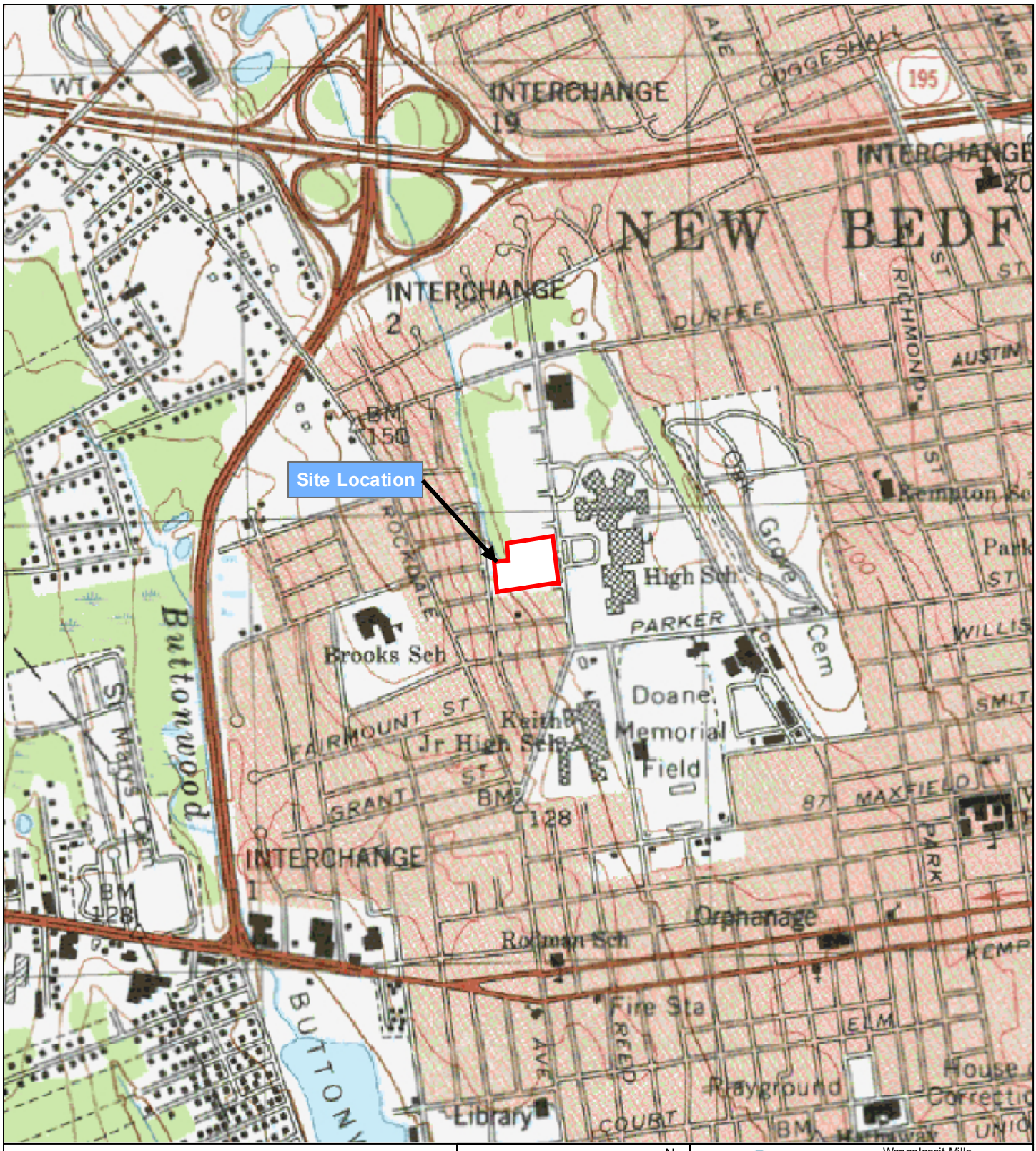


TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
978-970-5600

SITE MAP

NEMASKET STREET LOTS
NEW BEDFORD, MA

FIGURE 1	MAY 2016



Site Boundary

0 500 1,000 Feet

N

MASSACHUSETTS

Base map: USGS 7.5 MinuteTopographic Quadrangle: New Bedford

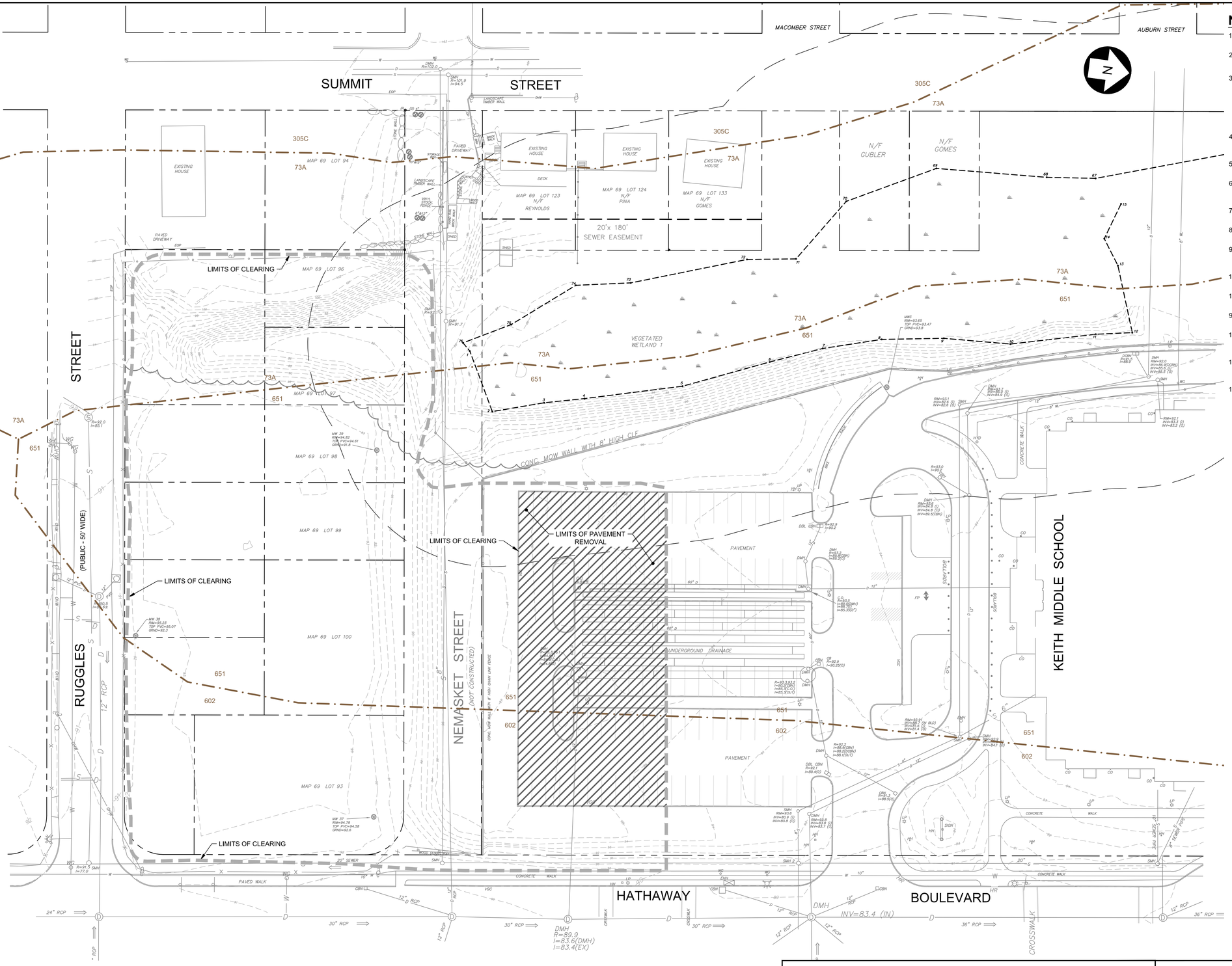
TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
978-970-5600

SITE LOCATION MAP

NEMASKET STREET LOTS
NEW BEDFORD, MA

FIGURE 2	MAY 2016

R:\Projects\GIS_2010\115058_Nemasket_Lots\2014\mxd\Fig1_Site_Location_Nemasket.mxd



NOTES

1. BASE MAP TAKEN FROM "EXISTING CONDITIONS PLAN NEMASKET STREET NEW BEDFORD, MA BY LAND PLANNING INC. DATED 3/10/2016.
2. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, MAINLAND ZONE, NAD83, US SURVEY FEET.
   VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM, 1988 (NAVD88), US FEET
3. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND COMPILED FROM PROPOSED PLAN INFORMATION. TRC MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING THE LOCATIONS OF ALL UTILITIES. PRIOR TO WORK, THE CONTRACTOR SHALL, AT A MINIMUM, CONTACT "DIG SAFE" 1-888-344-7233 TO IDENTIFY OR VERIFY SIZE, DEPTH AND LOCATIONS OF ALL UNDERGROUND UTILITIES WITHIN THE VICINITY OF THE WORK AREA.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. CONSTRUCTION ACTIVITIES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), AND STANDARDS SET FORTH BY THE CITY OF NEW BEDFORD.
5. IF NECESSARY, CONTRACTOR SHALL COORDINATE WITH THE CITY TO SECURE SITE ACCESS AGREEMENTS FROM ABUTTING PROPERTY OWNERS PRIOR TO ENTERING ABUTTING PROPERTIES.
6. CONTRACTOR SHALL INSPECT AND MAINTAIN EROSION CONTROL MEASURES AND REMOVE ACCUMULATED SEDIMENT IN ACCORDANCE WITH THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) FOR THIS PROJECT.
7. TEMPORARY 6-FOOT CHAIN-LINK FENCE WILL ALREADY BE INSTALLED AS INDICATED ON THIS PLAN. FENCE SECTIONS WILL HAVE SUPPORT FEET AND WILL NOT PENETRATE THE GROUND.
8. TRUCKS SHALL USE EXISTING CURB CUTS FOR PROPERTY ACCESS, OR STEEL PLATING SHALL BE UTILIZED IF NECESSARY TO AVOID DAMAGE TO EXISTING CURBING.
9. PRIOR TO COMMENCING SITE WORK, THE CONTRACTOR SHALL INSTALL TYPICAL CONSTRUCTION ENTRANCE/EXIT PAD(S) AT ONE OR MORE OF THE ACCESS GATES ON HATHAWAY BOULEVARD, RUGGLES STREET, AND THE KEITH MIDDLE SCHOOL PARKING LOT.
10. CONTRACTOR SHALL ENSURE THAT NO SOILS ARE TRACKED OFF-SITE ON TRUCKS OR HEAVY MACHINERY BY BRUSHING OFF TIRES AND VEHICLE BODIES PRIOR TO LEAVING THE SITE.
11. CONTRACTOR SHALL ENSURE THAT NO SITE SOILS ARE OTHERWISE SPREAD ONTO THE STREET OR ABUTTING PROPERTIES AT ANY POINT DURING INSTALLATION OF THE FIELD.
9. TRAFFIC FLOW PATTERN TO BE APPROVED BY CITY OF NEW BEDFORD POLICE DEPARTMENT, AND INCORPORATED INTO A CONTRACTOR'S HAUL ROUTES AND STAGING AREAS PLAN.
10. NECESSARY EXCAVATION, BACKFILLING, GRADING AND COMPACTION FOR PREPARATION OF SUBBASE WILL BE PERFORMED BY THE CITY PRIOR TO FIELD INSTALLATION. CONTRACTOR SHALL MINIMIZE AND REPAIR ANY DISTURBANCE OF EXISTING SITE SOILS.
11. IF NECESSARY, A STORMWATER DRAINAGE SYSTEM WILL BE INSTALLED IN THE SUBBASE BY THE CITY PRIOR TO FIELD INSTALLATION. CONTRACTOR SHALL ENSURE THAT STORMWATER STRUCTURES ARE NOT DAMAGED DURING INSTALLATION OF THE SYNTHETIC TURF SYSTEM.
12. SUBBASE ELEVATIONS IDENTIFIED ON THIS PLAN SHALL BE CONFIRMED AND PROPERTY CORNERS AND POINTS OF TANGENCY IDENTIFIED ON THIS PLAN SHALL BE LOCATED AND MARKED BY A LICENSED PROFESSIONAL LAND SURVEYOR PRIOR TO THE START OF WORK.

LEGEND

- PROPERTY BOUNDARY
- WETLAND BUFFER ZONE
- EXISTING BUILDING
- STONE WALL
- FENCE
- GUARD RAIL
- CONTOUR
- SOILS
- WETLAND BOUNDARY
- WETLAND MARKER
- WETLAND SYMBOL
- SHRUB / TREE
- TREELINE
- WATERLINE
- WATER GATE VALVE
- HYDRANT
- SANITARY SEWER LINE
- SANITARY MANHOLE
- STORM DRAIN LINE
- STORM DRAIN MANHOLE
- CATCH BASIN
- CLEAN OUT
- OVERHEAD WIRE
- UTILITY POLE
- LIGHT POLE
- ELECTRIC HANDHOLE
- LIMITS OF CLEARING

30 0 30 60 FT
SCALE: 1" = 30'

ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

TRC
249 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 115058

REV	DESCRIPTION	DATE	DES	CHK	APP
.	.	.	.	.	.

PGT DESIGNED
CMW DRAWN
PGT CHECKED
APPROVED
REVIEW 1
REVIEW 2

EXISTING CONDITIONS & REMOVALS PLAN
NEMASKET STREET
RECREATION AREA
NEW BEDFORD MA

03/28/16 DATE
1" = 30' SCALE

TRC

C-1

REV.

MACOMBER STREET

AUBURN STREET

SUMMIT STREET

STREET

RUGGLES (PUBLIC - 50' WIDE)

KEITH MIDDLE SCHOOL

HATHAWAY BOULEVARD

305C

73A

651

602

MAP 69 LOT 94

MAP 69 LOT 123 N/F REYNOLDS

MAP 69 LOT 124 N/F PINA

MAP 69 LOT 133 N/F GOMES

N/F GUBLER

N/F GOMES

EXISTING HOUSE

DECK

SHED

20'x 180' SEWER EASEMENT

VEGETATED WETLAND 1

100' WETLAND BUFFER ZONE

CONC. MOW WALL WITH 8' HIGH CLF

PAVED DRIVEWAY

LANDSCAPE TIMBER WALL

STONE WALL

VINYL FENCE

CHAIN LINK FENCE

PAVED WALK

CONCRETE WALK

CONCRETE WALK

PAVEMENT

UNDERGROUND DRAINAGE

CROSSWALK

24" RCP

30" RCP

12" RCP

10" RCP

DMH R=89.9 I=83.6(DMH) I=83.4(EX)

DMH INV=83.4 (IN)

SOILS LEGEND

MAP UNIT	SOIL NAME	HYDROLOGIC SOIL GROUP
73A	WHITMAN FINE SANDY LOAM	D
602	URBAN LAND	A
651	UDORTHENTS, SMOOTHED	A

LEGEND

TOTAL BUFFER DISTURBANCE = 18,603 SF

ISOLATED WETLAND FILL OUTSIDE OF BUFFER = 542 SF

ISOLATED WETLAND FILL WITHIN 100 FT. BUFFER = 2,159 SF

LIMITS OF DISTURBANCE

30 0 30 60 FT

SCALE: 1" = 30'

ISSUED FOR PERMITTING

NOT FOR CONSTRUCTION

TRC

249 WESTERN AVENUE
AUGUSTA, ME 04330

PROJECT NO: 115058

REV	DESCRIPTION	DATE	DES	CHK	APP
.	.	.	.	.	.

PGT DESIGNED
CMW DRAWN
PGT CHECKED
. APPROVED
REVIEW 1
REVIEW 2

RESOURCE MAP
NEMASKET STREET
RECREATION AREA

NEW BEDFORD MA

03/28/16 DATE
1" = 30' SCALE

TRC

C-10

REV.

ATTACHMENT B

2010 Wetland Determination of Applicability

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

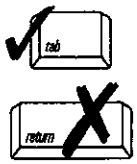
WPA Form 2 – Determination of Applicability

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

RECEIVED
MAR 05 2010
BY: CZH

A. General Information

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



From:

New Bedford
Conservation Commission

To: Applicant

City of New Bedford - Dept. of Environmental Stewardship c/o Cheryl Henlin
133 William Street
Mailing Address
New Bedford | MA | 02740
City/Town | State | Zip Code

Property Owner (if different from applicant):

Name
Mailing Address
City/Town | State | Zip Code

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

Fig 2. Nemasket Streets Lots, New Bedford, MA, Map 69, Lots 86, 88-93 and 96-100. — stamp date received 2/3/2010
Title — Date
Title — Date

2. Date Request Filed:

2/3/2010

B. Determination

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

Project Description (if applicable):

Applicant requests a Determination as to whether the wetland on site is subject to the MA Wetlands Protection Act. The Applicant also knows the work location is within the Buffer Zone to a Bordering Vegetated Wetland located to the north of the site and they are requesting approval to work in that Buffer Zone as well. The work involves clearing vegetation, soil sampling and subsurface investigation and the applicant requests to know if this work requires the filing of a Notice of Intent.

Project Location:

Ruggles Street and Hathaway Boulevard — Street Address
New Bedford — City/Town
Map 69 — Assessors Map/Plat Number
Lots 86, 88, 91, 92, 93, 97, 99 & 100 — Parcel/Lot Number

B. Determination (cont.)

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

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

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

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

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

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

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

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

Name of Municipality

Pursuant to the following municipal wetland ordinance or bylaw:

Name | Ordinance or Bylaw Citation

B. Determination (cont.)

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

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

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

Negative Determination

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

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

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

☐ 3. The work described in the Request is within the Buffer Zone, as defined in the regulations, but will not alter an Area subject to protection under the Act. Therefore, said work does not require the filing of a Notice of Intent, subject to the following conditions (if any).

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

B. Determination (cont.)

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

Exempt Activity (site applicable statuatory/regulatory provisions)

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

Name of Municipality

Pursuant to a municipal wetlands ordinance or bylaw.

Name | Ordinance or Bylaw Citation

C. Authorization

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

☒ by hand delivery on 3/5/10
Date

☐ by certified mail, return receipt requested on
Date

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

This Determination must be signed by a majority of the Conservation Commission. A copy must be sent to the appropriate DEP Regional Office (see http://www.mass.gov/dep/about/region.findyour.htm) and the property owner (if different from the applicant).

Signatures:

2/16/10
Date

D. Appeals

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

ATTACHMENT C

Wetland Photographs

City of New Bedford
Nemasket Street Lots

Site Photographs, January, 2010

Photo 1: View of isolated vegetated wetland ("IVW") looking north toward Keith Middle School.

Photo 2: View south of IVW and 100-foot buffer zone of BVW from Nemasket Street right-of-way.

Photo 3: View of the 100-foot buffer zone near the IVW on west end of Site.

Photo 4: Typical view of upland vegetation on the Site.

ATTACHMENT D

USACE SELF-VERIFICATION CATEGORY 8 GP

Wannalancit Mills
650 Suffolk St., Suite 200
Lowell, MA 01854

978.970.5600 PHONE
978.453.1995 FAX

www.trcsolutions.com

May 23, 2016

Regulatory Division
U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

RE: Nemasket Street Recreation Area Project
City of New Bedford – Nemasket Street Lots
Nemasket and Ruggles Streets, New Bedford, Massachusetts

Dear Environmental Reviewer:

TRC Environmental is submitting this letter on behalf of the City of New Bedford in regard to proposed remediation and development activities proposed at the above-referenced Nemasket Street Lots ("the Site"), located at Nemasket and Ruggles Streets, New Bedford, Bristol County, Massachusetts (Site).

The Site consists of currently vacant vegetated parcels located west of New Bedford High School ("NBHS") and south of the Keith Middle School and bound by the Nemasket Street right-of-way, Ruggles Street, and Hathaway Boulevard and two lots along Summit Street. The selected remedial action includes a handful of small, targeted soil excavations that exhibit total PCB concentrations greater than 100 mg/kg and tree clearing within the 100-foot wetland buffer zone. Site remediation includes construction of three exposure barriers (synthetic turf system, pavement, and soil, depending on location at the Site) and implementation of an Activity and Use Limitation (AUL). This alternative would employ a §761.61(c) approach under TSCA regulations and would require review and approval by the EPA.

Following the proposed remediation of contaminated soils, proposed improvements consist of a new field turf soccer field and asphalt basketball court. A portion of the soccer field will be constructed within a portion of the existing school parking lot. A brick paver access walkway will connect the remaining parking lot with the basketball court and will be constructed just to the west of the soccer field. All of the improvements will be constructed on a portion of the Middle School property and on parcels owned by the City of New Bedford totaling approximately 1.91 acres. The proposed improvements will result a net decrease of 0.24 acre of impervious area.

Approximately 2,700 square feet of isolated vegetated wetlands that may be subject to United States Army Corps of Engineers (USACE) jurisdiction under Section 404 of the Clean Water Act are located within the area of proposed site activities. Thus, please find a VII: Self-

Verification Notification Form for a GP 8 (Section 10 and 404; tidal and non-tidal waters of the U.S.) for the permanent filling of a 2,701 square-foot isolated wetland.

In accordance with GPs conditions, TRC has received clearance (dated May 11, 2010) from the State Historic Preservation Officer at the Massachusetts Historical Commission, and has notified the Wampanoag Tribal Authorities in Aquinnah, MA and Mashpee, MA. Due to the presence of another nearby wetland that is associated with an intermittent stream, a Notice of Intent will also be filed on behalf of the City of New Bedford to account for the proposed areas of the site improvements within the 100-foot buffer zone to this wetland per the Massachusetts Wetlands Protection Act (WPA).

If you have any questions or require additional information, please do not hesitate to contact me at (978) 656-3565 or via email at DSullivan@trcsolutions.com.

Sincerely,
TRC Environmental

David Sullivan, LSP

US Army Corps of Engineers®
New England District

VII: Self-Verification Notification Form

Complete all fields (write "none" if applicable) below. Send this form and the existing plans to the address below, fax to (978) 318-8303, or email to cenae-r@usace.army.mil before work within Corps jurisdiction commences unless otherwise specified. The Corps will acknowledge receipt of this form in writing. Please call (978) 318-8338 with questions.

Regulatory Division
U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

Permittee: City of New Bedford
Address, City, State & Zip: 133 William Street, New Bedford, MA 02740
Phone(s) and Email: Contact: Michele Paul, LSP (508) 979-7487 / michele.paul@newbedford-ma.gov

Project Location (provide detailed description if necessary): Nemasket Street parcels: map 69, blocks 86 through 93, blocks 96 through 100, and 125 (undeveloped)
Address, City, State & Zip: Eastern end of Ruggles Street and or near the intersection of Hathaway Boulevard, New Bedford, MA 02740.
Latitude/Longitude Coordinates (if address doesn't exist): 41.64N, -70.95W
Waterway Name: Not applicable. Isolated wetland is separated from bordering wetlands by earthen berm located within Nemasket Street Easement. Contains no culvert/outlet.

Contractor: TRC Environmental (David Sullivan, LSP)
Address, City, State & Zip: Wannalancit Mills, 650 Suffolk Street, Lowell, MA 01854
Phone(s) and Email: (978) 656-3565 / DSullivan@trcsolutions.com

Project Purpose: Remediation of city-owned land and construction of an athletic facility on undeveloped land.

Work Description: This work will include filling of 2,701 square feet of isolated vegetated wetland.

Work will be done under the following activity(s) in Section III, Eligible Activities (check all that apply):

1____	5____	9____	13____	17____	21____
2____	6____	10____	14____	18____	22____
3____	7____	11____	15____	19____	23____
4____	8 X	12____	16____	20____	

(continued on next page)

ATTACHMENT E

Stormwater Management Report, Stormwater Checklist, Letter Re: Influence of Storm Water Infiltration on Impacted Fill

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854

978.970.5600 PHONE
978.453.1995 FAX

www.TRCsolutions.com

TRC Reference Number: 115058

May 12, 2016

Mr. Scott Turner, PE, AICP, LEED AP ND
Nitsch Engineering
2 Center Plaza, Suite 430
Boston, Massachusetts 02108

Subject: Influence of Storm Water Infiltration on Impacted Fill
Nemasket Street Lots - Parker Street Waste Site
New Bedford, Massachusetts
Release Tracking Number 4-15685

Dear Mr. Turner:

As you are aware, TRC Environmental Corporation (TRC) is working with the City of New Bedford, Massachusetts to implement a remedial alternative under the Massachusetts Contingency Plan (MCP) that involves the following Nemasket Street properties: map 69, blocks 86 through 93, and blocks 96 through 100, hereafter referred to as "the Site". The Phase II Comprehensive Site Assessment (Phase II) that was completed in January 2012, indicates that fill material was placed at the Site sometime during the period between the 1940s and the 1970s. The fill consists of sandy soil intermingled with ash, coal fragments, asphalt, rubber, slag, brick, concrete, porcelain, glass, fabric, plastic and metal, and is present across the Site and overlies native peat and glaciofluvial deposits. The chemical quality of the fill has been extensively characterized through laboratory analysis. Samples collected and analyzed as part of the Phase II found that the fill material contains certain metals (i.e., arsenic, barium, cadmium, chromium, lead and nickel), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and dioxins above Massachusetts Department of Environmental Protection (MassDEP) soil cleanup standards which consider the potential mobility of these analytes for protection of groundwater.

The remedy for the Site involves the targeted removal of localized fill that contains greater than 100 milligrams per kilogram (mg/kg) total PCBs and redeveloping the Site as a community athletic complex that principally includes a soccer field and basketball courts. The fill will be covered with three feet of clean soil and three types of exposure barriers will be used to limit the potential for direct contact with residual constituents present in the fill. Since two of the three types of exposure barriers (i.e., artificial turf and clean soil) that will be used over the vast majority of the Site are pervious and will allow for continued infiltration of precipitation through the fill, the New Bedford Conservation Commission has requested information from the Licensed Site Professional (LSP) of Record that infiltration is appropriate at this Site given the nature of the impacted fill. This letter provides the requested documentation.

Infiltration is considered appropriate for the Site since the constituents of interest in the fill exhibit a low potential for mobility. As noted above, the fill contains concentrations of certain PAHs, PCBs, dioxins, and metals that are above Massachusetts soil cleanup standards, which take into consideration the potential migration of these constituents from soil to groundwater. Note that the fill materials at the Site contain significant quantities of ash, decomposing wood and cinders which are an abundant source of organic carbon[1].

TRC estimated the maximum theoretical concentration of the PAHs, PCBs, and dioxins that could potentially partition from the soil into water that percolates through the fill (see Attachment 1) using the following equation (Freeze and Cherry, 1979)[2] and site-specific values of organic carbon:

$$C_w = C_s/(K_{oc} * f_{oc})$$

Where: C_w = the maximum equilibrium concentration of the analyte in water that can partition from soil containing the analyte, mass/volume;
C_s = the concentration of the analyte of interest in soil, mass/mass;
K_{oc} = Organic carbon partitioning coefficient, volume/mass; and
f_{oc} = the fraction of organic carbon in the soil/fill.

To provide a conservative worst-case estimate, the maximum concentrations of PAHs, PCBs, and dioxins detected in the fill were used to estimate the concentration of the analytes in water that contacts the fill. As shown in Attachment 1, the maximum concentrations of PAHs, PCBs and dioxins that could leach from the fill and migrate to groundwater are orders of magnitude lower than the applicable GW-2 or GW-3 groundwater cleanup standards that apply to the Site. These data indicate that the fill material is not capable of contributing dissolved PAHs, PCBs, or dioxins to groundwater at levels that could pose a risk to potential receptors. It should be noted that the calculated concentrations do not account for attenuation processes in the subsurface that would further reduce concentrations of these analytes in groundwater.

Unlike organic substances (e.g., PAHs, PCBs, and dioxins), the mobility of the metals of interest (i.e., arsenic, barium, cadmium, chromium, lead, and nickel) is influenced primarily by adsorption of these metals onto minerals that exist within soil or fill, the stability of these minerals, and redox reactions that occur in response to precipitation and storm water infiltration through the fill. These processes, and thus metals mobility, are controlled largely by the pH of the precipitation and storm water. As previously noted, the fill will be covered with precharacterized clean soil that would be below applicable Massachusetts soil cleanup standards and synthetic turf and pavement which are inert. These materials will not significantly alter the pH or chemical characteristics of precipitation or storm water, which has been percolating through the fill for over 30 years. Based on the most current groundwater data which was presented in the Phase II, metals concentrations in wells located at and immediately downgradient of the Site meet the GW-3 groundwater criteria that apply to the Site as well as the more stringent GW-1 criteria[3]. Since the pH and chemical characteristics of the storm water and precipitation is anticipated to be similar to existing conditions, the geochemical reactions and stability of

[1] The average fraction of organic carbon in the soil/fill measured during the Phase II ranged from 0.094 and ranged from 0.0735 to 0.1149.
[2] Freeze, R.A. and J.A. Cherry, 1979. Groundwater. Prentice-Hall, Englewood Cliffs, NJ.
[3] GW-2 standards apply to compounds that could potentially volatile from groundwater to soil gas and cause a vapor intrusion concern to indoor air. Since metals do not volatize, GW-2 criteria do not apply to metals.

minerals that currently limit the mobility of metals are not expected to change. Therefore, there is no basis to conclude that concentrations of metals in groundwater will increase to a level that would pose a risk to potential receptors as a result of infiltration.

If you have any questions or comments, please do not hesitate to contact me at 978-656-3565.

Sincerely,

TRC

David M. Sullivan, LSP
Senior Project Manager

Attachment

Attachment 1
Estimated Maximum Theoretical Concentrations of Organic Constituents of Interest
That Could Leach from Fill
Nemasket Street Properties
New Bedford, Massachusetts

Statement of Problem:

Estimate the theoretical maximum concentration of organic constituents in water infiltrating the fill as the Nemasket Street properties for those constituents exceeding Massachusetts Contigency Plan (MC) generic Method 1 Soil Standards that consider protection of groundwater.

Approach:

The theoretical equlibrium concentration of a constuent that can partition from soil into water contained in the soil pore space is a linear process that is characterized by the Freundlich Isotherm and can be mathmatically expressed by the following equation:

$$C_w = C_s/K_d$$

Where: C_w = Theoretical concentration of constituent in sporewater infiltration through the soil/fill, mass/volume;
C_s = Concentration of constituent in the soil/fill, mass/volume;
K_d = Soil distribution coefficient = Koc * foc, volume/mass;
K_{oc} = organic carbon partitioning coefficient; and
f_{oc} = fraction of organic carbon in the soil/fill, unitless.

Organic carbon partitioning coefficents for organic constituents are established in the scientific literature and were presented in the Phase II Investigation Report (TRC, 2012). The average fraction organic carbon content of thesoil/ fill based on samples analyzed as part of the Phase II Investigation of the Nemasket Street Properties to be 0.094. The organic carbon content is consistent with the presence ash, cinders, wood debris and other sources of organic carbon within the fill. Based on these data and the maximum concentrations of constituents detected in the soil, the maximum theoretical concentrations the the constituents that could be expected to partition from the fill to stormwater or precipitation infiltrating the fill was conservatively estimated in the following table.

Compound	Maximum Concentration in Fill (mg/Kg)	Organic Carbon Partitioning Coefficient, K_{oc} (L/Kg)	Fraction of Organic Carbon, f_{oc} (unitless)	Distribution Coefficient, K_d (L/Kg)	Theoretical Maximum Pore Water Concentration, C_w (mg/L)	Theoretical Maximum Pore Water Concentration, C_w (µg/L)	Appicable MCP Groundwater Criteria GW-2 (µg/L)	Appicable MCP Groundwater Criteria GW-3 (µg/L)
Organic Analytes								
Acenaphthylene	13	4,786	0.094	451	0.029	29	10000	40
Benzo(a)anthracene	120	358,000	0.094	33,759	0.004	4	NA	1,000
Benzo(a)pyrene	93	969,000	0.094	91,377	0.001	1	NA	500
Benzo(b)fluoranthene	130	1,230,000	0.094	115,989	0.001	1	NA	400
Chrysene	130	398,000	0.094	37,531	0.003	3	NA	70
Dibenz(a,h)anthracene	15	1,790,000	0.094	168,797	8.89E-05	0.1	NA	40
ideno(1.2.3-cd)pyrene	53	3,470,000	0.094	327,221	1.62E-04	0.2	NA	100
PCBs	95.295	309,000	0.094	29,139	0.003270393	3	5	10
Dioxins (TEQ)	0.41	1,584,893	0.094	148979.942	2.75E-06	2.75E-03	NA	0.04

As shown in the table above, the maximum concentration of organic constituents of interest would not exceed the groundwater standards that apply to the Site.

Notes:

1. mg/Kg = milligrams per kilogram
2. L/Kg = Liters per kilogram.
3. mg/L = Milligrams per liter.
4. µg/liter.

STORMWATER MANAGEMENT REPORT

NEMASKET STREET RECREATIONAL AREA

225 HATHAWAY BOULEVARD
NEW BEDFORD, MASSACHUSETTS

PREPARED FOR:

CITY OF NEW BEDFORD
133 WILLIAM STREET, ROOM 304
NEW BEDFORD MA 02740

PREPARED BY:

TRC ENGINEERS, INC
650 SUFFOLK STREET
LOWELL, MA 01854
TEL: 978-656-3680

MAY 2016

TABLE OF CONTENTS

TABLES

ATTACHMENTS

Section I
Project Information

1. Project Description

The Nemasket Street Recreation Area will be located on the corner of Ruggles Street and Hathaway Boulevard, in the City of New Bedford, Bristol County, Massachusetts. The soccer field is just to the south of the existing middle school building.

The proposed improvements consist of a new artificial field turf soccer field and asphalt basketball court. A portion of the soccer field will be constructed on top of a section of the existing school parking lot. A brick paver access walkway connecting the existing parking lot with the basketball court will be constructed just to the west of the soccer field. All improvements will be constructed on a portion of the middle school property and on parcels owned by the City of New Bedford, approximately 1.91 acres on the northwest corner of Ruggles street and Hathaway boulevard in New Bedford, Bristol County, Massachusetts (Site).

The proposed improvements will result in a net decrease of 0.24 acre of impervious area, which considers the paved basketball court and access walkway and paved parking lot surface removals.

A total of 2.61 acres of disturbed area is anticipated, including the construction activities associated with the soccer field, basketball court and access walkway.

All work will take place within the proposed property limits, with minimal impact to wetlands. A Notice of Intent will also be filed on behalf of the City of New Bedford to account for the proposed areas of the site improvements within the 100-foot Buffer per Wetlands Protection Act (WPA).

This Stormwater Report includes the calculations, runoff modeling, and engineering analysis required to evaluate the pre-development and post-development conditions associated with the proposed soccer field and basketball court and associated site improvements.

The property for the proposed soccer field and basketball court encompasses approximately 1.91 acres. The site is currently vacant residential properties that have a good amount of vegetated cover. The land use cover surrounding the site is predominantly residential with a few wetland areas. The wooded areas are a mix of evergreens and deciduous trees with very light undergrowth. A fence separates Keith Middle school parking lot from the residential parcels.

The impervious surfaces will be kept to the minimum practical. This design reduces the drainage detention infrastructure and utilizes the gravel cap material and artificial field turf as an alternative infiltration best management practice (BMPs). Upon completion of the soccer field and basketball court, the disturbed areas around the

perimeter of the site will either be revegetated or covered by a permeable stone layer. The stormwater design also incorporates temporary and permanent erosion and sediment control measures to prevent off-site transport of sediment and protect existing wetlands throughout construction phases. The following table summarizes the list of civil engineering drawings pertinent to MassDEP and City of New Bedford requirements.

Table I
List of Drawings for the Nemasket street Recreation Area

Drawing No.	Drawing Title
C-1	Existing Conditions & Removals Plan
C-2	Site Grading Plan
C-3	Site Grading Sections & Details I
C-4	Site Grading Sections & Details II
C-5	Site Grading and Drainage Details
C-6	Erosion Control Plan
C-7	Erosion Control Notes & Details
C-8	Pre-development Stormwater Plan
C-9	Post-development Stormwater Plan

2. Soil Types

The Natural Resources Conservation Service (NRCS) Web Soil Survey data identified three (3) principal soil types on or adjacent to the site. Table II provides a listing of soil types present. A copy of the NRCS Soils Map and other key soil characteristics are included in Attachment A.

Table II
Table of Soil Characteristics

Map Unit	Soil Name	Slopes	Hydrologic Soils Group
73A	Whitman fine sandy loam	0-3%	D
602	Urban Land	0-3%	A(assumed)
651	Udorthents, smoothed	0-3%	A

Source: USDA Natural Resource Conservation Service Web Soil Survey, Bristol County, Massachusetts, Southern Part.

A subsurface soil evaluation was conducted on April 20, 2016 by TRC Engineers Inc. Their findings indicate that the soil conditions were consistent with the NRCS soil survey and those observed during the site visit. See Attachment A for the soils information.

3. Water Resources

The soccer field and basketball court will be constructed on the City of New Bedford 1.91-acre parcel area. Elevations within the site range from approximately 103 to 88 feet above mean sea level. This unimproved site generally slopes from east to west, while the existing parking lot is generally flat. Existing site slopes range from approximately 35 percent in steep sections near the isolated wetland to the west to nearly flat within the eastern portion of the site.

The project is located in the Buzzards Bay Watershed. The runoff from the site flows into an adjacent wetland feeding into an unnamed tributary eventually feeding into the Paskamanset River.

The site is not located within the 100-year floodplain. See Attachment A for firmette based on Community Panels 25005C0389F.

Section III
Stormwater Management

The stormwater management system associated with the proposed soccer field and basketball court will utilize the proposed grading, infiltration and revegetation to prevent an increase of runoff and impacts to wetlands and perennial riverfronts during precipitation events. In accordance with MassDEP requirements, the site grading and revegetation plans were developed such that the total post-development peak flows generated by 2-year, 10-year, and 100-year return period design storms will be less than those of the pre-development condition. New impervious surfaces will be limited to the basketball court and access walkway. The surrounding disturbed areas of the site will either be revegetated or covered by a permeable stone layer. The soccer field will be constructed of 24 inches of a well-draining gravel material capped with a field turf. This configuration will minimize natural resource impacts as much as practicable. Following construction activities, long-term stormwater and erosion controls will be maintained through the Stormwater Management Operation and Maintenance Plan.

The following sections address the ten (10) standards for stormwater design from the MassDEP Stormwater Handbook.

1. Protection of Wetlands, No Untreated Discharges

In accordance with Standard 1, stormwater runoff from impervious areas will be treated on-site and will not be directly discharged to adjacent wetlands or natural resource areas. Prior to any earth disturbing activities, combination silt fence/hay bale erosion control BMPs will be installed around the perimeter of the disturbance areas. During site preparation and earthwork activities, runoff will be intercepted by the silt fence before reaching the adjacent wetlands. Upon completion of construction activities, the disturbed areas and yard embankment slopes of the site will either be revegetated or covered by a permeable stone layer such that runoff will sheet flow from the developed areas, and will not cause erosion in wetlands or waters of the

Commonwealth. The permeable low maintenance cover type will also serve as a filter strip, attenuating stormwater runoff further and providing some measure of TSS treatment.

No outlets, outfalls or structures discharge runoff from the site directly to wetlands or resource areas. The supporting calculations, consistent with the requirements of Volume 2, Chapter 3 of the Massachusetts Stormwater Handbook for this engineering analysis are provided in Attachment C.

2. Peak Rate Attenuation

Peak rate attenuation is achieved with a combination of infiltration surfaces, site grading and permeable low maintenance cover type. The stormwater runoff model was developed using HydroCAD software, which employs TR-55 and TR-20 methodology to calculate peak flows.

Modeling assumptions, inputs, and outputs for the pre- and post-development routing calculations are provided with Attachment C. Total post-development peak flows are attenuated to less than the pre-development peak flows for the 2-year, 10-year, 25-year, and 100-year, 24-hour storm events.

Analysis of Pre-Development Stormwater Runoff

This section presents hydrologic data and information to demonstrate that total peak rates of stormwater runoff under post-development conditions will not exceed those under pre-development conditions during the 2-year, 10-year, 25-year, and 100-year, 24-hour rainfall events.

Pre-development runoff rates were determined by dividing the site, based on existing topography, into five (5) subcatchments, labeled 1S, 2S, 3S, 4S and 5S. The boundaries of the subcatchments are based on property lines, land use and topography. Existing land cover for the project site was determined by aerial photography and field investigation. Cover types are summarized in Table III-1 below. The Pre-Development Stormwater Management Plan is included in Attachment C.

Precipitation events with a 24-hour duration and a Type III distribution were used in this analysis. Rainfall return frequencies of 2, 10, 25, and 100 years were applied. Storm event precipitation depths were obtained from Appendix F of the Hydrology Handbook for Conservation Commissioners March 2002.

Table III-1 **Pre-Development Drainage Areas (acres)**							
LAND COVER	**CN**	**1S**	**2S**	**3S**	**4S**	**5S**	**Totals**
Pavement	98	0.159	0.000	1.244	0.103	0.174	1.680
Grass, HSG A	39	0.000	0.000	0.694	0.014	0.139	0.847
Brush, HSG A	30	0.572	0.732	0.000	0.149	0.082	1.535
Brush, HSG D	78	0.028	0.059	0.000	0.000	0.000	0.087
Woods, HSG A	45	0.000	0.021	0.000	0.000	0.000	0.021
Woods, HSG D	83	0.026	0.338	0.000	0.000	0.000	0.364
Total Area		**0.785**	**1.150**	**1.938**	**0.266**	**0.395**	**4.534**
Composite CN		**47**	**48**	**77**	**57**	**63**	

Table III-2 **Precipitation Frequency Estimates (inches)**				
Duration	**Average Recurrence Interval (years)**			
	2 year	**10 year**	**25 year**	**100 year**
24-hours	3.4 inches	4.8 inches	5.6 inches	7.0 inches

For each subcatchment, the time of concentration (Tc) was determined using the hydraulically longest flow path. The Tc flow paths are identified on the Pre Development Stormwater Management Plan. In the pre-development model, the maximum sheet flow length used is 50 feet, per MassDEP recommendations. In subcatchments 3S and 5S, a minimum time of concentration of 6 minutes was used for these areas. Curve numbers (CNs) were generated for the subcatchments based on hydrologic soil group and land cover type. Peak rates of runoff were evaluated for each subcatchment. HydroCAD output for pre-development conditions for the 2-year, 10-year, 25-year, and 100-year, 24-hour storm events is included in Attachment C and is summarized in Table III-3.

Table III-3 **Pre-Development Peak Rates of Runoff (cfs)**			
Storm Event	**SP1**	**SP2**	**Total Site**
2-year	0.00	3.20	3.20
10-year	0.00	6.23	6.23
25-year	0.00	8.13	8.13
100-year	0.00	11.73	11.73

Analysis of Post-Development Stormwater Runoff

Post-development runoff rates were determined using the same approach. The project area was divided into seven (7) subcatchments, labeled 1S, 2S, 2SA, 2SB, 3S, 4S and 5S as shown in Attachment E – Post Development Stormwater Management Plan.

The post-development runoff pattern will remain generally unchanged from the pre-development pattern.

Proposed land use within each drainage area is summarized in Table III-4.

Table III-4
Post-Development Drainage Areas (acres)

LAND COVER	**CN**	**1S**	**2S**	**2SA**	**2SB**	**3S**	**4S**	**5S**	**Totals**
Brick Pavers	76	0.00	0.000	0.000	0.053	0.000	0.000	0.000	0.053
Pavement	98	0.159	0.000	0.000	0.204	0.843	0.103	0.174	1.483
Field turf	68	0.000	0.000	1.581	0.130	0.000	0.000	0.000	1.711
*Grass, HSG A	39	0.153	0.080	0.000	0.000	0.494	0.108	0.196	1.031
*Grass, HSG D	80	0.061	0.26	0.000	0.000	0.000	0.000	0.000	0.321
Woods, HSG A	45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Woods, HSG D	83	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Area		**0.373**	**0.340**	**1.581**	**0.387**	**1.337**	**0.211**	**0.370**	**4.599**
Composite CN		**71**	**70**	**68**	**85**	**76**	**68**	**67**	

*Grass may be substituted with a permeable low maintenance cover type.

As in the pre-development analysis, the time of concentration (Tc) was determined using the hydraulically longest flow path. The Tc flow paths for each subcatchment are identified on the Post Development Stormwater Management Plan located in Attachment E. A maximum sheet flow length of 50 feet was used in the time of concentration calculations. In all cases a minimum time of concentration of 6 minutes was used for the post development subcatchments. HydroCAD output for Post-Development conditions for the 2-year, 10-year, 25-year, and 100-year, 24 hour storm events is included in Attachment C and summarized in Table III-5.

Table III-5
Post-Development Peak Rates of Runoff (cfs)

Storm Event	**SP1**	**SP2**	**Total 6R**
2-year	0.01	2.83	2.84
10-year	0.12	5.61	5.73
25-year	0.60	7.33	7.93
100-year	1.79	10.46	12.25

Table III-7 provides a comparison between pre-development and post-development runoff conditions for each design storm.

Table III-6 Pre- to Post-Development Change in Peak Rates of Runoff (cfs)			
Storm Event	**Pre-Development Total**	**Post-Development Total**	**Total**
2-year	3.20	2.84	**(-)0.36**
10-year	6.23	5.73	**(-)0.50**
25-year	8.13	7.93	**(-)0.20**
100-year	11.73	12.25	**0.52**

Peak Rates of Runoff

The results of the analyses indicate that a decrease in the peak rates of runoff from all storm events with the exception of 100-year. The small increase, attributable to the runoff from the westerly embankment slope, Node 2S, will be contained within the wetland to the northwest of the site and will not impact downstream properties.

3. Groundwater Recharge

Annual recharge to groundwater will be maintained through the use of environmentally sensitive site design, low impact development techniques, BMPs, and long-term effective operation and maintenance. In general, the Soccer field is low impact and the removal of existing pavement exceeds the extent of new impervious surfaces. The annual recharge requirements will be met under the post-development conditions based on recharge volume calculations, consistent with MassDEP standards. MassDEP standards for stormwater recharge are achieved through the stormwater management system as designed.

The intent of these standards is to ensure that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions. The paved basketball court and brick walkway are the only proposed impervious areas associated with the project. Infiltration is proposed for the soccer field as well but it's not considered impervious. The basketball court will be treated below the field turf areas through infiltration. The Dynamic Field Method, as outlined within the Massachusetts Stormwater Handbook provides the basis for the recharge volume calculation. Because the Dynamic Field Method was employed, a field infiltration evaluation was performed using a double ring infiltrometer. The Site visit and soil observations were utilized as a supplement to existing soils information given by the Natural Resources Conservation Service website. The report and calculations provided within Attachment A demonstrate compliance with the following MassDEP criteria.

- Infiltration BMPs will drain in 72 hours;
- Runoff from the basketball court is infiltrated into the adjacent field turf section to the east;

- Runoff from the soccer field is infiltrated into gravel subbase layers just below the surface of the field.

The Dynamic Field Method was used to determine the infiltration rates. There were a total of 6 in-situ hydraulic conductivity tests. The results of the field testing ranged from 0.67 to 6.85 inches per hour. For the soccer field we chose to use the most conservative test of 0.67 inches per hour as the infiltration rate. For the Basketball court we chose 5.23 inches per hour which was the closest test to the infiltration area.

See the infiltration test results included in Attachment A for in-situ hydraulic conductivity test results.

4. Water Quality

The Infiltration Volume Calculation worksheets in Attachment B show the calculations for both the recharge volume and water quality volume based on the impervious area created by the soccer field and basketball court. The required water quality equals one inch times the total impervious area of the post-development project site.

5. Higher Potential Pollutant Loads

The soccer field, basketball court and access walkway and associated stormwater BMPs will not result in higher potential pollutant loads. Source control and pollution prevention will be implemented in accordance with the Long-Term BMP Operations and Maintenance Plan, which was developed in accordance with the Massachusetts Stormwater Handbook to eliminate untreated off-site discharge of stormwater and associated TSS impacts. A National Pollutant Discharge Elimination System (NPDES) Construction General Permit will be submitted prior to the site preparation activities and building construction activities. The Long-Term Pollution Prevention measures will be summarized within the Long-Term BMP Operations and Maintenance Plan.

6. Critical Areas

The stormwater BMPs for the Site have been designed to prevent untreated stormwater discharges from new impervious areas. Standard 6 stipulates that for stormwater treatment in critical areas, all runoff effluent must achieve 80% total suspended solids (TSS) removal. The requirements also stipulate that 44% TSS removal must be performed via “pre-treatment” prior to discharge to the infiltration structure. The pre-treatment options include physical separators or a vegetated filter strip. Physical separators are not a viable option as they only provide 25% pre-treatment and treat limited areas, and each one requires its own outfall. A project with multiple outfalls in wetlands are not recommended by regulatory bodies. This leaves only a vegetated filter strip, for which there is simply no space for. Per the TSS removal efficiencies table, in order to achieve the 44% pre-treatment the vegetated filter strip will need to be 50 feet in width.

The Soccer field is an atypical land use, without a higher pollutant load. The site design benefits from the application of field turf over a 2 feet thick gravel base material over most of the site. This surfacing captures the runoff water, treating it as a large surface filter, releasing any runoff to the wetlands dispersed evenly in the form of sheet flow. The treatment of stormwater through this gravel infiltration system meets the final TSS requirements of the Stormwater standards.

Justification for waiving the pre-treatment requirement for the Recreation area would include the fact that this site has no roadway construction as part of the design.

7. Redevelopment

A portion of the existing parking lot will be impacted due to the soccer field construction to the south. Some of the existing pavement will be removed from the current middle school parking lot. This project is considered a new stand-alone development project and is not considered a redevelopment project.

8. Construction Period Controls

A plan will be developed by the construction contractor to identify potential construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities. Land disturbance and construction activities will be implemented in a manner which limits off-site TSS transport through the installation of silt fencing down-gradient of the limit of disturbance. A NPDES permit will be submitted to EPA by the construction contractor prior to site preparation and land disturbance. The NPDES permit will include a Stormwater Pollution Prevention Plan (SWPPP), which will comply with the requirements of Standard 8.

The SWPPP will address all stormwater management activities necessary during land disturbance and construction, including source control and pollution prevention measures, BMPs to address erosion and sedimentation, stabilization measures, and procedures for operating and maintaining the BMPs. The SWPPP will also include a schedule for sequencing construction and stormwater management activities that minimize land disturbance and expedite restoration activities. The construction sequence will begin with the installation of silt fencing, filter fabric, the construction entrance and any additional erosion and sediment BMPs. Once all temporary BMPs are in place, the site improvements will commence concurrent with clearing and grubbing of the expansion areas, general earthwork activities, followed by the construction of the building. Disturbed areas will be stabilized with hydro-seed, mulch and tack coat. After final stabilization has been achieved, temporary erosion and sediment control BMPs will be removed.

9. Operation and Maintenance Plan

The construction period controls are addressed in the SWPPP developed as part of NPDES permitting activities. The Operations and Maintenance Plan will address the stormwater management systems and required post-construction maintenance activities. The stormwater management system BMPs will be maintained by the City of New Bedford. The Operations and Maintenance Plan provides emergency contact information for personnel to be notified during routine and non-routine maintenance tasks to be undertaken after construction is complete. The proposed schedule for implementing stormwater operation and maintenance is also summarized within the plan.

10. Illicit Discharge Statement

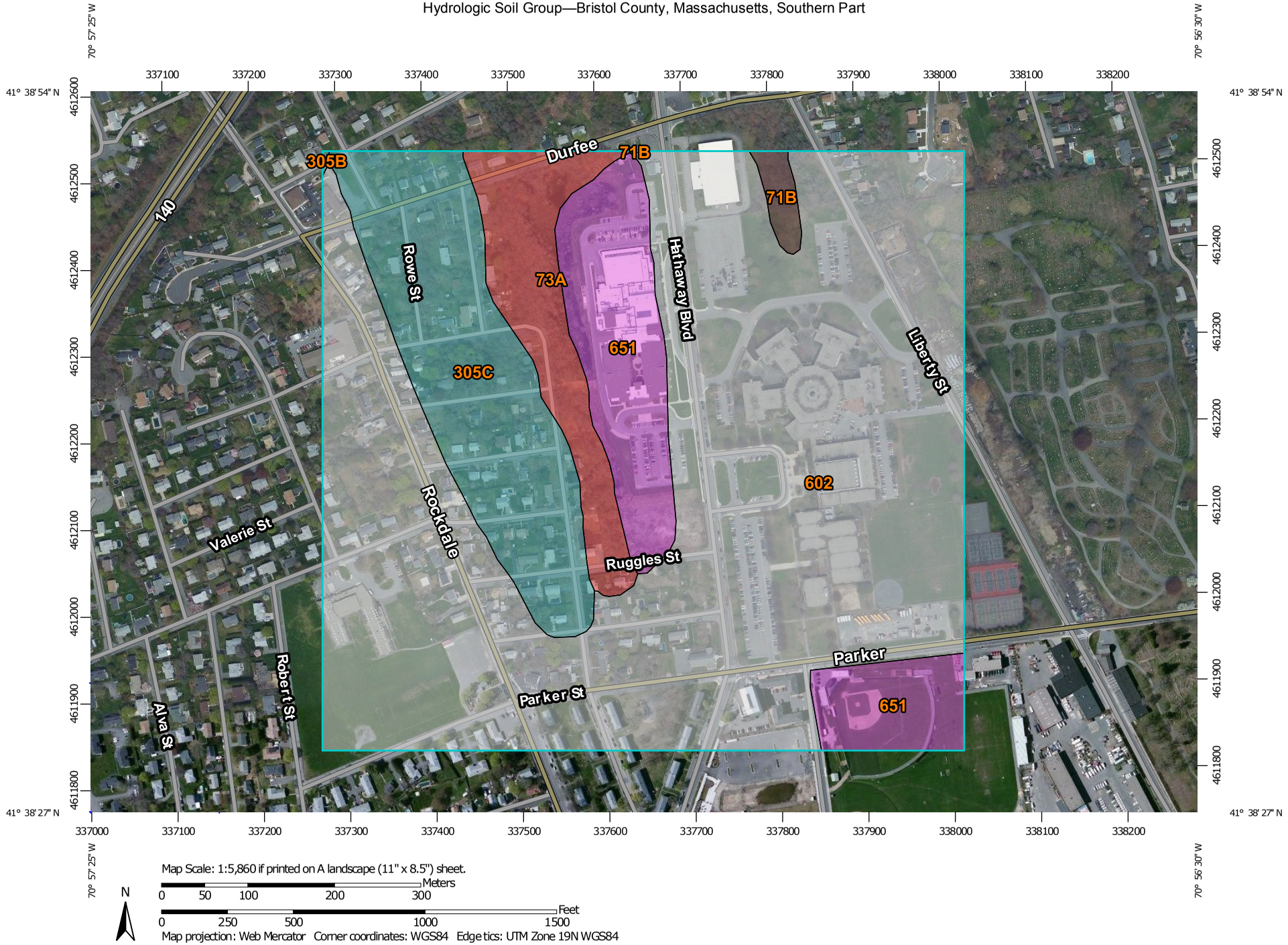
The stormwater management system was designed to convey, treat and infiltrate all stormwater on-site generated during a 25 year, 24-hour design storm. The site grading and stormwater BMPs have also been designed to store runoff on-site in excess of this design standard. There will be minimum off-site discharges or discharges to storm and sanitary sewers. Precipitation from the design storm and storms in excess of this standard will be confined within the areas of disturbance and the developed site footprint. The Site will be surrounded by fencing and access to the Site will be further limited by locked gates to limit the probability of illicit discharges to the Site stormwater BMPs. Stormwater operation and maintenance will be performed according to the BMP Long Term Operations and Maintenance Plan and implement all specified pollution prevention measures.

Section IV
Conclusion

The Nemasket Street Recreational Area Project will disturb approximately 1.61 acres and result in a net decrease in impervious surface of approximately 0.24 acres. The post development stormwater management controls for this project have been designed to address flooding, groundwater recharge and water quality as required by the MassDEP. It is TRC's professional opinion that the proposed improvements to the Site have been designed in accordance with these requirements and can be constructed without negatively impacting offsite drainage.

ATTACHMENTS

Attachment A
NRCS Soils Data and Support Information


70° 57' 25" W
70° 56' 30" W
41° 38' 54" N
41° 38' 27" N
337100
337200
337300
337400
337500
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338000
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338200
337000
4612600
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4612400
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4612100
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4611900
4611800
305B
71B
Durfee
71B
140
Rowe St
73A
Hathaway Blvd
651
Liberty St
305C
602
Rockdale
Valerie St
Ruggles St
Parker
Parker St
651
Robert St
Alva St
N
Map Scale: 1:5,860 if printed on A landscape (11" x 8.5") sheet.
Meters
0 50 100 200 300
Feet
0 250 500 1000 1500
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Bristol County, Massachusetts, Southern Part
Survey Area Data: Version 9, Sep 28, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—Oct 8, 2011

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Bristol County, Massachusetts, Southern Part (MA603)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	B/D	1.0	0.8%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	8.8	6.9%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	0.0	0.0%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	18.3	14.4%
602	Urban land		84.9	66.6%
651	Udorthents, smoothed	A	14.4	11.3%
Totals for Area of Interest			**127.5**	**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

F-1. Rainfall Data for Massachusetts from *Rainfall Frequency Atlas of the United States* (TP-40)

- Users of this Handbook should note that current MA DEP written guidance (see DEP Waterlines newsletter -- Fall 2000) requires the use of TP-40 Rainfall Data for calculations under the Wetlands Protection Regulations and the Stormwater Management Policy. More stringent design storms may be used under a local bylaw or ordinance. However, DEP will continue to require the use of TP-40 in any case it reviews under the Wetlands Protection Act and Stormwater Management Policy.

Adjusted Technical Paper 40 Design Storms for 24-hour Event by County

County Name	1-yr 24-hr	2-yr 24-hr	5-yr 24-hr	10-yr 24-hr	25-yr 24-hr	50-yr 24-hr	100-yr 24-hr
Barnstable	2.5	3.6	4.5	4.8	5.7	6.4	7.1
Berkshire	2.5	2.9	3.8	4.4	5.1	5.9	6.4
Bristol	2.5	3.4	4.3	4.8	5.6	6.3	7.0
Dukes	2.5	3.6	4.6	4.9	5.8	6.5	7.2
Essex	2.5	3.1	3.9	4.5	5.4	5.9	6.5
Franklin	2.5	2.9	3.8	4.3	5.1	5.8	6.2
Hampden	2.5	3.0	4.0	4.6	5.3	6.0	6.5
Hampshire	2.5	3.0	3.9	4.5	5.2	5.9	6.4
Middlesex	2.5	3.1	4.0	4.5	5.3	5.9	6.5
Nantucket	2.5	3.6	4.6	4.9	5.8	6.5	7.2
Norfolk	2.5	3.2	4.1	4.7	5.5	6.1	6.7
Plymouth	2.5	3.4	4.3	4.7	5.6	6.2	7.0
Suffolk	2.5	3.2	4.0	4.6	5.5	6.0	6.6
Worcester	2.5	3.0	4.0	4.5	5.3	5.9	6.5

Stormwater Infiltration Testing Narrative

From April 13-15, 2016, TRC performed an in-situ stormwater vertical infiltration study on site soils at the Nemasket Street Lots (the Site) in accordance with the double-ring infiltrometer method described in ASTM Standard D3385-09. Infiltration tests were performed in six discrete locations to assess the permeability of the subgrade material that will underlie the proposed athletic field. Four test locations were placed in the area of the proposed synthetic turf soccer field, one location was placed in the area of the proposed concrete basketball court and one location was placed in the area of the proposed natural grass landscape. All tests were located outside of former soil-disturbing investigation activities so as to be representative of the soil structure and condition over the majority of the Site.

Prior to the execution of each test, six to twelve inches of topsoil were hand cleared to expose the underlying fill material on which the athletic field will be constructed. For each individual test, an aluminum alloy outer ring of twenty inches in height and twenty-four inches in diameter was driven three to four inches into the ground and leveled. Then an aluminum alloy inner ring of twenty inches in height and twelve inches in diameter was driven two to three inches into the ground and leveled in the center of the larger outer ring. The abundance of glass, brick and metal fragments in the fill material prevented the rings from being driven any farther into the ground. Rings were driven using an aluminum alloy driving cap, a wooden block and a heavy sledge hammer.

The City of New Bedford (the City) provided access to the fire hydrant at 98 Ruggles Street to provide water to the Site from the municipal water supply. The water was added to the rings to a head height of three to four and a half inches and maintained constant and equal between the inner and outer rings for the duration of each test by measurement with hook gauges. The volume of water needed to maintain a constant head was tracked with graduated containers and recorded on field forms. Test durations ranged from four to six hours depending on the time it took to obtain relatively constant infiltration rates.

The results of the infiltration rates are summarized in the table below. Test locations INF-1 through INF-4 were placed in the area of the proposed synthetic turf soccer field, test location INF-5 was placed in the area of the proposed concrete basketball court, and INF-6 was placed in the area of proposed natural grass cover.

Test	Incremental Infiltration Rates (Inner Ring)		
	Lowest	Average	Approximate Maximum-Steady State
	(in/hr)	(in/hr)	(in/hr)
INF-1	6.47	9.69	6.47
INF-2	0.81	2.82	1.89
INF-3	5.18	6.88	6.85
INF-4	0.00	1.37	0.67
INF-5	5.23	6.75	5.23
INF-6	2.70	3.94	2.97

According to the ASTM Standards, "The maximum-steady state or average incremental infiltration velocity, depending on the purpose/application of the test is equivalent to the infiltration rate." Both are included for comparison. The maximum-steady state results are an interpretation of the data. The lowest rates are included for comparison.

Seasonal High Water Table Observation Narrative

On April 20th and 21st, 2016 TRC oversaw investigative test pitting in ten discrete locations at the Nemasket Street Lots and the Keith Middle School (KMS) property. In addition to collecting geotechnical soil samples, TRC inspected the test pits for evidence of a seasonal high water table.

Soil mottling was difficult to identify in the landfill material; however, in two test pits (TP-6 and TP-7 in the Nemasket Lots, see site plan figure) mottling was suspected between 6-7 feet below grade. See photo of potential mottling at TP-7.

At the KMS property, potential mottling was observed in TP-2 below the peat layer at approximately 7 feet below grade. However, it should be noted that this observation may be influenced by potential groundwater mounding from the stormwater management structure located adjacent to the test pit.

It is assumed that the groundwater elevation shouldn't change much between Nemasket and KMS. Using the Nemasket data, TRC estimated that the most conservative seasonal high water table would be six feet below grade, or at an elevation of 87 feet based on an approximate ground elevation of 93 feet in the location of TP-6. In addition, historic groundwater elevations as measured through the three monitoring wells installed on the Nemasket Street Lots show the site groundwater elevation ranging from approximately 82 to 84 feet.

Double-Ring Infiltrometer Field Record Form

Project Identification:	Nemasket Street, New Bedford, MA			Constants		Area (in^2)	Depth of Liquid (in)	Liquid No.	
Test Location:	TP-1								
Liquid Used:	City water			Inner Ring		113.1	3.94	1	
Tested by:	BM	Liquid level maintained using:	Graduated buckets	Annular Space		339.3	3.94	2	
Deptwater to water table:	9.6 ft	Penetration of rings	Inner: 3 in	Outer: 4 in		Duration of Test (hours)	5	Date: 4/14/2016	

Trial No.		Time (hr:min)	Elapsed Time:		Flow Readings						Incremental Infiltration Rate		Remarks
					Inner Reading			Annular Space					
			Δ/total (min)	Δ/total (hr)	Reading (Liters)	Flow (Liters)	Flow (in^3)	Reading (Liters)	Flow (Liters)	Flow (in^3)	**Inner (in/h)	***Annular (in/h)	Weather conditions, etc.
1	S	10:15	15	0.25	14	9.1	555.32	32	25.8	1574.41	19.64	18.56	
	E	10:30	15		4.9			6.2					Sunny, slight wind, Hi 48ºF
2	S	10:30	15	0.25	7	5.5	335.63	24	18.7	1141.14	11.87	13.45	
	E	10:45	30		1.5			5.3					
3	S	10:45	15	0.25	7	4.8	292.91	16	15.8	964.17	10.36	11.37	
	E	11:00	45		2.2			0.2					
4	S	11:00	15	0.25	7	4.1	250.20	16	14.9	909.25	8.85	10.72	
	E	11:15	60		2.9			1.1					
5	S	11:15	30	0.5	14	7.6	463.78	32	26.4	1611.03	8.20	9.50	
	E	11:45	90		6.4			5.6					
6	S	11:45	30	0.5	14	7.3	445.47	32	26.0	1586.62	7.88	9.35	
	E	12:15	120		6.7			6					
7	S	12:15	60	1	14	13.7	836.02	48	47.6	2904.73	7.39	8.56	
	E	13:15	180		0.3			0.4					
8	S	13:15	60	1	14	12.2	744.49	48	42.1	2569.10	6.58	7.57	
	E	14:15	240		1.8			5.9					
9	S	14:15	60	1	14	12	732.28	40	38.5	2349.41	6.47	6.92	
	E	15:15	300		2			1.5					
10	S												
	E												
11	S												
	E												
12	S												
	E												
13	S												
	E												
14	S												
	E												
15	S												
	E												
16	S												
	E												
17	S												
	E												
18	S												
	E												

Notes:

* Calculated from the difference of the elevation of the infiltration test to measured groundwater on 4/13/16

** To calculate the inner ring incremental infiltration velocity in in/hr:

V(ir) = ΔV(ir)/(A(ir)*Δt)

Where:
V(ir) = inner ring incremental infiltration velocity, in/h,
ΔV(ir) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(ir) = internal area of inner ring, in2, and
Δt = time interval, h.

*** To calculate the annular space incremental infiltration velocity in in/hr:

V(a) = ΔV(a)/(A(a)*Δt)

Where:
V(a) = inner ring incremental infiltration velocity, in/h,
ΔV(a) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(a) = internal area of inner ring, in2, and
Δt = time interval, h.

Double-Ring Infiltrometer Field Record Form

Project Identification: Nemasket Street, New Bedford, MA

Test Location: TP-2

Liquid Used: City water

Tested by: CR Liquid level maintained using: Graduated buckets

Deptwater to water table: 5.9 ft Penetration of rings Inner: 3 in Outer: 4 in

Constants		Area (in^2)	Depth of Liquid (in)	Liquid No.
Inner Ring		113.1	3.5	1
Annular Space		339.3	3.5	2

Duration of Test (hours) 6 Date: 4/14/2016

Trial No.		Time (hr:min)	Elapsed Time:		Flow Readings						Incremental Infiltration Rate		Remarks
					Inner Reading			Annular Space					
			Δ/total (min)	Δ/total (hr)	Reading (Liters)	Flow (Liters)	Flow (in^3)	Reading (Liters)	Flow (Liters)	Flow (in^3)	**Inner (in/h)	***Annular (in/h)	Weather conditions, etc.
1	S	10:00	20	0.33	4	1	61.02	8	8	488.19	1.62	4.32	
	E	10:20	20		3			0					Sunny, slight wind, Hi 48ºF
2	S	10:20	20	0.33	3	3	183.07	8	5	305.12	4.86	2.70	
	E	10:40	40		0			3					
3	S	10:40	20	0.33	6	3.5	213.58	8	4.5	274.61	5.67	2.43	
	E	11:00	60		2.5			3.5					
4	S	11:00	30	0.50	6	4	244.09	16	10.5	640.75	4.32	3.78	
	E	11:30	90		2			5.5					
5	S	11:30	30	0.50	6	2.5	152.56	14	9	549.21	2.70	3.24	
	E	12:00	120		3.5			5					
6	S	12:00	60	1.00	6	1.5	91.54	28	26.0	1586.62	0.81	4.68	
	E	13:00	180		4.5			2					
7	S	13:00	60	1.00	6	3.5	213.58	28	23	1403.55	1.89	4.14	
	E	14:00	240		2.5			5					
8	S	14:00	60	1.00	6	3	183.07	28	20	1220.47	1.62	3.60	
	E	15:00	300		3			8					
9	S	15:00	60	1.00	6	3.5	213.58	28	20.5	1250.99	1.89	3.69	
	E	16:00	360		2.5			7.5					
10	S												
	E												
11	S												
	E												
12	S												
	E												
13	S												
	E												
14	S												
	E												
15	S												
	E												
16	S												
	E												
17	S												
	E												
18	S												
	E												

Notes:

* Calculated from the difference of the elevation of the infiltration test to measured groundwater on 4/13/16

** To calculate the inner ring incremental infiltration velocity in in/hr:

V(ir) = ΔV(ir)/(A(ir)*Δt)

Where:
V(ir) = inner ring incremental infiltration velocity, in/h,
ΔV(ir) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(ir) = internal area of inner ring, in2, and
Δt = time interval, h.

*** To calculate the annular space incremental infiltration velocity in in/hr:

V(a) = ΔV(a)/(A(a)*Δt)

Where:
V(a) = inner ring incremental infiltration velocity, in/h,
ΔV(a) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(a) = internal area of inner ring, in2, and
Δt = time interval, h.

Double-Ring Infiltrometer Field Record Form

Project Identification: Nemasket Street, New Bedford, MA

Test Location: TP-3

Liquid Used: City water

Tested by: BM Liquid level maintained using: Graduated buckets

Deptwater to water table: 8.8 ft Penetration of rings Inner: 2 in Outer: 3 in

Constants		Area (in^2)	Depth of Liquid (in)	Liquid No.
Inner Ring		113.1	4.3	1
Annular Space		339.3	4.3	2

Duration of Test (hours) 4 Date: 4/13/2016

Trial No.		Time (hr:min)	Elapsed Time:		Flow Readings						Incremental Infiltration Rate		Remarks
					Inner Reading			Annular Space					
			Δ/total (min)	Δ/total (hr)	Reading (Liters)	Flow (Liters)	Flow (in^3)	Reading (Liters)	Flow (Liters)	Flow (in^3)	**Inner (in/h)	***Annular (in/h)	Weather conditions, etc.
1	S	13:30	15	0.25	7	2.4	146.46	7	7	427.17	5.18	5.04	
	E	13:45	15		4.6			0					Sunny, slight wind, Hi 52ºF
2	S	13:45	15	0.25	5	4.5	274.61	14	10	610.24	9.71	7.19	
	E	14:00	30		0.5			4					
3	S	14:00	15	0.25	7	4.4	268.50	16	15.5	945.87	9.50	11.15	
	E	14:15	45		2.6			0.5					
4	S	14:15	15	0.25	7	2.6	158.66	8	8	488.19	5.61	5.76	
	E	14:30	60		4.4			0					
5	S	14:30	30	0.50	7	5.2	317.32	24	18.2	1110.63	5.61	6.55	
	E	15:00	90		1.8			5.8					
6	S	15:00	30	0.50	7	5.4	329.53	24	18.3	1116.73	5.83	6.58	
	E	15:30	120		1.6			5.7					
7	S	15:30	60	1.00	14	12.5	762.80	40	33.9	2068.70	6.74	6.10	
	E	16:30	180		1.5			6.1					
8	S	16:30	60	1.00	14	12.7	775.00	32	30.8	1879.53	6.85	5.54	
	E	17:30	240		1.3			1.2					
9	S												
	E												
10	S												
	E												
11	S												
	E												
12	S												
	E												
13	S												
	E												
14	S												
	E												
15	S												
	E												
16	S												
	E												
17	S												
	E												
18	S												
	E												

Notes:

* Calculated from the difference of the elevation of the infiltration test to measured groundwater on 4/13/16

** To calculate the inner ring incremental infiltration velocity in in/hr:

V(ir) = ΔV(ir)/(A(ir)*Δt)

Where:
V(ir) = inner ring incremental infiltration velocity, in/h,
ΔV(ir) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(ir) = internal area of inner ring, in2, and
Δt = time interval, h.

*** To calculate the annular space incremental infiltration velocity in in/hr:

V(a) = ΔV(a)/(A(a)*Δt)

Where:
V(a) = inner ring incremental infiltration velocity, in/h,
ΔV(a) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(a) = internal area of inner ring, in2, and
Δt = time interval, h.

Double-Ring Infiltrometer Field Record Form

Project Identification: Nemasket Street, New Bedford, MA

Test Location: TP-4

Liquid Used: City water

Tested by: CR Liquid level maintained using: Graduated buckets

Deptwater to water table: 8.5 ft Penetration of rings Inner: 3 in Outer: 3 in

Constants		Area (in^2)	Depth of Liquid (in)	Liquid No.
Inner Ring		113.1	3.5	1
Annular Space		339.3	3.5	2

Duration of Test (hours) 4 Date: 4/13/2016

Trial No.		Time (hr:min)	Elapsed Time:		Flow Readings						Incremental Infiltration Rate		Remarks
					Inner Reading			Annular Space					
			Δ/total (min)	Δ/total (hr)	Reading (Liters)	Flow (Liters)	Flow (in^3)	Reading (Liters)	Flow (Liters)	Flow (in^3)	**Inner (in/h)	***Annular (in/h)	Weather conditions, etc.
1	S	14:35	15	0.25	5	0.0	0.00	7	5.5	335.63	0.00	3.96	
	E	14:50	15		5			1.5					Sunny, slight wind, Hi 52ºF
2	S	15:00	15	0.25	5	0.5	30.51	8	6.0	366.14	1.08	4.32	
	E	15:15	30		4.5			2					
3	S	15:15	15	0.25	4.5	1.5	91.54	8	5.0	305.12	3.24	3.60	
	E	15:30	45		3			3					
4	S	15:30	15	0.25	3	1.0	61.02	8	4.5	274.61	2.16	3.24	
	E	15:45	60		2			3.5					
5	S	15:45	30	0.50	7	3.0	183.07	9	8.0	488.19	3.24	2.88	
	E	16:15	90		4			1					
6	S	16:15	30	0.50	4	0.5	30.51	18	12.0	732.28	0.54	4.32	
	E	16:45	120		3.5			6					
7	S	16:45	60	1.00	3.5	1.25	76.28	18	13.0	793.31	0.67	2.34	
	E	17:45	180		2.25			5					
8	S	17:45	60	1.00	4	0.0	0.00	26	25.0	1525.59	0.00	4.50	
	E	18:45	240		4			1					
9	S												
	E												
10	S												
	E												
11	S												
	E												
12	S												
	E												
13	S												
	E												
14	S												
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15	S												
	E												
16	S												
	E												
17	S												
	E												
18	S												
	E												

Notes:

* Calculated from the difference of the elevation of the infiltration test to measured groundwater on 4/13/16

** To calculate the inner ring incremental infiltration velocity in in/hr:

V(ir) = ΔV(ir)/(A(ir)*Δt)

Where:
V(ir) = inner ring incremental infiltration velocity, in/h,
ΔV(ir) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(ir) = internal area of inner ring, in2, and
Δt = time interval, h.

*** To calculate the annular space incremental infiltration velocity in in/hr:

V(a) = ΔV(a)/(A(a)*Δt)

Where:
V(a) = inner ring incremental infiltration velocity, in/h,
ΔV(a) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(a) = internal area of inner ring, in2, and
Δt = time interval, h.

Double-Ring Infiltrometer Field Record Form

Project Identification: Nemasket Street, New Bedford, MA

Test Location: TP-5

Liquid Used: City water

Tested by: BM Liquid level maintained using: Graduated buckets

Deptwater to water table: 9.9 ft Penetration of rings: Inner: 3 in Outer: 4 in

Constants		Area (in^2)	Depth of Liquid (in)	Liquid No.
Inner Ring		113.1	3.94	1
Annular Space		339.3	3.94	2

Duration of Test (hours) 5 Date: 4/15/2016

Trial No.		Time (hr:min)	Elapsed Time:		Flow Readings						Incremental Infiltration Rate		Remarks
					Inner Reading			Annular Space					
			Δ/total (min)	Δ/total (hr)	Reading (Liters)	Flow (Liters)	Flow (in^3)	Reading (Liters)	Flow (Liters)	Flow (in^3)	**Inner (in/h)	***Annular (in/h)	Weather conditions, etc.
1	S	10:15	15	0.25	7	4.5	274.61	16	14	854.33	9.71	10.07	
	E	10:30	15		2.5			2					Sunny, slight wind, Hi 52ºF
2	S	10:30	15	0.25	7	3.6	219.69	16	12.9	787.21	7.77	9.28	
	E	10:45	30		3.4			3.1					
3	S	10:45	15	0.25	7	3.9	237.99	16	11.6	707.87	8.42	8.35	
	E	11:00	45		3.1			4.4					
4	S	11:00	15	0.25	7	2.9	176.97	16	9.9	604.13	6.26	7.12	
	E	11:15	60		4.1			6.1					
5	S	11:15	30	0.5	7	5.8	353.94	24	17.6	1074.02	6.26	6.33	
	E	11:45	90		1.2			6.4					
6	S	11:45	30	0.5	7	5.4	329.53	24	16.7	1019.10	5.83	6.01	
	E	12:15	120		1.6			7.3					
7	S	12:15	60	1	14	10.9	665.16	40	34.7	2117.52	5.88	6.24	
	E	13:15	180		3.1			5.3					
8	S	13:15	60	1	14	10.0	610.24	32	32.0	1952.76	5.40	5.76	
	E	14:15	240		4			0					
9	S	14:15	60	1	14	9.7	591.93	32	29.7	1812.40	5.23	5.34	
	E	15:15	300		4.3			2.3					
10	S												
	E												
11	S												
	E												
12	S												
	E												
13	S												
	E												
14	S												
	E												
15	S												
	E												
16	S												
	E												
17	S												
	E												
18	S												
	E												

Notes:

* Calculated from the difference of the elevation of the infiltration test to measured groundwater on 4/13/16

** To calculate the inner ring incremental infiltration velocity in in/hr:

V(ir) = ΔV(ir)/(A(ir)*Δt)

Where:
V(ir) = inner ring incremental infiltration velocity, in/h,
ΔV(ir) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(ir) = internal area of inner ring, in2, and
Δt = time interval, h.

*** To calculate the annular space incremental infiltration velocity in in/hr:

V(a) = ΔV(a)/(A(a)*Δt)

Where:
V(a) = inner ring incremental infiltration velocity, in/h,
ΔV(a) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(a) = internal area of inner ring, in2, and
Δt = time interval, h.
V(a) = inner ring incremental infiltration velocity, in/h,
ΔV(a) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(a) = internal area of inner ring, in2, and
Δt = time interval, h.

Double-Ring Infiltrometer Field Record Form

Project Identification: Nemasket Street, New Bedford, MA

Test Location: TP-6

Liquid Used: City water

Tested by: CR Liquid level maintained using: Graduated buckets

Deptwater to water table: 9.0 ft Penetration of rings Inner: 3 in Outer: 4 in

Constants		Area (in^2)	Depth of Liquid (in)	Liquid No.
Inner Ring		113.1	3.0	1
Annular Space		339.3	3.0	2

Duration of Test (hours) 5.83 Date: 4/15/2016

Trial No.		Time (hr:min)	Elapsed Time:		Flow Readings						Incremental Infiltration Rate		Remarks
					Inner Reading			Annular Space					
			Δ/total (min)	Δ/total (hr)	Reading (Liters)	Flow (Liters)	Flow (in^3)	Reading (Liters)	Flow (Liters)	Flow (in^3)	**Inner (in/h)	***Annular (in/h)	Weather conditions, etc.
1	S	9:10	20	0.33	5	3.75	228.84	24	21.5	1312.01	6.07	11.60	
	E	9:30	20		1.25			2.5					Sunny, slight wind, Hi 52ºF
2	S	9:30	15	0.25	6	2.5	152.56	14	14.0	854.33	5.40	10.07	
	E	9:45	35		3.5			0					
3	S	9:45	15	0.25	6	1.25	76.28	26	17.0	1037.40	2.70	12.23	
	E	10:00	50		4.75			9					
4	S	10:00	30	0.50	6	4.5	274.61	28	28.0	1708.66	4.86	10.07	
	E	10:30	80		1.5			0					
5	S	10:30	30	0.50	6	2.5	152.56	28	27.0	1647.64	2.70	9.71	
	E	11:00	110		3.5			1					
6	S	11:00	60	1.00	13	8.5	518.70	40	40.0	2440.95	4.59	7.19	
	E	12:00	170		4.5			0					
7	S	12:00	60	1.00	7	6.0	366.14	42	34.5	2105.32	3.24	6.20	
	E	13:00	230		1			7.5					
8	S	13:00	60	1.00	7	5.5	335.63	28	28.0	1708.66	2.97	5.04	
	E	14:00	290		1.5			0					
9	S	14:00	60	1.00	7	5.5	335.63	40	27.0	1647.64	2.97	4.86	
	E	15:00	350		1.5			13					
10	S												
	E												
11	S												
	E												
12	S												
	E												
13	S												
	E												
14	S												
	E												
15	S												
	E												
16	S												
	E												
17	S												
	E												
18	S												
	E												

Notes:

* Calculated from the difference of the elevation of the infiltration test to measured groundwater on 4/13/16

** To calculate the inner ring incremental infiltration velocity in in/hr:

$V(ir) = \Delta V(ir)/(A(ir)*\Delta t)$

Where:
V(ir) = inner ring incremental infiltration velocity, in/h,
ΔV(ir) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(ir) = internal area of inner ring, in2, and
Δt = time interval, h.

*** To calculate the annular space incremental infiltration velocity in in/hr:

$V(a) = \Delta V(a)/(A(a)*\Delta t)$

Where:
V(a) = inner ring incremental infiltration velocity, in/h,
ΔV(a) = volume of liquid used during time interval to maintain constant head in the inner ring, in3,
A(a) = internal area of inner ring, in2, and
Δt = time interval, h.

Seasonal High Groundwater Table
Test Pit Photos

Photo 1: TP-2

Photo 2: TP-6

Photo 3: TP-7

TRC Job No.	Photographs Taken By:	Page No.	Client:	Site Name & Address:	
115058	Chris Ragnelli	1 of 1	City of New Bedford	Nemasket Street Lots New Bedford, MA	TRC

TRC
249 Western Ave
Augusta, ME 04330

Main 207.620.3800
Fax 207.621.7001

Minutes of Meeting

Project:	Nemasket Street Soccer Field Design	Meeting Date:	April 25, 2016
Project No.:	115058	Date Prepared:	April 26, 2016
Prepared By:	Pete Trottier Senior Civil Engineer		
Participants:	TRC –Jim Doherty, David Sullivan, Matthew Oliveria Nitsch Engineering –Scott Turner City of New Bedford – Ray Holberger, Sara Porter		
Purpose:	Permitting Meeting		

1. Questions:
    a. If necessary and additional capacity is available, is it acceptable to incorporate the underground stormwater system in the Keith Middle School Parking lot into the soccer field SWM?

       Response - Scot has several versions of the middle school stormwater calculations and will try to find the approved calculations. He stated that if there is any additional capacity in the existing underground system it can be used for this project.

    b. Groundwater recharge requirements - Can we take a credit for the impervious surface (parking lot pavement) we are removing as a result of the soccer field displacing a portion of the lot.

       Response: Credit can be taken for the reduction in impervious surfaces. Scot stated that the state regulations indicate groundwater recharge is not required for sites with contaminated soil. Dave stated that the capping material is mainly a separation barrier and not an impermeable barrier to restrict infiltration. Due to the type of contaminated materials on-site there is no risk of groundwater contamination. Using infiltration will not contribute to groundwater contamination and that ongoing groundwater monitoring is occurring.

    c. If the Soccer field is considered “a pervious surface” What is an acceptable curve

number to represent the soccer field for runoff modeling purposes?

Response: The soccer field can be considered pervious surface.

d. If the turf manufacturer requires underdrain system for the soccer fields can it still qualify as an infiltration BMP?

Response: Underdrain system is acceptable. Scott said because of soil contamination at the site, infiltration for groundwater recharge is not required.

e. The current design does not call for any construction of roadways or parking. What will be the TSS requirements for a soccer field and basketball court?

Response: Scott understands the proposed cover types have a minimal potential for pollutant loading. The city stated that the soccer field will not be used for snow storage. Scott recommended a shallow perimeter swale around the soccer field to collect any crumb rubber materials from leaving the site and entering the wetland.

f. Pre/Post analysis – currently a major portion of the site drains into an on-site isolated wetland and then outlets to the wetland on the west side of the school. Reducing the 2-yr and 10-yr peak rates should not be a problem. If there is a minor increase in the 100-year peak rate is this acceptable? Otherwise a much larger subsurface detention storage system will probably be needed.

Response: Post development peak runoff rates to be controlled to pre development peaks rates. No waiver for peak rate increases is likely to be granted.

2. Other Issues:
    a. It is likely that the NOI will be submitted prior to submittal of the Remedy Implementation Plan so EPA approval will not be in-place at the time of the NOI. However, the EPA has approved the Phase III report which selected the proposed turf field configuration and conceptual drainage plan.

    b. As part of the submittal package, TRC will provide written documentation that the LSP for the site has approved on-site infiltration of stormwater if necessary.

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TRC Reference Number: 115058

May 12, 2016

Mr. Scott Turner, PE, AICP, LEED AP ND
Nitsch Engineering
2 Center Plaza, Suite 430
Boston, Massachusetts 02108

Subject: Influence of Storm Water Infiltration on Impacted Fill
Nemasket Street Lots - Parker Street Waste Site
New Bedford, Massachusetts
Release Tracking Number 4-15685

Dear Mr. Turner:

As you are aware, TRC Environmental Corporation (TRC) is working with the City of New Bedford, Massachusetts to implement a remedial alternative under the Massachusetts Contingency Plan (MCP) that involves the following Nemasket Street properties: map 69, blocks 86 through 93, and blocks 96 through 100, hereafter referred to as "the Site". The Phase II Comprehensive Site Assessment (Phase II) that was completed in January 2012, indicates that fill material was placed at the Site sometime during the period between the 1940s and the 1970s. The fill consists of sandy soil intermingled with ash, coal fragments, asphalt, rubber, slag, brick, concrete, porcelain, glass, fabric, plastic and metal, and is present across the Site and overlies native peat and glaciofluvial deposits. The chemical quality of the fill has been extensively characterized through laboratory analysis. Samples collected and analyzed as part of the Phase II found that the fill material contains certain metals (i.e., arsenic, barium, cadmium, chromium, lead and nickel), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and dioxins above Massachusetts Department of Environmental Protection (MassDEP) soil cleanup standards which consider the potential mobility of these analytes for protection of groundwater.

The remedy for the Site involves the targeted removal of localized fill that contains greater than 100 milligrams per kilogram (mg/kg) total PCBs and redeveloping the Site as a community athletic complex that principally includes a soccer field and basketball courts. The fill will be covered with three feet of clean soil and three types of exposure barriers will be used to limit the potential for direct contact with residual constituents present in the fill. Since two of the three types of exposure barriers (i.e., artificial turf and clean soil) that will be used over the vast majority of the Site are pervious and will allow for continued infiltration of precipitation through the fill, the New Bedford Conservation Commission has requested information from the Licensed Site Professional (LSP) of Record that infiltration is appropriate at this Site given the nature of the impacted fill. This letter provides the requested documentation.

Infiltration is considered appropriate for the Site since the constituents of interest in the fill exhibit a low potential for mobility. As noted above, the fill contains concentrations of certain PAHs, PCBs, dioxins, and metals that are above Massachusetts soil cleanup standards, which take into consideration the potential migration of these constituents from soil to groundwater. Note that the fill materials at the Site contain significant quantities of ash, decomposing wood and cinders which are an abundant source of organic carbon[1].

TRC estimated the maximum theoretical concentration of the PAHs, PCBs, and dioxins that could potentially partition from the soil into water that percolates through the fill (see Attachment 1) using the following equation (Freeze and Cherry, 1979)[2] and site-specific values of organic carbon:

$$C_w = C_s/(K_{oc} * f_{oc})$$

Where: C_w = the maximum equilibrium concentration of the analyte in water that can partition from soil containing the analyte, mass/volume;
C_s = the concentration of the analyte of interest in soil, mass/mass;
K_{oc} = Organic carbon partitioning coefficient, volume/mass; and
f_{oc} = the fraction of organic carbon in the soil/fill.

To provide a conservative worst-case estimate, the maximum concentrations of PAHs, PCBs, and dioxins detected in the fill were used to estimate the concentration of the analytes in water that contacts the fill. As shown in Attachment 1, the maximum concentrations of PAHs, PCBs and dioxins that could leach from the fill and migrate to groundwater are orders of magnitude lower than the applicable GW-2 or GW-3 groundwater cleanup standards that apply to the Site. These data indicate that the fill material is not capable of contributing dissolved PAHs, PCBs, or dioxins to groundwater at levels that could pose a risk to potential receptors. It should be noted that the calculated concentrations do not account for attenuation processes in the subsurface that would further reduce concentrations of these analytes in groundwater.

Unlike organic substances (e.g., PAHs, PCBs, and dioxins), the mobility of the metals of interest (i.e., arsenic, barium, cadmium, chromium, lead, and nickel) is influenced primarily by adsorption of these metals onto minerals that exist within soil or fill, the stability of these minerals, and redox reactions that occur in response to precipitation and storm water infiltration through the fill. These processes, and thus metals mobility, are controlled largely by the pH of the precipitation and storm water. As previously noted, the fill will be covered with precharacterized clean soil that would be below applicable Massachusetts soil cleanup standards and synthetic turf and pavement which are inert. These materials will not significantly alter the pH or chemical characteristics of precipitation or storm water, which has been percolating through the fill for over 30 years. Based on the most current groundwater data which was presented in the Phase II, metals concentrations in wells located at and immediately downgradient of the Site meet the GW-3 groundwater criteria that apply to the Site as well as the more stringent GW-1 criteria[3]. Since the pH and chemical characteristics of the storm water and precipitation is anticipated to be similar to existing conditions, the geochemical reactions and stability of

[1] The average fraction of organic carbon in the soil/fill measured during the Phase II ranged from 0.094 and ranged from 0.0735 to 0.1149.
[2] Freeze, R.A. and J.A. Cherry, 1979. Groundwater. Prentice-Hall, Englewood Cliffs, NJ.
[3] GW-2 standards apply to compounds that could potentially volatile from groundwater to soil gas and cause a vapor intrusion concern to indoor air. Since metals do not volatize, GW-2 criteria do not apply to metals.

minerals that currently limit the mobility of metals are not expected to change. Therefore, there is no basis to conclude that concentrations of metals in groundwater will increase to a level that would pose a risk to potential receptors as a result of infiltration.

If you have any questions or comments, please do not hesitate to contact me at 978-656-3565.

Sincerely,

TRC

David M. Sullivan, LSP
Senior Project Manager

Attachment

Attachment 1
Estimated Maximum Theoretical Concentrations of Organic Constituents of Interest
That Could Leach from Fill
Nemasket Street Properties
New Bedford, Massachusetts

Statement of Problem:

Estimate the theoretical maximum concentration of organic constituents in water infiltrating the fill as the Nemasket Street properties for those constituents exceeding Massachusetts Contigency Plan (MC) generic Method 1 Soil Standards that consider protection of groundwater.

Approach:

The theoretical equlibrium concentration of a constuent that can partition from soil into water contained in the soil pore space is a linear process that is characterized by the Freundlich Isotherm and can be mathmatically expressed by the following equation:

$$C_w = C_s/K_d$$

Where: C_w = Theoretical concentration of constituent in sporewater infiltration through the soil/fill, mass/volume;
C_s = Concentration of constituent in the soil/fill, mass/volume;
K_d = Soil distribution coefficient = Koc * foc, volume/mass;
K_{oc} = organic carbon partitioning coefficient; and
f_{oc} = fraction of organic carbon in the soil/fill, unitless.

Organic carbon partitioning coefficents for organic constituents are established in the scientific literature and were presented in the Phase II Investigation Report (TRC, 2012). The average fraction organic carbon content of thesoil/ fill based on samples analyzed as part of the Phase II Investigation of the Nemasket Street Properties to be 0.094. The organic carbon content is consistent with the presence ash, cinders, wood debris and other sources of organic carbon within the fill. Based on these data and the maximum concentrations of constituents detected in the soil, the maximum theoretical concentrations the the constituents that could be expected to partition from the fill to stormwater or precipitation infiltrating the fill was conservatively estimated in the following table.

Compound	Maximum Concentration in Fill (mg/Kg)	Organic Carbon Partitioning Coefficient, K_{oc} (L/Kg)	Fraction of Organic Carbon, f_{oc} (unitless)	Distribution Coefficient, K_d (L/Kg)	Theoretical Maximum Pore Water Concentration, C_w (mg/L)	Theoretical Maximum Pore Water Concentration, C_w (µg/L)	Appicable MCP Groundwater Criteria GW-2 (µg/L)	Appicable MCP Groundwater Criteria GW-3 (µg/L)
Organic Analytes								
Acenaphthylene	13	4,786	0.094	451	0.029	29	10000	40
Benzo(a)anthracene	120	358,000	0.094	33,759	0.004	4	NA	1,000
Benzo(a)pyrene	93	969,000	0.094	91,377	0.001	1	NA	500
Benzo(b)fluoranthene	130	1,230,000	0.094	115,989	0.001	1	NA	400
Chrysene	130	398,000	0.094	37,531	0.003	3	NA	70
Dibenz(a,h)anthracene	15	1,790,000	0.094	168,797	8.89E-05	0.1	NA	40
ideno(1.2.3-cd)pyrene	53	3,470,000	0.094	327,221	1.62E-04	0.2	NA	100
PCBs	95.295	309,000	0.094	29,139	0.003270393	3	5	10
Dioxins (TEQ)	0.41	1,584,893	0.094	148979.942	2.75E-06	2.75E-03	NA	0.04

As shown in the table above, the maximum concentration of organic constituents of interest would not exceed the groundwater standards that apply to the Site.

Notes:

1. mg/Kg = milligrams per kilogram
2. L/Kg = Liters per kilogram.
3. mg/L = Milligrams per liter.
4. µg/liter.

Attachment B
Water Quality Calculations

PROJECT:	**Newmasket**	**Calculated By:**	PGT
	New Bedford, MA	**Checked By:**	PMM
Proj. No.:	**115058**	**Date:**	May 16, 2016
		Sheet:	1 of 2

Infiltration Volume Calculations

Impervious Area Calculations: **6S** **Basketball Court & Access Path**

	8,856	Basketball Court
	2,315	Access Walkway
Impervious Area, A_{TOTAL}:	11,171	sq.ft

Massachusetts Stormwater Handbook, Volume 1, Standard 3 "Groundwater Recharge" - "The intent of this standard is to ensure that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions."

The volume is calculated by multiplying the new impervious area for each hydrologic soil group by the infiltration coefficient for that soil group.

For this project, all new impervious area is located on HSG A soils.

HSG	Coefficient (inches)	Imp.Area (sf)
A	0.60	11,171
B	0.35	0
C	0.25	0
D	0.10	0

Vol.= $(Area_A*0.60)+(Area_B*0.35)+(Area_C*0.25)+(Area_D*0.01)/12$ cf

Vol.= 559 cf

Massachusetts Stormwater Handbook, Volume 1, Standard 4 "Water Quality Volume" - "Stormwater management sytems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS)."

For this project, the required Water Quality Volume (WQv) equals 1.0 inches of runoff times the new impervious area of the post-development site.

WQv= A_{TOTAL} * 1.0" / 12 cf

WQv= 931 cf

Infiltration Volume Provided:

The infiltration trench provides 3509 cubic feet of storage at elevation of 94.67 feet.
See Pond Nodes 4P & 5P for stage storage table.

PROJECT:	**Newmasket**	**Calculated By:**	PGT
	New Bedford, MA	**Checked By:**	PMM
Proj. No.:	**115058**	**Date:**	May 16, 2016
		Sheet:	2 of 2

Infiltration Volume Calculations

Impervious Area Calculations: **2SA** **Soccer field area**

Existing Impervious Area Removed, A_{EX}:	17,459	sq.ft	Existing parking lot (to be removed)
New Impervious Area Created, A_{NEW}:	68,880	sq.ft	
Net Increase of Impervious Area, A_{TOTAL}:	51,421	sq.ft	

Massachusetts Stormwater Handbook, Volume 1, Standard 3 "Groundwater Recharge" - "The intent of this standard is to ensure that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions."

The volume is calculated by multiplying the new impervious area for each hydrologic soil group by the infiltration coefficient for that soil group.

For this project, all new impervious area is located on HSG A soils.

HSG	Coefficient (inches)	Imp.Area (sf)
A	0.60	51,421
B	0.35	0
C	0.25	0
D	0.10	0

Vol.= $(Area_A*0.60)+(Area_B*0.35)+(Area_C*0.25)+(Area_D*0.01)/12$ cf

Vol.= 2,571 cf

Massachusetts Stormwater Handbook, Volume 1, Standard 4 "Water Quality Volume" - "Stormwater management sytems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS)."

For this project, the required Water Quality Volume (WQv) equals 1.0 inches of runoff times the new impervious area of the post-development site.

WQv= A_{TOTAL} * 1.0" / 12 cf

WQv= 4285 cf

A_{EX} includes part of the existing paved parking lot.
A_{NEW} includes soccer field.

Infiltration Volume Provided:

The soccer field infiltration provides 41,126 cubic feet of storage at a water surface elevation of 94.67 feet. See Pond Node 3P for stage storage table.

PROJECT:	**Newmasket**	**Calculated By:**	PGT
	New Bedford, MA	**Checked By:**	PMM
Proj. No.:	**115058**	**Date:**	May 6, 2016
		Sheet:	1 of 1

Drawdown Calculations for Infiltration BMP's

To determine whether an infiltration BMP will drain within 72 hours. The following formula must be used:

$$Time_d = \frac{Rv}{(K)(1ft/12in)(BA)}$$

Where:

Rv = Storage volume

K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3). For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.

BA = Bottom Area of Recharge Structure

Massachusetts Stormwater Handbook, Volume 3, Chapter 1 Page 25 "Documenting Compliance with the Masachusetts Stormwater Management Standards"

Infiltration	Rv	K	BA	$Time_d$	Required
Id#	ft^3	(in/hr)	ft^2	hr	hr
3P	41126	0.335	68544	21.6	72
4P	1089	2.615	1815	2.8	72
5P	4033	2.615	2475	7.5	72

Double Ring Infiltrometer field testing was performed on April 20th and 21st 2016.
Hydraulic conductivity values used for the infiltration design are as follows:

Test site	Approximate Maximum steady State	50% Saturated Hydraulic Conductivity
INF-4	0.67 in/hr	0.33
INF-5	5.23 in/hr	2.615

Attachment C
Pre- and Post-Development HydroCAD Routings and Calculations

PROJECT:	**City of New Bedford MA**	**Calculated By:**	PGT
	Newmasket St - Soccer Field	**Date:**	5/6/2016
Proj. No.:	**115058.0000.00000**	**Checked By:**	PMM
	Time of Concentration Summary	**Date:**	

Time of Concentration Equations:

1. Where $T_t := \frac{0.007 \cdot (N \cdot L)^{0.8}}{P_2^{0.5} \cdot S^{0.4}}$ from SCS TR-55. For Sheet Flow (300 feet or less)

2. Where $V := 20.3282 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Shallow Concentrated Flow (Paved surfaces)

3. Where $T_t := \frac{L}{3600 \cdot V}$ from the SCS Upland Method *Channel Flow Chart* Travel time equation

4. Where $v := 16.1345 \cdot \sqrt{s}$ from the SCS Upland Method *Channel Flow Chart* For Shallow Concentrated Flow (Unpaved surfaces)

5. Where: v = 7 √s from the SCS Upland Method *Channel Flow Chart* For Shallow Concentrated Flow (Short Grass Pasture)

6. Where: v = 5 √s from the SCS Upland Method *Channel Flow Chart* For Shallow Concentrated Flow (Woodland)

7. Where $v := 12 \cdot \sqrt{s}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Waterways and Swamps, No Channels

8. Where $v := 15 \cdot \sqrt{s}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Grassed Waterways and Roadside Ditches

9. Where $v := 21 \cdot \sqrt{s}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Small Tributary & Swamp w/Channels

10. Where $V := 35 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Large Tributary

11. Where $v := 60 \cdot \sqrt{s}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Main River

12. Where $V := \frac{1.49 \cdot R^{.667} \cdot \sqrt{S}}{N}$ For Channel Flow - Culvert Flow

13. Where P_2 = 2-Year, 24 Hour Rainfall (in) (Bristol, County: P_2= 3.4 inches)

Mannings Roughness Coefficients Table

Surface Description	n - value
Smooth surfaces	0.011
Crush Stone/Substation Yards	0.025
Fallow	0.050
Cultivated: Residue<=20%	0.060
Cultivated: Residue>=20%	0.170
Grass: Short	0.150
Grass: Dense	0.240
Grass: Bermuda	0.410
Range	0.130
Woods: Light underbrush	0.400
Woods: Dense underbrush	0.800

PROJECT:	**City of New Bedford MA**						**Calculated By:**		PGT
	Newmasket St - Soccer Field						**Checked By:**		PMM
TRc Proj. No.:	**115058.0000.00000**						**Date:**		5/6/16
Subcatchment:	**Pre Dev 1S**						**Revised:**		

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.41								
Length, ft	50								
P2 , in	3.4								
Slope, ft/ft	0.0085								
T_t[1], hr	0.286								0.2864
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft			83						
Slope, ft/ft			0.006						
Velocity[2], ft/sec			1.5746156						
T_t[3], hr			0.015						0.0146
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft		49							
Slope, ft/ft		0.0429							
Velocity[4], ft/sec		1.4499							
T_t[3], hr		0.009							0.0094
Woodland									
Length, ft									
Slope, ft/ft									
Velocity[5], ft/sec									
T_t[3], hr									0.0000
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[12], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.310
Min	**18.63**

PROJECT:	**City of New Bedford MA**						**Calculated By:**		PGT
	Newmasket St - Soccer Field						**Checked By:**		PMM
TRc Proj. No.:	**115058.0000.00000**						**Date:**		5/6/16
Subcatchment:	**Pre Dev 2S**						**Revised:**		

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.41								
Length, ft	50								
P2 , in	3.4								
Slope, ft/ft	0.0071								
T_t[1], hr	0.308								0.3078
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft		54							
Slope, ft/ft		0.0574							
Velocity[4], ft/sec		1.6771							
T_t[3], hr		0.009							0.0089
Woodland									
Length, ft									
Slope, ft/ft									
Velocity[5], ft/sec									
T_t[3], hr									0.0000
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft			217						
Slope, ft/ft			0.0184						
Velocity[7], ft/sec			2.035						
T_t, hr			0.030						0.0296
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[12], ft/sec									
Length, L, ft									
T_t, hr									0.0000

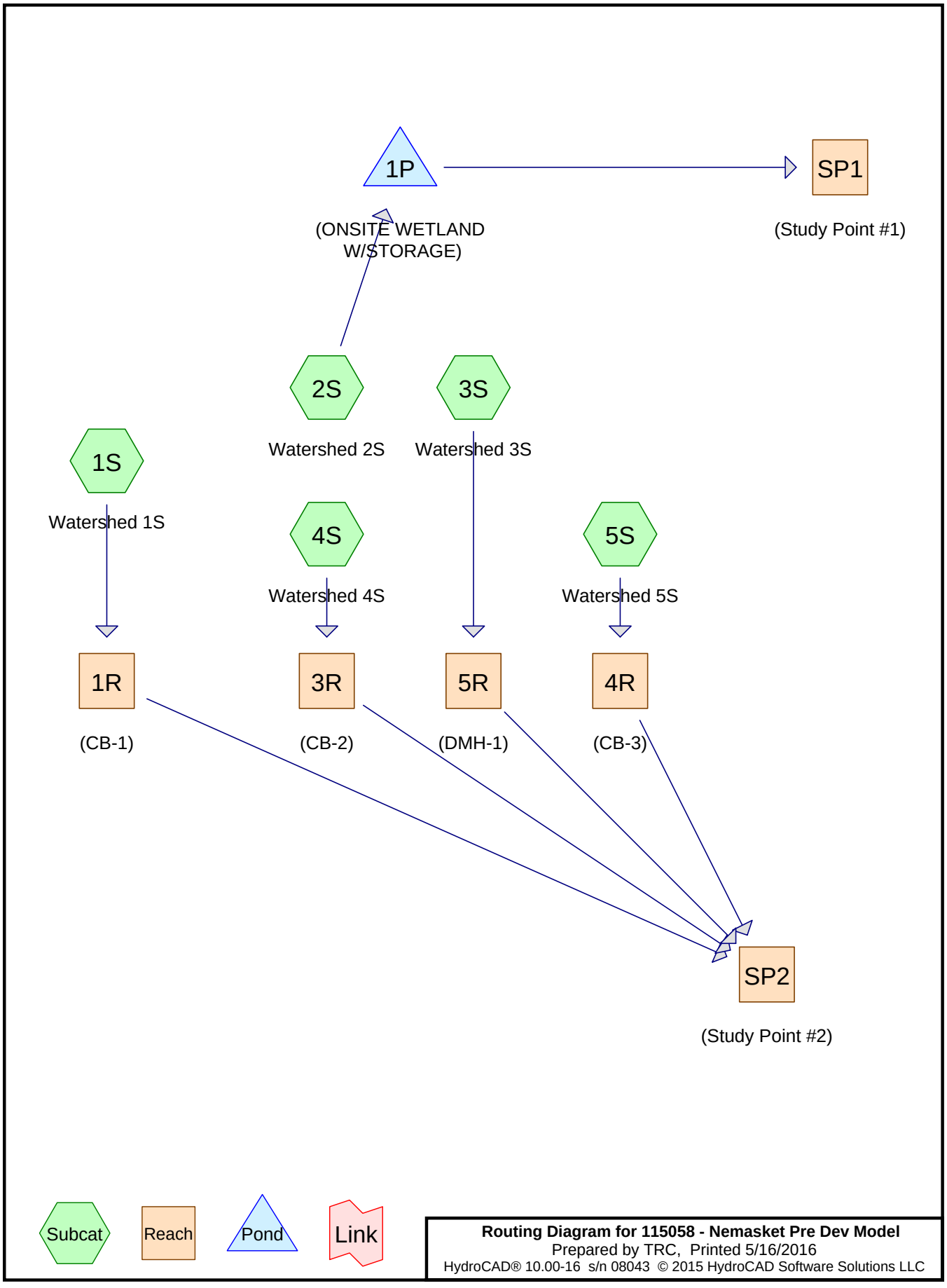
HR	0.346
Min	**20.78**

PROJECT:	**City of New Bedford MA**						**Calculated By:**		PGT
	Newmasket St - Soccer Field						**Checked By:**		PMM
TRc Proj. No.:	**115058.0000.00000**						**Date:**		5/16/16
Subcatchment:	**Pre Dev 4S**						**Revised:**		

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.41								
Length, ft	50								
P2 , in	3.4								
Slope, ft/ft	0.0358								
T_t[1], hr	0.161								0.1611
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft		87							
Slope, ft/ft		0.0118							
Velocity[2], ft/sec		2.2082077							
T_t[3], hr		0.011							0.0109
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft									
Slope, ft/ft									
Velocity[5], ft/sec									
T_t[3], hr									0.0000
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[12], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.172
Min	**10.33**


1P
SP1
(ONSITE WETLAND W/STORAGE)
(Study Point #1)
2S
3S
Watershed 2S
Watershed 3S
1S
Watershed 1S
4S
5S
Watershed 4S
Watershed 5S
1R
3R
5R
4R
(CB-1)
(CB-2)
(DMH-1)
(CB-3)
SP2
(Study Point #2)
Subcat
Reach
Pond
Link
Routing Diagram for 115058 - Nemasket Pre Dev Model
Prepared by TRC, Printed 5/16/2016
HydroCAD® 10.00-16 s/n 08043 © 2015 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.847	39	>75% Grass cover, Good, HSG A (3S, 4S, 5S)
1.535	30	Brush, Good, HSG A (1S, 2S, 4S, 5S)
0.087	73	Brush, Good, HSG D (1S, 2S)
1.680	98	Paved parking, HSG A (1S, 3S, 4S, 5S)
0.026	77	Woods, Good, HSG D (1S)
0.021	45	Woods, Poor, HSG A (2S)
0.338	83	Woods, Poor, HSG D (2S)
4.534	**62**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.083	HSG A	1S, 2S, 3S, 4S, 5S
0.000	HSG B	
0.000	HSG C	
0.451	HSG D	1S, 2S
0.000	Other	
4.534		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.847	0.000	0.000	0.000	0.000	0.847	>75% Grass cover, Good	3S, 4S, 5S
1.535	0.000	0.000	0.087	0.000	1.622	Brush, Good	1S, 2S, 4S, 5S
1.680	0.000	0.000	0.000	0.000	1.680	Paved parking	1S, 3S, 4S, 5S
0.000	0.000	0.000	0.026	0.000	0.026	Woods, Good	1S
0.021	0.000	0.000	0.338	0.000	0.359	Woods, Poor	2S
4.083	**0.000**	**0.000**	**0.451**	**0.000**	**4.534**	**TOTAL AREA**	

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Watershed 1S Runoff Area=0.785 ac 20.25% Impervious Runoff Depth=0.11"
Tc=18.6 min CN=47 Runoff=0.01 cfs 0.007 af

Subcatchment 2S: Watershed 2S Runoff Area=1.150 ac 0.00% Impervious Runoff Depth=0.13"
Tc=20.8 min CN=48 Runoff=0.02 cfs 0.012 af

Subcatchment 3S: Watershed 3S Runoff Area=1.938 ac 64.19% Impervious Runoff Depth=1.36"
Tc=6.0 min CN=77 Runoff=2.97 cfs 0.219 af

Subcatchment 4S: Watershed 4S Runoff Area=0.266 ac 38.72% Impervious Runoff Depth=0.38"
Tc=10.3 min CN=57 Runoff=0.05 cfs 0.008 af

Subcatchment 5S: Watershed 5S Runoff Area=0.395 ac 44.05% Impervious Runoff Depth=0.61"
Tc=6.0 min CN=63 Runoff=0.21 cfs 0.020 af

Reach 1R: (CB-1) Inflow=0.01 cfs 0.007 af
Outflow=0.01 cfs 0.007 af

Reach 3R: (CB-2) Inflow=0.05 cfs 0.008 af
Outflow=0.05 cfs 0.008 af

Reach 4R: (CB-3) Inflow=0.21 cfs 0.020 af
Outflow=0.21 cfs 0.020 af

Reach 5R: (DMH-1) Inflow=2.97 cfs 0.219 af
Outflow=2.97 cfs 0.219 af

Reach SP1: (Study Point #1) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP2: (Study Point #2) Inflow=3.20 cfs 0.255 af
Outflow=3.20 cfs 0.255 af

Pond 1P: (ONSITE WETLAND W/STORAGE) Peak Elev=85.36' Storage=526 cf Inflow=0.02 cfs 0.012 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 4.534 ac Runoff Volume = 0.267 af Average Runoff Depth = 0.71"
62.95% Pervious = 2.854 ac 37.05% Impervious = 1.680 ac

Summary for Subcatchment 1S: Watershed 1S

Runoff = 0.01 cfs @ 13.94 hrs, Volume= 0.007 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.159	98	Paved parking, HSG A
0.026	77	Woods, Good, HSG D
0.572	30	Brush, Good, HSG A
0.028	73	Brush, Good, HSG D
0.785	47	Weighted Average
0.626		79.75% Pervious Area
0.159		20.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.6					**Direct Entry, see spreadsheet**

Summary for Subcatchment 2S: Watershed 2S

Runoff = 0.02 cfs @ 13.80 hrs, Volume= 0.012 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.021	45	Woods, Poor, HSG A
0.338	83	Woods, Poor, HSG D
0.732	30	Brush, Good, HSG A
0.059	73	Brush, Good, HSG D
1.150	48	Weighted Average
1.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8					**Direct Entry, See spreadsheet**

Summary for Subcatchment 3S: Watershed 3S

Runoff = 2.97 cfs @ 12.10 hrs, Volume= 0.219 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
1.244	98	Paved parking, HSG A
0.694	39	>75% Grass cover, Good, HSG A
1.938	77	Weighted Average
0.694		35.81% Pervious Area
1.244		64.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - Minimum**

Summary for Subcatchment 4S: Watershed 4S

Runoff = 0.05 cfs @ 12.27 hrs, Volume= 0.008 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.103	98	Paved parking, HSG A
0.014	39	>75% Grass cover, Good, HSG A
0.149	30	Brush, Good, HSG A
0.266	57	Weighted Average
0.163		61.28% Pervious Area
0.103		38.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3					**Direct Entry, see spreadsheet**

Summary for Subcatchment 5S: Watershed 5S

Runoff = 0.21 cfs @ 12.11 hrs, Volume= 0.020 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.174	98	Paved parking, HSG A
0.139	39	>75% Grass cover, Good, HSG A
0.082	30	Brush, Good, HSG A
0.395	63	Weighted Average
0.221		55.95% Pervious Area
0.174		44.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - minimum**

Summary for Reach 1R: (CB-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.785 ac, 20.25% Impervious, Inflow Depth = 0.11" for 2YR-24HR event
Inflow = 0.01 cfs @ 13.94 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 13.94 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: (CB-2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.266 ac, 38.72% Impervious, Inflow Depth = 0.38" for 2YR-24HR event
Inflow = 0.05 cfs @ 12.27 hrs, Volume= 0.008 af
Outflow = 0.05 cfs @ 12.27 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: (CB-3)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.395 ac, 44.05% Impervious, Inflow Depth = 0.61" for 2YR-24HR event
Inflow = 0.21 cfs @ 12.11 hrs, Volume= 0.020 af
Outflow = 0.21 cfs @ 12.11 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: (DMH-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.938 ac, 64.19% Impervious, Inflow Depth = 1.36" for 2YR-24HR event
Inflow = 2.97 cfs @ 12.10 hrs, Volume= 0.219 af
Outflow = 2.97 cfs @ 12.10 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach SP1: (Study Point #1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2YR-24HR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: (Study Point #2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.384 ac, 49.65% Impervious, Inflow Depth = 0.90" for 2YR-24HR event
Inflow = 3.20 cfs @ 12.10 hrs, Volume= 0.255 af
Outflow = 3.20 cfs @ 12.10 hrs, Volume= 0.255 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: (ONSITE WETLAND W/STORAGE)

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 0.13" for 2YR-24HR event
Inflow = 0.02 cfs @ 13.80 hrs, Volume= 0.012 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 85.36' @ 25.25 hrs Surf.Area= 1,828 sf Storage= 526 cf
Flood Elev= 89.50' Surf.Area= 6,808 sf Storage= 17,798 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	17,798 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	1,134	0	0
86.00	3,087	2,111	2,111
87.00	4,474	3,781	5,891
88.00	5,586	5,030	10,921
89.00	6,807	6,197	17,118
89.10	6,808	681	17,798

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**50.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Watershed 1S Runoff Area=0.785 ac 20.25% Impervious Runoff Depth=0.47"
Tc=18.6 min CN=47 Runoff=0.15 cfs 0.031 af

Subcatchment 2S: Watershed 2S Runoff Area=1.150 ac 0.00% Impervious Runoff Depth=0.51"
Tc=20.8 min CN=48 Runoff=0.26 cfs 0.049 af

Subcatchment 3S: Watershed 3S Runoff Area=1.938 ac 64.19% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=77 Runoff=5.47 cfs 0.397 af

Subcatchment 4S: Watershed 4S Runoff Area=0.266 ac 38.72% Impervious Runoff Depth=1.00"
Tc=10.3 min CN=57 Runoff=0.22 cfs 0.022 af

Subcatchment 5S: Watershed 5S Runoff Area=0.395 ac 44.05% Impervious Runoff Depth=1.38"
Tc=6.0 min CN=63 Runoff=0.58 cfs 0.046 af

Reach 1R: (CB-1) Inflow=0.15 cfs 0.031 af
Outflow=0.15 cfs 0.031 af

Reach 3R: (CB-2) Inflow=0.22 cfs 0.022 af
Outflow=0.22 cfs 0.022 af

Reach 4R: (CB-3) Inflow=0.58 cfs 0.046 af
Outflow=0.58 cfs 0.046 af

Reach 5R: (DMH-1) Inflow=5.47 cfs 0.397 af
Outflow=5.47 cfs 0.397 af

Reach SP1: (Study Point #1) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP2: (Study Point #2) Inflow=6.23 cfs 0.495 af
Outflow=6.23 cfs 0.495 af

Pond 1P: (ONSITE WETLAND W/STORAGE) Peak Elev=86.01' Storage=2,149 cf Inflow=0.26 cfs 0.049 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 4.534 ac Runoff Volume = 0.544 af Average Runoff Depth = 1.44"
62.95% Pervious = 2.854 ac 37.05% Impervious = 1.680 ac

Summary for Subcatchment 1S: Watershed 1S

Runoff = 0.15 cfs @ 12.48 hrs, Volume= 0.031 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.159	98	Paved parking, HSG A
0.026	77	Woods, Good, HSG D
0.572	30	Brush, Good, HSG A
0.028	73	Brush, Good, HSG D
0.785	47	Weighted Average
0.626		79.75% Pervious Area
0.159		20.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.6					**Direct Entry, see spreadsheet**

Summary for Subcatchment 2S: Watershed 2S

Runoff = 0.26 cfs @ 12.49 hrs, Volume= 0.049 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.021	45	Woods, Poor, HSG A
0.338	83	Woods, Poor, HSG D
0.732	30	Brush, Good, HSG A
0.059	73	Brush, Good, HSG D
1.150	48	Weighted Average
1.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8					**Direct Entry, See spreadsheet**

Summary for Subcatchment 3S: Watershed 3S

Runoff = 5.47 cfs @ 12.09 hrs, Volume= 0.397 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
1.244	98	Paved parking, HSG A
0.694	39	>75% Grass cover, Good, HSG A
1.938	77	Weighted Average
0.694		35.81% Pervious Area
1.244		64.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - Minimum**

Summary for Subcatchment 4S: Watershed 4S

Runoff = 0.22 cfs @ 12.17 hrs, Volume= 0.022 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.103	98	Paved parking, HSG A
0.014	39	>75% Grass cover, Good, HSG A
0.149	30	Brush, Good, HSG A
0.266	57	Weighted Average
0.163		61.28% Pervious Area
0.103		38.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3					**Direct Entry, see spreadsheet**

Summary for Subcatchment 5S: Watershed 5S

Runoff = 0.58 cfs @ 12.10 hrs, Volume= 0.046 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.174	98	Paved parking, HSG A
0.139	39	>75% Grass cover, Good, HSG A
0.082	30	Brush, Good, HSG A
0.395	63	Weighted Average
0.221		55.95% Pervious Area
0.174		44.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - minimum**

Summary for Reach 1R: (CB-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.785 ac, 20.25% Impervious, Inflow Depth = 0.47" for 10YR-24HR event
Inflow = 0.15 cfs @ 12.48 hrs, Volume= 0.031 af
Outflow = 0.15 cfs @ 12.48 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: (CB-2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.266 ac, 38.72% Impervious, Inflow Depth = 1.00" for 10YR-24HR event
Inflow = 0.22 cfs @ 12.17 hrs, Volume= 0.022 af
Outflow = 0.22 cfs @ 12.17 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: (CB-3)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.395 ac, 44.05% Impervious, Inflow Depth = 1.38" for 10YR-24HR event
Inflow = 0.58 cfs @ 12.10 hrs, Volume= 0.046 af
Outflow = 0.58 cfs @ 12.10 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: (DMH-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.938 ac, 64.19% Impervious, Inflow Depth = 2.46" for 10YR-24HR event
Inflow = 5.47 cfs @ 12.09 hrs, Volume= 0.397 af
Outflow = 5.47 cfs @ 12.09 hrs, Volume= 0.397 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach SP1: (Study Point #1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10YR-24HR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: (Study Point #2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.384 ac, 49.65% Impervious, Inflow Depth = 1.76" for 10YR-24HR event
Inflow = 6.23 cfs @ 12.10 hrs, Volume= 0.495 af
Outflow = 6.23 cfs @ 12.10 hrs, Volume= 0.495 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: (ONSITE WETLAND W/STORAGE)

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 0.51" for 10YR-24HR event
Inflow = 0.26 cfs @ 12.49 hrs, Volume= 0.049 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 86.01' @ 25.25 hrs Surf.Area= 3,104 sf Storage= 2,149 cf
Flood Elev= 89.50' Surf.Area= 6,808 sf Storage= 17,798 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	17,798 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	1,134	0	0
86.00	3,087	2,111	2,111
87.00	4,474	3,781	5,891
88.00	5,586	5,030	10,921
89.00	6,807	6,197	17,118
89.10	6,808	681	17,798

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**50.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Watershed 1S Runoff Area=0.785 ac 20.25% Impervious Runoff Depth=0.77"
Tc=18.6 min CN=47 Runoff=0.31 cfs 0.050 af

Subcatchment 2S: Watershed 2S Runoff Area=1.150 ac 0.00% Impervious Runoff Depth=0.83"
Tc=20.8 min CN=48 Runoff=0.51 cfs 0.079 af

Subcatchment 3S: Watershed 3S Runoff Area=1.938 ac 64.19% Impervious Runoff Depth=3.13"
Tc=6.0 min CN=77 Runoff=6.98 cfs 0.506 af

Subcatchment 4S: Watershed 4S Runoff Area=0.266 ac 38.72% Impervious Runoff Depth=1.44"
Tc=10.3 min CN=57 Runoff=0.34 cfs 0.032 af

Subcatchment 5S: Watershed 5S Runoff Area=0.395 ac 44.05% Impervious Runoff Depth=1.90"
Tc=6.0 min CN=63 Runoff=0.83 cfs 0.063 af

Reach 1R: (CB-1) Inflow=0.31 cfs 0.050 af
Outflow=0.31 cfs 0.050 af

Reach 3R: (CB-2) Inflow=0.34 cfs 0.032 af
Outflow=0.34 cfs 0.032 af

Reach 4R: (CB-3) Inflow=0.83 cfs 0.063 af
Outflow=0.83 cfs 0.063 af

Reach 5R: (DMH-1) Inflow=6.98 cfs 0.506 af
Outflow=6.98 cfs 0.506 af

Reach SP1: (Study Point #1) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP2: (Study Point #2) Inflow=8.13 cfs 0.650 af
Outflow=8.13 cfs 0.650 af

Pond 1P: (ONSITE WETLAND W/STORAGE) Peak Elev=86.40' Storage=3,449 cf Inflow=0.51 cfs 0.079 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 4.534 ac Runoff Volume = 0.730 af Average Runoff Depth = 1.93"
62.95% Pervious = 2.854 ac 37.05% Impervious = 1.680 ac

Summary for Subcatchment 1S: Watershed 1S

Runoff = 0.31 cfs @ 12.38 hrs, Volume= 0.050 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.159	98	Paved parking, HSG A
0.026	77	Woods, Good, HSG D
0.572	30	Brush, Good, HSG A
0.028	73	Brush, Good, HSG D
0.785	47	Weighted Average
0.626		79.75% Pervious Area
0.159		20.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.6					**Direct Entry, see spreadsheet**

Summary for Subcatchment 2S: Watershed 2S

Runoff = 0.51 cfs @ 12.40 hrs, Volume= 0.079 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.021	45	Woods, Poor, HSG A
0.338	83	Woods, Poor, HSG D
0.732	30	Brush, Good, HSG A
0.059	73	Brush, Good, HSG D
1.150	48	Weighted Average
1.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8					**Direct Entry, See spreadsheet**

Summary for Subcatchment 3S: Watershed 3S

Runoff = 6.98 cfs @ 12.09 hrs, Volume= 0.506 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
1.244	98	Paved parking, HSG A
0.694	39	>75% Grass cover, Good, HSG A
1.938	77	Weighted Average
0.694		35.81% Pervious Area
1.244		64.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - Minimum**

Summary for Subcatchment 4S: Watershed 4S

Runoff = 0.34 cfs @ 12.16 hrs, Volume= 0.032 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.103	98	Paved parking, HSG A
0.014	39	>75% Grass cover, Good, HSG A
0.149	30	Brush, Good, HSG A
0.266	57	Weighted Average
0.163		61.28% Pervious Area
0.103		38.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3					**Direct Entry, see spreadsheet**

Summary for Subcatchment 5S: Watershed 5S

Runoff = 0.83 cfs @ 12.10 hrs, Volume= 0.063 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.174	98	Paved parking, HSG A
0.139	39	>75% Grass cover, Good, HSG A
0.082	30	Brush, Good, HSG A
0.395	63	Weighted Average
0.221		55.95% Pervious Area
0.174		44.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - minimum**

Summary for Reach 1R: (CB-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.785 ac, 20.25% Impervious, Inflow Depth = 0.77" for 25YR-24HR event
Inflow = 0.31 cfs @ 12.38 hrs, Volume= 0.050 af
Outflow = 0.31 cfs @ 12.38 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: (CB-2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.266 ac, 38.72% Impervious, Inflow Depth = 1.44" for 25YR-24HR event
Inflow = 0.34 cfs @ 12.16 hrs, Volume= 0.032 af
Outflow = 0.34 cfs @ 12.16 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: (CB-3)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.395 ac, 44.05% Impervious, Inflow Depth = 1.90" for 25YR-24HR event
Inflow = 0.83 cfs @ 12.10 hrs, Volume= 0.063 af
Outflow = 0.83 cfs @ 12.10 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: (DMH-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.938 ac, 64.19% Impervious, Inflow Depth = 3.13" for 25YR-24HR event
Inflow = 6.98 cfs @ 12.09 hrs, Volume= 0.506 af
Outflow = 6.98 cfs @ 12.09 hrs, Volume= 0.506 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach SP1: (Study Point #1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 0.00" for 25YR-24HR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: (Study Point #2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.384 ac, 49.65% Impervious, Inflow Depth = 2.31" for 25YR-24HR event
Inflow = 8.13 cfs @ 12.10 hrs, Volume= 0.650 af
Outflow = 8.13 cfs @ 12.10 hrs, Volume= 0.650 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: (ONSITE WETLAND W/STORAGE)

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 0.83" for 25YR-24HR event
Inflow = 0.51 cfs @ 12.40 hrs, Volume= 0.079 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 86.40' @ 25.25 hrs Surf.Area= 3,639 sf Storage= 3,449 cf
Flood Elev= 89.50' Surf.Area= 6,808 sf Storage= 17,798 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	17,798 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	1,134	0	0
86.00	3,087	2,111	2,111
87.00	4,474	3,781	5,891
88.00	5,586	5,030	10,921
89.00	6,807	6,197	17,118
89.10	6,808	681	17,798

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**50.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Time span=5.00-30.00 hrs, dt=0.05 hrs, 501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Watershed 1S Runoff Area=0.785 ac 20.25% Impervious Runoff Depth=1.41"
Tc=18.6 min CN=47 Runoff=0.72 cfs 0.092 af

Subcatchment 2S: Watershed 2S Runoff Area=1.150 ac 0.00% Impervious Runoff Depth=1.49"
Tc=20.8 min CN=48 Runoff=1.10 cfs 0.143 af

Subcatchment 3S: Watershed 3S Runoff Area=1.938 ac 64.19% Impervious Runoff Depth=4.37"
Tc=6.0 min CN=77 Runoff=9.68 cfs 0.705 af

Subcatchment 4S: Watershed 4S Runoff Area=0.266 ac 38.72% Impervious Runoff Depth=2.31"
Tc=10.3 min CN=57 Runoff=0.59 cfs 0.051 af

Subcatchment 5S: Watershed 5S Runoff Area=0.395 ac 44.05% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=63 Runoff=1.30 cfs 0.095 af

Reach 1R: (CB-1) Inflow=0.72 cfs 0.092 af
Outflow=0.72 cfs 0.092 af

Reach 3R: (CB-2) Inflow=0.59 cfs 0.051 af
Outflow=0.59 cfs 0.051 af

Reach 4R: (CB-3) Inflow=1.30 cfs 0.095 af
Outflow=1.30 cfs 0.095 af

Reach 5R: (DMH-1) Inflow=9.68 cfs 0.705 af
Outflow=9.68 cfs 0.705 af

Reach SP1: (Study Point #1) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP2: (Study Point #2) Inflow=11.73 cfs 0.944 af
Outflow=11.73 cfs 0.944 af

Pond 1P: (ONSITE WETLAND W/STORAGE) Peak Elev=87.07' Storage=6,225 cf Inflow=1.10 cfs 0.143 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 4.534 ac Runoff Volume = 1.087 af Average Runoff Depth = 2.88"
62.95% Pervious = 2.854 ac 37.05% Impervious = 1.680 ac

Summary for Subcatchment 1S: Watershed 1S

Runoff = 0.72 cfs @ 12.31 hrs, Volume= 0.092 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.159	98	Paved parking, HSG A
0.026	77	Woods, Good, HSG D
0.572	30	Brush, Good, HSG A
0.028	73	Brush, Good, HSG D
0.785	47	Weighted Average
0.626		79.75% Pervious Area
0.159		20.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.6					**Direct Entry, see spreadsheet**

Summary for Subcatchment 2S: Watershed 2S

Runoff = 1.10 cfs @ 12.35 hrs, Volume= 0.143 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.021	45	Woods, Poor, HSG A
0.338	83	Woods, Poor, HSG D
0.732	30	Brush, Good, HSG A
0.059	73	Brush, Good, HSG D
1.150	48	Weighted Average
1.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8					**Direct Entry, See spreadsheet**

Summary for Subcatchment 3S: Watershed 3S

Runoff = 9.68 cfs @ 12.09 hrs, Volume= 0.705 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
1.244	98	Paved parking, HSG A
0.694	39	>75% Grass cover, Good, HSG A
1.938	77	Weighted Average
0.694		35.81% Pervious Area
1.244		64.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - Minimum**

Summary for Subcatchment 4S: Watershed 4S

Runoff = 0.59 cfs @ 12.16 hrs, Volume= 0.051 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.103	98	Paved parking, HSG A
0.014	39	>75% Grass cover, Good, HSG A
0.149	30	Brush, Good, HSG A
0.266	57	Weighted Average
0.163		61.28% Pervious Area
0.103		38.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3					**Direct Entry, see spreadsheet**

Summary for Subcatchment 5S: Watershed 5S

Runoff = 1.30 cfs @ 12.10 hrs, Volume= 0.095 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.174	98	Paved parking, HSG A
0.139	39	>75% Grass cover, Good, HSG A
0.082	30	Brush, Good, HSG A
0.395	63	Weighted Average
0.221		55.95% Pervious Area
0.174		44.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - minimum**

Summary for Reach 1R: (CB-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.785 ac, 20.25% Impervious, Inflow Depth = 1.41" for 100YR-24HR event
Inflow = 0.72 cfs @ 12.31 hrs, Volume= 0.092 af
Outflow = 0.72 cfs @ 12.31 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: (CB-2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.266 ac, 38.72% Impervious, Inflow Depth = 2.31" for 100YR-24HR event
Inflow = 0.59 cfs @ 12.16 hrs, Volume= 0.051 af
Outflow = 0.59 cfs @ 12.16 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: (CB-3)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.395 ac, 44.05% Impervious, Inflow Depth = 2.90" for 100YR-24HR event
Inflow = 1.30 cfs @ 12.10 hrs, Volume= 0.095 af
Outflow = 1.30 cfs @ 12.10 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: (DMH-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.938 ac, 64.19% Impervious, Inflow Depth = 4.37" for 100YR-24HR event
Inflow = 9.68 cfs @ 12.09 hrs, Volume= 0.705 af
Outflow = 9.68 cfs @ 12.09 hrs, Volume= 0.705 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach SP1: (Study Point #1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 0.00" for 100YR-24HR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: (Study Point #2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.384 ac, 49.65% Impervious, Inflow Depth = 3.35" for 100YR-24HR event
Inflow = 11.73 cfs @ 12.10 hrs, Volume= 0.944 af
Outflow = 11.73 cfs @ 12.10 hrs, Volume= 0.944 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: (ONSITE WETLAND W/STORAGE)

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 1.49" for 100YR-24HR event
Inflow = 1.10 cfs @ 12.35 hrs, Volume= 0.143 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 87.07' @ 25.25 hrs Surf.Area= 4,556 sf Storage= 6,225 cf
Flood Elev= 89.50' Surf.Area= 6,808 sf Storage= 17,798 cf

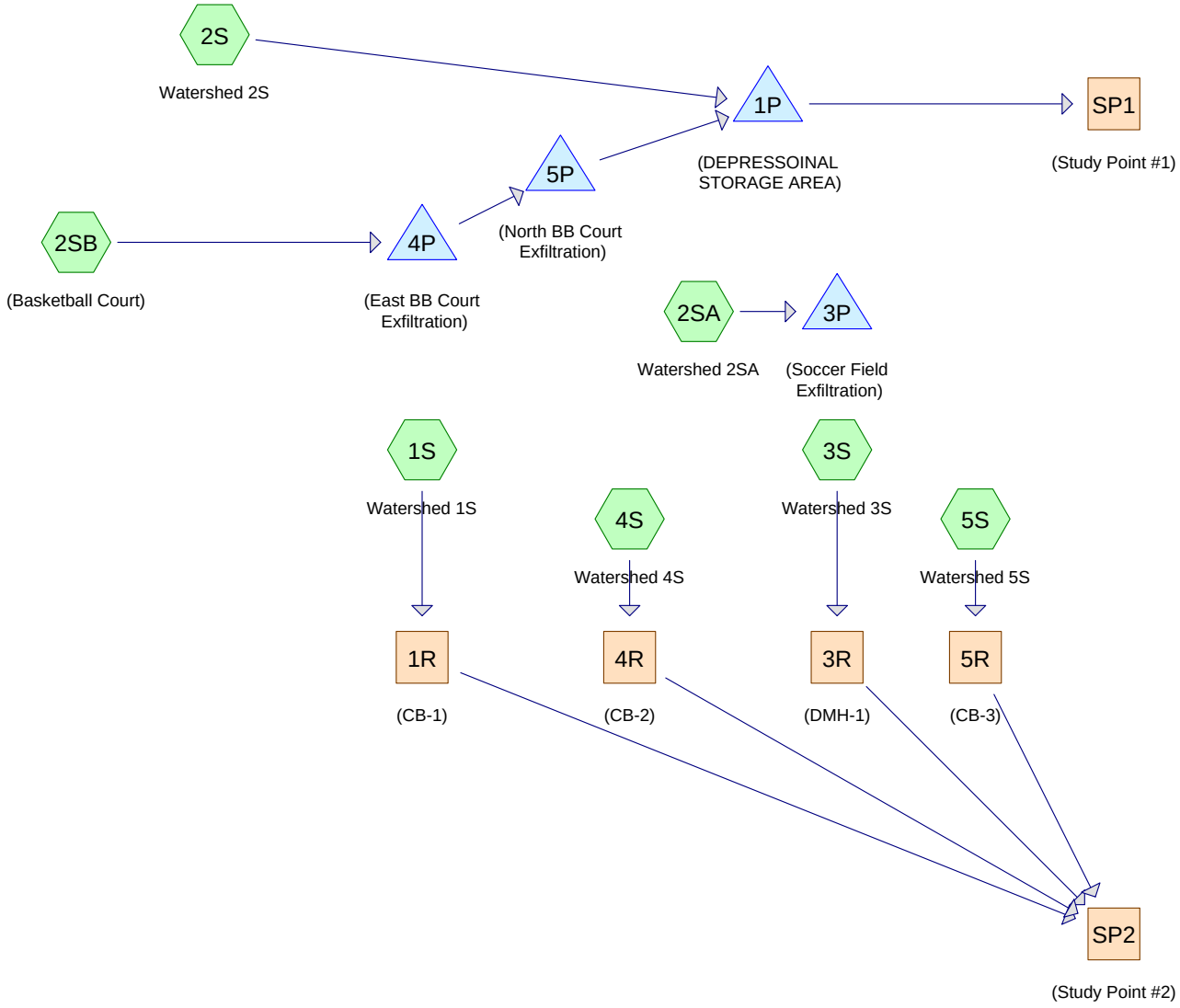
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	17,798 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	1,134	0	0
86.00	3,087	2,111	2,111
87.00	4,474	3,781	5,891
88.00	5,586	5,030	10,921
89.00	6,807	6,197	17,118
89.10	6,808	681	17,798

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**50.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)



Subcat Reach Pond Link

Routing Diagram for 115058 - Nemasket Post Dev Model
Prepared by TRC, Printed 5/16/2016

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.031	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 4S, 5S)
0.321	80	>75% Grass cover, Good, HSG D (1S, 2S)
0.053	76	Brick pavers (2SB)
1.711	68	Field turf (2SA, 2SB)
1.483	98	Paved parking, HSG A (1S, 2SB, 3S, 4S, 5S)
4.599	**72**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.514	HSG A	1S, 2S, 2SB, 3S, 4S, 5S
0.000	HSG B	
0.000	HSG C	
0.321	HSG D	1S, 2S
1.764	Other	2SA, 2SB
4.599		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.031	0.000	0.000	0.321	0.000	1.352	>75% Grass cover, Good	1S, 2S, 3S, 4S, 5S
0.000	0.000	0.000	0.000	0.053	0.053	Brick pavers	2SB
0.000	0.000	0.000	0.000	1.711	1.711	Field turf	2SA, 2SB
1.483	0.000	0.000	0.000	0.000	1.483	Paved parking	1S, 2SB, 3S, 4S, 5S
2.514	**0.000**	**0.000**	**0.321**	**1.764**	**4.599**	**TOTAL AREA**	

Time span=0.00-30.00 hrs, dt=0.04 hrs, 751 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Watershed 1S Runoff Area=0.373 ac 42.63% Impervious Runoff Depth=1.00"
Tc=6.0 min CN=71 Runoff=0.40 cfs 0.031 af

Subcatchment 2S: Watershed 2S Runoff Area=0.340 ac 0.00% Impervious Runoff Depth=0.95"
Tc=6.0 min CN=70 Runoff=0.34 cfs 0.027 af

Subcatchment 2SA: Watershed 2SA Runoff Area=1.581 ac 0.00% Impervious Runoff Depth=0.84"
Tc=6.0 min CN=68 Runoff=1.36 cfs 0.111 af

Subcatchment 2SB: (Basketball Court) Runoff Area=0.387 ac 52.71% Impervious Runoff Depth=1.93"
Tc=6.0 min CN=85 Runoff=0.87 cfs 0.062 af

Subcatchment 3S: Watershed 3S Runoff Area=1.337 ac 63.05% Impervious Runoff Depth=1.29"
Tc=6.0 min CN=76 Runoff=1.96 cfs 0.144 af

Subcatchment 4S: Watershed 4S Runoff Area=0.211 ac 48.82% Impervious Runoff Depth=0.84"
Tc=6.0 min CN=68 Runoff=0.18 cfs 0.015 af

Subcatchment 5S: Watershed 5S Runoff Area=0.370 ac 47.03% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=67 Runoff=0.29 cfs 0.024 af

Reach 1R: (CB-1) Inflow=0.40 cfs 0.031 af
Outflow=0.40 cfs 0.031 af

Reach 3R: (DMH-1) Inflow=1.96 cfs 0.144 af
Outflow=1.96 cfs 0.144 af

Reach 4R: (CB-2) Inflow=0.18 cfs 0.015 af
Outflow=0.18 cfs 0.015 af

Reach 5R: (CB-3) Inflow=0.29 cfs 0.024 af
Outflow=0.29 cfs 0.024 af

Reach SP1: (Study Point #1) Inflow=0.01 cfs 0.000 af
Outflow=0.01 cfs 0.000 af

Reach SP2: (Study Point #2) Inflow=2.83 cfs 0.215 af
Outflow=2.83 cfs 0.215 af

Pond 1P: (DEPRESSOINAL STORAGE AREA) Peak Elev=89.00' Storage=1,151 cf Inflow=0.34 cfs 0.027 af
Outflow=0.01 cfs 0.000 af

Pond 3P: (Soccer Field Exfiltration) Peak Elev=93.35' Storage=4,843 cf Inflow=1.36 cfs 0.111 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4P: (East BB Court Exfiltration) Peak Elev=94.34' Storage=847 cf Inflow=0.87 cfs 0.062 af
Discarded=0.13 cfs 0.062 af Primary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.062 af

Pond 5P: (North BB Court Exfiltration) Peak Elev=93.17' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 4.599 ac Runoff Volume = 0.415 af Average Runoff Depth = 1.08"
67.75% Pervious = 3.116 ac 32.25% Impervious = 1.483 ac

Summary for Subcatchment 1S: Watershed 1S

Runoff = 0.40 cfs @ 12.10 hrs, Volume= 0.031 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.159	98	Paved parking, HSG A
0.153	39	>75% Grass cover, Good, HSG A
0.061	80	>75% Grass cover, Good, HSG D
0.373	71	Weighted Average
0.214		57.37% Pervious Area
0.159		42.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, see spreadsheet**

Summary for Subcatchment 2S: Watershed 2S

Runoff = 0.34 cfs @ 12.10 hrs, Volume= 0.027 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.260	80	>75% Grass cover, Good, HSG D
0.080	39	>75% Grass cover, Good, HSG A
0.340	70	Weighted Average
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, See spreadsheet**

Summary for Subcatchment 2SA: Watershed 2SA

Runoff = 1.36 cfs @ 12.10 hrs, Volume= 0.111 af, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

	Area (ac)	CN	Description
*	1.581	68	Field turf
	1.581		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum Tc = 6 min.**

Summary for Subcatchment 2SB: (Basketball Court)

Runoff = 0.87 cfs @ 12.09 hrs, Volume= 0.062 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

	Area (ac)	CN	Description
	0.204	98	Paved parking, HSG A
*	0.130	68	Field turf
*	0.053	76	Brick pavers
	0.387	85	Weighted Average
	0.183		47.29% Pervious Area
	0.204		52.71% Impervious Area

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

Summary for Subcatchment 3S: Watershed 3S

Runoff = 1.96 cfs @ 12.09 hrs, Volume= 0.144 af, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.843	98	Paved parking, HSG A
0.494	39	>75% Grass cover, Good, HSG A
1.337	76	Weighted Average
0.494		36.95% Pervious Area
0.843		63.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - Minimum**

Summary for Subcatchment 4S: Watershed 4S

Runoff = 0.18 cfs @ 12.10 hrs, Volume= 0.015 af, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.103	98	Paved parking, HSG A
0.108	39	>75% Grass cover, Good, HSG A
0.211	68	Weighted Average
0.108		51.18% Pervious Area
0.103		48.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, see spreadsheet**

Summary for Subcatchment 5S: Watershed 5S

Runoff = 0.29 cfs @ 12.10 hrs, Volume= 0.024 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 2YR-24HR Rainfall=3.40"

Area (ac)	CN	Description
0.174	98	Paved parking, HSG A
0.196	39	>75% Grass cover, Good, HSG A
0.370	67	Weighted Average
0.196		52.97% Pervious Area
0.174		47.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - minimum**

Summary for Reach 1R: (CB-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.373 ac, 42.63% Impervious, Inflow Depth = 1.00" for 2YR-24HR event
Inflow = 0.40 cfs @ 12.10 hrs, Volume= 0.031 af
Outflow = 0.40 cfs @ 12.10 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 3R: (DMH-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.337 ac, 63.05% Impervious, Inflow Depth = 1.29" for 2YR-24HR event
Inflow = 1.96 cfs @ 12.09 hrs, Volume= 0.144 af
Outflow = 1.96 cfs @ 12.09 hrs, Volume= 0.144 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 4R: (CB-2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.211 ac, 48.82% Impervious, Inflow Depth = 0.84" for 2YR-24HR event
Inflow = 0.18 cfs @ 12.10 hrs, Volume= 0.015 af
Outflow = 0.18 cfs @ 12.10 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 5R: (CB-3)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.370 ac, 47.03% Impervious, Inflow Depth = 0.79" for 2YR-24HR event
Inflow = 0.29 cfs @ 12.10 hrs, Volume= 0.024 af
Outflow = 0.29 cfs @ 12.10 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach SP1: (Study Point #1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.727 ac, 28.06% Impervious, Inflow Depth = 0.01" for 2YR-24HR event
Inflow = 0.01 cfs @ 23.51 hrs, Volume= 0.000 af
Outflow = 0.01 cfs @ 23.51 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach SP2: (Study Point #2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.291 ac, 55.83% Impervious, Inflow Depth = 1.12" for 2YR-24HR event
Inflow = 2.83 cfs @ 12.10 hrs, Volume= 0.215 af
Outflow = 2.83 cfs @ 12.10 hrs, Volume= 0.215 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Pond 1P: (DEPRESSOINAL STORAGE AREA)

Inflow Area = 0.727 ac, 28.06% Impervious, Inflow Depth = 0.44" for 2YR-24HR event
Inflow = 0.34 cfs @ 12.10 hrs, Volume= 0.027 af
Outflow = 0.01 cfs @ 23.51 hrs, Volume= 0.000 af, Atten= 98%, Lag= 684.4 min
Primary = 0.01 cfs @ 23.51 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 89.00' @ 23.51 hrs Surf.Area= 1,212 sf Storage= 1,151 cf
Flood Elev= 89.50' Surf.Area= 1,560 sf Storage= 1,842 cf

Plug-Flow detention time= 727.2 min calculated for 0.000 af (2% of inflow)
Center-of-Mass det. time= 552.7 min (1,424.0 - 871.3)

Volume	Invert	Avail.Storage	Storage Description
#1	87.00'	2,709 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
87.00	101	0	0
88.00	493	297	297
89.00	1,211	852	1,149
89.50	1,560	693	1,842
90.00	1,909	867	2,709

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**50.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.01 cfs @ 23.51 hrs HW=89.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 0.01 cfs @ 0.09 fps)

Summary for Pond 3P: (Soccer Field Exfiltration)

Inflow Area = 1.581 ac, 0.00% Impervious, Inflow Depth = 0.84" for 2YR-24HR event
Inflow = 1.36 cfs @ 12.10 hrs, Volume= 0.111 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 93.35' @ 24.36 hrs Surf.Area= 68,544 sf Storage= 4,843 cf
Flood Elev= 94.67' Surf.Area= 68,544 sf Storage= 41,126 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	50,174 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	68,544	0.0	0	0
93.67	68,544	40.0	13,709	13,709
94.67	68,544	40.0	27,418	41,126
95.00	68,544	40.0	9,048	50,174

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**336.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	94.17'	**0.335 in/hr Exfiltration over Surface area above 94.17'** Conductivity to Groundwater Elevation = 87.00' Excluded Surface area = 68,544 sf

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
└**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: (East BB Court Exfiltration)

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=98)

Inflow Area = 0.387 ac, 52.71% Impervious, Inflow Depth = 1.93" for 2YR-24HR event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 0.062 af
Outflow = 0.13 cfs @ 12.62 hrs, Volume= 0.062 af, Atten= 85%, Lag= 31.7 min
Discarded = 0.13 cfs @ 12.62 hrs, Volume= 0.062 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 94.34' @ 12.62 hrs Surf.Area= 1,815 sf Storage= 847 cf
Flood Elev= 94.67' Surf.Area= 1,815 sf Storage= 1,089 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 47.5 min (871.0 - 823.4)

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	1,329 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	1,815	0.0	0	0
93.67	1,815	40.0	363	363
94.67	1,815	40.0	726	1,089
95.00	1,815	40.0	240	1,329

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**25.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	93.17'	**2.610 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 87.00'

Discarded OutFlow Max=0.13 cfs @ 12.62 hrs HW=94.34' (Free Discharge)
2=Exfiltration (Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' TW=93.17' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 5P: (North BB Court Exfiltration)

Inflow Area = 0.387 ac, 52.71% Impervious, Inflow Depth = 0.00" for 2YR-24HR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 93.17' @ 0.00 hrs Surf.Area= 4,033 sf Storage= 0 cf
Flood Elev= 94.67' Surf.Area= 4,033 sf Storage= 2,420 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	2,952 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	4,033	0.0	0	0
93.67	4,033	40.0	807	807
94.67	4,033	40.0	1,613	2,420
95.00	4,033	40.0	532	2,952

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**100.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	93.17'	**2.615 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 87.00'

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
2=Exfiltration (Passes 0.00 cfs of 0.24 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' TW=87.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Time span=0.00-30.00 hrs, dt=0.04 hrs, 751 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Watershed 1S Runoff Area=0.373 ac 42.63% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=71 Runoff=0.84 cfs 0.061 af

Subcatchment 2S: Watershed 2S Runoff Area=0.340 ac 0.00% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=70 Runoff=0.73 cfs 0.054 af

Subcatchment 2SA: Watershed 2SA Runoff Area=1.581 ac 0.00% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=68 Runoff=3.09 cfs 0.229 af

Subcatchment 2SB: (Basketball Court) Runoff Area=0.387 ac 52.71% Impervious Runoff Depth=3.18"
Tc=6.0 min CN=85 Runoff=1.42 cfs 0.103 af

Subcatchment 3S: Watershed 3S Runoff Area=1.337 ac 63.05% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=76 Runoff=3.68 cfs 0.264 af

Subcatchment 4S: Watershed 4S Runoff Area=0.211 ac 48.82% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=68 Runoff=0.41 cfs 0.031 af

Subcatchment 5S: Watershed 5S Runoff Area=0.370 ac 47.03% Impervious Runoff Depth=1.67"
Tc=6.0 min CN=67 Runoff=0.69 cfs 0.051 af

Reach 1R: (CB-1) Inflow=0.84 cfs 0.061 af
Outflow=0.84 cfs 0.061 af

Reach 3R: (DMH-1) Inflow=3.68 cfs 0.264 af
Outflow=3.68 cfs 0.264 af

Reach 4R: (CB-2) Inflow=0.41 cfs 0.031 af
Outflow=0.41 cfs 0.031 af

Reach 5R: (CB-3) Inflow=0.69 cfs 0.051 af
Outflow=0.69 cfs 0.051 af

Reach SP1: (Study Point #1) Inflow=0.12 cfs 0.027 af
Outflow=0.12 cfs 0.027 af

Reach SP2: (Study Point #2) Inflow=5.61 cfs 0.407 af
Outflow=5.61 cfs 0.407 af

Pond 1P: (DEPRESSOINAL STORAGE AREA) Peak Elev=89.01' Storage=1,160 cf Inflow=0.73 cfs 0.054 af
Outflow=0.12 cfs 0.027 af

Pond 3P: (Soccer Field Exfiltration) Peak Elev=93.53' Storage=9,978 cf Inflow=3.09 cfs 0.229 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4P: (East BB Court Exfiltration) Peak Elev=94.72' Storage=1,123 cf Inflow=1.42 cfs 0.103 af
Discarded=0.14 cfs 0.089 af Primary=0.75 cfs 0.014 af Outflow=0.89 cfs 0.103 af

Pond 5P: (North BB Court Exfiltration) Peak Elev=93.31' Storage=223 cf Inflow=0.75 cfs 0.014 af
Discarded=0.25 cfs 0.014 af Primary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.014 af

Total Runoff Area = 4.599 ac Runoff Volume = 0.793 af Average Runoff Depth = 2.07"
67.75% Pervious = 3.116 ac 32.25% Impervious = 1.483 ac

Summary for Subcatchment 1S: Watershed 1S

Runoff = 0.84 cfs @ 12.09 hrs, Volume= 0.061 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.159	98	Paved parking, HSG A
0.153	39	>75% Grass cover, Good, HSG A
0.061	80	>75% Grass cover, Good, HSG D
0.373	71	Weighted Average
0.214		57.37% Pervious Area
0.159		42.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, see spreadsheet**

Summary for Subcatchment 2S: Watershed 2S

Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.260	80	>75% Grass cover, Good, HSG D
0.080	39	>75% Grass cover, Good, HSG A
0.340	70	Weighted Average
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, See spreadsheet**

Summary for Subcatchment 2SA: Watershed 2SA

Runoff = 3.09 cfs @ 12.10 hrs, Volume= 0.229 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

	Area (ac)	CN	Description
*	1.581	68	Field turf
	1.581		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum Tc = 6 min.**

Summary for Subcatchment 2SB: (Basketball Court)

Runoff = 1.42 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

	Area (ac)	CN	Description
	0.204	98	Paved parking, HSG A
*	0.130	68	Field turf
*	0.053	76	Brick pavers
	0.387	85	Weighted Average
	0.183		47.29% Pervious Area
	0.204		52.71% Impervious Area

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

Summary for Subcatchment 3S: Watershed 3S

Runoff = 3.68 cfs @ 12.09 hrs, Volume= 0.264 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.843	98	Paved parking, HSG A
0.494	39	>75% Grass cover, Good, HSG A
1.337	76	Weighted Average
0.494		36.95% Pervious Area
0.843		63.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - Minimum**

Summary for Subcatchment 4S: Watershed 4S

Runoff = 0.41 cfs @ 12.10 hrs, Volume= 0.031 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.103	98	Paved parking, HSG A
0.108	39	>75% Grass cover, Good, HSG A
0.211	68	Weighted Average
0.108		51.18% Pervious Area
0.103		48.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, see spreadsheet**

Summary for Subcatchment 5S: Watershed 5S

Runoff = 0.69 cfs @ 12.10 hrs, Volume= 0.051 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 10YR-24HR Rainfall=4.80"

Area (ac)	CN	Description
0.174	98	Paved parking, HSG A
0.196	39	>75% Grass cover, Good, HSG A
0.370	67	Weighted Average
0.196		52.97% Pervious Area
0.174		47.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - minimum**

Summary for Reach 1R: (CB-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.373 ac, 42.63% Impervious, Inflow Depth = 1.97" for 10YR-24HR event
Inflow = 0.84 cfs @ 12.09 hrs, Volume= 0.061 af
Outflow = 0.84 cfs @ 12.09 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 3R: (DMH-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.337 ac, 63.05% Impervious, Inflow Depth = 2.37" for 10YR-24HR event
Inflow = 3.68 cfs @ 12.09 hrs, Volume= 0.264 af
Outflow = 3.68 cfs @ 12.09 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 4R: (CB-2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.211 ac, 48.82% Impervious, Inflow Depth = 1.74" for 10YR-24HR event
Inflow = 0.41 cfs @ 12.10 hrs, Volume= 0.031 af
Outflow = 0.41 cfs @ 12.10 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 5R: (CB-3)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.370 ac, 47.03% Impervious, Inflow Depth = 1.67" for 10YR-24HR event
Inflow = 0.69 cfs @ 12.10 hrs, Volume= 0.051 af
Outflow = 0.69 cfs @ 12.10 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach SP1: (Study Point #1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.727 ac, 28.06% Impervious, Inflow Depth = 0.45" for 10YR-24HR event
Inflow = 0.12 cfs @ 12.69 hrs, Volume= 0.027 af
Outflow = 0.12 cfs @ 12.69 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach SP2: (Study Point #2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.291 ac, 55.83% Impervious, Inflow Depth = 2.13" for 10YR-24HR event
Inflow = 5.61 cfs @ 12.09 hrs, Volume= 0.407 af
Outflow = 5.61 cfs @ 12.09 hrs, Volume= 0.407 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Pond 1P: (DEPRESSOINAL STORAGE AREA)

Inflow Area = 0.727 ac, 28.06% Impervious, Inflow Depth = 0.88" for 10YR-24HR event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 0.054 af
Outflow = 0.12 cfs @ 12.69 hrs, Volume= 0.027 af, Atten= 84%, Lag= 36.0 min
Primary = 0.12 cfs @ 12.69 hrs, Volume= 0.027 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 89.01' @ 12.68 hrs Surf.Area= 1,218 sf Storage= 1,160 cf
Flood Elev= 89.50' Surf.Area= 1,560 sf Storage= 1,842 cf

Plug-Flow detention time= 249.1 min calculated for 0.027 af (51% of inflow)
Center-of-Mass det. time= 124.5 min (974.4 - 849.9)

Volume	Invert	Avail.Storage	Storage Description
#1	87.00'	2,709 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
87.00	101	0	0
88.00	493	297	297
89.00	1,211	852	1,149
89.50	1,560	693	1,842
90.00	1,909	867	2,709

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**50.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.11 cfs @ 12.69 hrs HW=89.01' TW=0.00' (Dynamic Tailwater)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.25 fps)

Summary for Pond 3P: (Soccer Field Exfiltration)

Inflow Area = 1.581 ac, 0.00% Impervious, Inflow Depth = 1.74" for 10YR-24HR event
Inflow = 3.09 cfs @ 12.10 hrs, Volume= 0.229 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 93.53' @ 24.36 hrs Surf.Area= 68,544 sf Storage= 9,978 cf
Flood Elev= 94.67' Surf.Area= 68,544 sf Storage= 41,126 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	50,174 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	68,544	0.0	0	0
93.67	68,544	40.0	13,709	13,709
94.67	68,544	40.0	27,418	41,126
95.00	68,544	40.0	9,048	50,174

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**336.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	94.17'	**0.335 in/hr Exfiltration over Surface area above 94.17'** Conductivity to Groundwater Elevation = 87.00' Excluded Surface area = 68,544 sf

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
2=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 4P: (East BB Court Exfiltration)

[58] Hint: Peaked 0.05' above defined flood level
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=76)

Inflow Area = 0.387 ac, 52.71% Impervious, Inflow Depth = 3.18" for 10YR-24HR event
Inflow = 1.42 cfs @ 12.09 hrs, Volume= 0.103 af
Outflow = 0.89 cfs @ 12.22 hrs, Volume= 0.103 af, Atten= 37%, Lag= 7.7 min
Discarded = 0.14 cfs @ 12.20 hrs, Volume= 0.089 af
Primary = 0.75 cfs @ 12.22 hrs, Volume= 0.014 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 94.72' @ 12.20 hrs Surf.Area= 1,815 sf Storage= 1,123 cf
Flood Elev= 94.67' Surf.Area= 1,815 sf Storage= 1,089 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 56.3 min (865.4 - 809.1)

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	1,329 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	1,815	0.0	0	0
93.67	1,815	40.0	363	363
94.67	1,815	40.0	726	1,089
95.00	1,815	40.0	240	1,329

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**25.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	93.17'	**2.610 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 87.00'

Discarded OutFlow Max=0.14 cfs @ 12.20 hrs HW=94.72' (Free Discharge)
└**2=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.66 cfs @ 12.22 hrs HW=94.72' TW=93.20' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 0.66 cfs @ 0.58 fps)

Summary for Pond 5P: (North BB Court Exfiltration)

Inflow Area = 0.387 ac, 52.71% Impervious, Inflow Depth = 0.43" for 10YR-24HR event
Inflow = 0.75 cfs @ 12.22 hrs, Volume= 0.014 af
Outflow = 0.25 cfs @ 12.47 hrs, Volume= 0.014 af, Atten= 67%, Lag= 15.0 min
Discarded = 0.25 cfs @ 12.47 hrs, Volume= 0.014 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 93.31' @ 12.47 hrs Surf.Area= 4,033 sf Storage= 223 cf
Flood Elev= 94.67' Surf.Area= 4,033 sf Storage= 2,420 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 9.7 min (751.4 - 741.7)

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	2,952 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	4,033	0.0	0	0
93.67	4,033	40.0	807	807
94.67	4,033	40.0	1,613	2,420
95.00	4,033	40.0	532	2,952

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**100.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	93.17'	**2.615 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 87.00'

Discarded OutFlow Max=0.25 cfs @ 12.47 hrs HW=93.31' (Free Discharge)
└**2=Exfiltration** (Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' TW=87.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-30.00 hrs, dt=0.04 hrs, 751 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Watershed 1S Runoff Area=0.373 ac 42.63% Impervious Runoff Depth=2.58"
Tc=6.0 min CN=71 Runoff=1.11 cfs 0.080 af

Subcatchment 2S: Watershed 2S Runoff Area=0.340 ac 0.00% Impervious Runoff Depth=2.49"
Tc=6.0 min CN=70 Runoff=0.98 cfs 0.071 af

Subcatchment 2SA: Watershed 2SA Runoff Area=1.581 ac 0.00% Impervious Runoff Depth=2.32"
Tc=6.0 min CN=68 Runoff=4.19 cfs 0.305 af

Subcatchment 2SB: (Basketball Court) Runoff Area=0.387 ac 52.71% Impervious Runoff Depth=3.93"
Tc=6.0 min CN=85 Runoff=1.74 cfs 0.127 af

Subcatchment 3S: Watershed 3S Runoff Area=1.337 ac 63.05% Impervious Runoff Depth=3.04"
Tc=6.0 min CN=76 Runoff=4.72 cfs 0.338 af

Subcatchment 4S: Watershed 4S Runoff Area=0.211 ac 48.82% Impervious Runoff Depth=2.32"
Tc=6.0 min CN=68 Runoff=0.56 cfs 0.041 af

Subcatchment 5S: Watershed 5S Runoff Area=0.370 ac 47.03% Impervious Runoff Depth=2.23"
Tc=6.0 min CN=67 Runoff=0.94 cfs 0.069 af

Reach 1R: (CB-1) Inflow=1.11 cfs 0.080 af
Outflow=1.11 cfs 0.080 af

Reach 3R: (DMH-1) Inflow=4.72 cfs 0.338 af
Outflow=4.72 cfs 0.338 af

Reach 4R: (CB-2) Inflow=0.56 cfs 0.041 af
Outflow=0.56 cfs 0.041 af

Reach 5R: (CB-3) Inflow=0.94 cfs 0.069 af
Outflow=0.94 cfs 0.069 af

Reach SP1: (Study Point #1) Inflow=0.60 cfs 0.044 af
Outflow=0.60 cfs 0.044 af

Reach SP2: (Study Point #2) Inflow=7.33 cfs 0.528 af
Outflow=7.33 cfs 0.528 af

Pond 1P: (DEPRESSOINAL STORAGE AREA) Peak Elev=89.03' Storage=1,184 cf Inflow=0.98 cfs 0.071 af
Outflow=0.60 cfs 0.044 af

Pond 3P: (Soccer Field Exfiltration) Peak Elev=93.66' Storage=13,301 cf Inflow=4.19 cfs 0.305 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4P: (East BB Court Exfiltration) Peak Elev=94.75' Storage=1,145 cf Inflow=1.74 cfs 0.127 af
Discarded=0.14 cfs 0.100 af Primary=1.45 cfs 0.027 af Outflow=1.58 cfs 0.127 af

Pond 5P: (North BB Court Exfiltration) Peak Elev=93.56' Storage=624 cf Inflow=1.45 cfs 0.027 af
Discarded=0.26 cfs 0.027 af Primary=0.00 cfs 0.000 af Outflow=0.26 cfs 0.027 af

Total Runoff Area = 4.599 ac Runoff Volume = 1.031 af Average Runoff Depth = 2.69"
67.75% Pervious = 3.116 ac 32.25% Impervious = 1.483 ac

Summary for Subcatchment 1S: Watershed 1S

Runoff = 1.11 cfs @ 12.09 hrs, Volume= 0.080 af, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.159	98	Paved parking, HSG A
0.153	39	>75% Grass cover, Good, HSG A
0.061	80	>75% Grass cover, Good, HSG D
0.373	71	Weighted Average
0.214		57.37% Pervious Area
0.159		42.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, see spreadsheet**

Summary for Subcatchment 2S: Watershed 2S

Runoff = 0.98 cfs @ 12.09 hrs, Volume= 0.071 af, Depth= 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.260	80	>75% Grass cover, Good, HSG D
0.080	39	>75% Grass cover, Good, HSG A
0.340	70	Weighted Average
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, See spreadsheet**

Summary for Subcatchment 2SA: Watershed 2SA

Runoff = 4.19 cfs @ 12.09 hrs, Volume= 0.305 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

	Area (ac)	CN	Description
*	1.581	68	Field turf
	1.581		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum Tc = 6 min.**

Summary for Subcatchment 2SB: (Basketball Court)

Runoff = 1.74 cfs @ 12.09 hrs, Volume= 0.127 af, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

	Area (ac)	CN	Description
	0.204	98	Paved parking, HSG A
*	0.130	68	Field turf
*	0.053	76	Brick pavers
	0.387	85	Weighted Average
	0.183		47.29% Pervious Area
	0.204		52.71% Impervious Area

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

Summary for Subcatchment 3S: Watershed 3S

Runoff = 4.72 cfs @ 12.09 hrs, Volume= 0.338 af, Depth= 3.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.843	98	Paved parking, HSG A
0.494	39	>75% Grass cover, Good, HSG A
1.337	76	Weighted Average
0.494		36.95% Pervious Area
0.843		63.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - Minimum**

Summary for Subcatchment 4S: Watershed 4S

Runoff = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.103	98	Paved parking, HSG A
0.108	39	>75% Grass cover, Good, HSG A
0.211	68	Weighted Average
0.108		51.18% Pervious Area
0.103		48.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, see spreadsheet**

Summary for Subcatchment 5S: Watershed 5S

Runoff = 0.94 cfs @ 12.09 hrs, Volume= 0.069 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 25YR-24HR Rainfall=5.60"

Area (ac)	CN	Description
0.174	98	Paved parking, HSG A
0.196	39	>75% Grass cover, Good, HSG A
0.370	67	Weighted Average
0.196		52.97% Pervious Area
0.174		47.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - minimum**

Summary for Reach 1R: (CB-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.373 ac, 42.63% Impervious, Inflow Depth = 2.58" for 25YR-24HR event
Inflow = 1.11 cfs @ 12.09 hrs, Volume= 0.080 af
Outflow = 1.11 cfs @ 12.09 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 3R: (DMH-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.337 ac, 63.05% Impervious, Inflow Depth = 3.04" for 25YR-24HR event
Inflow = 4.72 cfs @ 12.09 hrs, Volume= 0.338 af
Outflow = 4.72 cfs @ 12.09 hrs, Volume= 0.338 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 4R: (CB-2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.211 ac, 48.82% Impervious, Inflow Depth = 2.32" for 25YR-24HR event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af
Outflow = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 5R: (CB-3)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.370 ac, 47.03% Impervious, Inflow Depth = 2.23" for 25YR-24HR event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 0.069 af
Outflow = 0.94 cfs @ 12.09 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach SP1: (Study Point #1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.727 ac, 28.06% Impervious, Inflow Depth = 0.73" for 25YR-24HR event
Inflow = 0.60 cfs @ 12.29 hrs, Volume= 0.044 af
Outflow = 0.60 cfs @ 12.29 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach SP2: (Study Point #2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.291 ac, 55.83% Impervious, Inflow Depth = 2.77" for 25YR-24HR event
Inflow = 7.33 cfs @ 12.09 hrs, Volume= 0.528 af
Outflow = 7.33 cfs @ 12.09 hrs, Volume= 0.528 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Pond 1P: (DEPRESSOINAL STORAGE AREA)

Inflow Area = 0.727 ac, 28.06% Impervious, Inflow Depth = 1.17" for 25YR-24HR event
Inflow = 0.98 cfs @ 12.09 hrs, Volume= 0.071 af
Outflow = 0.60 cfs @ 12.29 hrs, Volume= 0.044 af, Atten= 39%, Lag= 12.0 min
Primary = 0.60 cfs @ 12.29 hrs, Volume= 0.044 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 89.03' @ 12.29 hrs Surf.Area= 1,231 sf Storage= 1,184 cf
Flood Elev= 89.50' Surf.Area= 1,560 sf Storage= 1,842 cf

Plug-Flow detention time= 189.1 min calculated for 0.044 af (63% of inflow)
Center-of-Mass det. time= 78.9 min (920.6 - 841.7)

Volume	Invert	Avail.Storage	Storage Description
#1	87.00'	2,709 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
87.00	101	0	0
88.00	493	297	297
89.00	1,211	852	1,149
89.50	1,560	693	1,842
90.00	1,909	867	2,709

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**50.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.52 cfs @ 12.29 hrs HW=89.03' TW=0.00' (Dynamic Tailwater)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 0.41 fps)

Summary for Pond 3P: (Soccer Field Exfiltration)

Inflow Area = 1.581 ac, 0.00% Impervious, Inflow Depth = 2.32" for 25YR-24HR event
Inflow = 4.19 cfs @ 12.09 hrs, Volume= 0.305 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 93.66' @ 24.36 hrs Surf.Area= 68,544 sf Storage= 13,301 cf
Flood Elev= 94.67' Surf.Area= 68,544 sf Storage= 41,126 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	50,174 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	68,544	0.0	0	0
93.67	68,544	40.0	13,709	13,709
94.67	68,544	40.0	27,418	41,126
95.00	68,544	40.0	9,048	50,174

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**336.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	94.17'	**0.335 in/hr Exfiltration over Surface area above 94.17'** Conductivity to Groundwater Elevation = 87.00' Excluded Surface area = 68,544 sf

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
2=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 4P: (East BB Court Exfiltration)

[58] Hint: Peaked 0.08' above defined flood level
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=69)

Inflow Area = 0.387 ac, 52.71% Impervious, Inflow Depth = 3.93" for 25YR-24HR event
Inflow = 1.74 cfs @ 12.09 hrs, Volume= 0.127 af
Outflow = 1.58 cfs @ 12.16 hrs, Volume= 0.127 af, Atten= 9%, Lag= 4.2 min
Discarded = 0.14 cfs @ 12.16 hrs, Volume= 0.100 af
Primary = 1.45 cfs @ 12.16 hrs, Volume= 0.027 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 94.75' @ 12.16 hrs Surf.Area= 1,815 sf Storage= 1,145 cf
Flood Elev= 94.67' Surf.Area= 1,815 sf Storage= 1,089 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 52.7 min (855.9 - 803.2)

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	1,329 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	1,815	0.0	0	0
93.67	1,815	40.0	363	363
94.67	1,815	40.0	726	1,089
95.00	1,815	40.0	240	1,329

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**25.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	93.17'	**2.610 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 87.00'

Discarded OutFlow Max=0.14 cfs @ 12.16 hrs HW=94.75' (Free Discharge)
└**2=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=1.40 cfs @ 12.16 hrs HW=94.75' TW=93.28' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 1.40 cfs @ 0.74 fps)

Summary for Pond 5P: (North BB Court Exfiltration)

Inflow Area = 0.387 ac, 52.71% Impervious, Inflow Depth = 0.83" for 25YR-24HR event
Inflow = 1.45 cfs @ 12.16 hrs, Volume= 0.027 af
Outflow = 0.26 cfs @ 12.51 hrs, Volume= 0.027 af, Atten= 82%, Lag= 21.1 min
Discarded = 0.26 cfs @ 12.51 hrs, Volume= 0.027 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 93.56' @ 12.51 hrs Surf.Area= 4,033 sf Storage= 624 cf
Flood Elev= 94.67' Surf.Area= 4,033 sf Storage= 2,420 cf

Plug-Flow detention time= 25.1 min calculated for 0.027 af (100% of inflow)
Center-of-Mass det. time= 25.1 min (764.2 - 739.1)

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	2,952 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	4,033	0.0	0	0
93.67	4,033	40.0	807	807
94.67	4,033	40.0	1,613	2,420
95.00	4,033	40.0	532	2,952

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**100.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	93.17'	**2.615 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 87.00'

Discarded OutFlow Max=0.26 cfs @ 12.51 hrs HW=93.56' (Free Discharge)
└**2=Exfiltration** (Controls 0.26 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' TW=87.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-30.00 hrs, dt=0.04 hrs, 751 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Watershed 1S Runoff Area=0.373 ac 42.63% Impervious Runoff Depth=3.72"
Tc=6.0 min CN=71 Runoff=1.61 cfs 0.116 af

Subcatchment 2S: Watershed 2S Runoff Area=0.340 ac 0.00% Impervious Runoff Depth=3.62"
Tc=6.0 min CN=70 Runoff=1.43 cfs 0.103 af

Subcatchment 2SA: Watershed 2SA Runoff Area=1.581 ac 0.00% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=68 Runoff=6.25 cfs 0.449 af

Subcatchment 2SB: (Basketball Court) Runoff Area=0.387 ac 52.71% Impervious Runoff Depth=5.25"
Tc=6.0 min CN=85 Runoff=2.30 cfs 0.169 af

Subcatchment 3S: Watershed 3S Runoff Area=1.337 ac 63.05% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=76 Runoff=6.60 cfs 0.474 af

Subcatchment 4S: Watershed 4S Runoff Area=0.211 ac 48.82% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=68 Runoff=0.83 cfs 0.060 af

Subcatchment 5S: Watershed 5S Runoff Area=0.370 ac 47.03% Impervious Runoff Depth=3.31"
Tc=6.0 min CN=67 Runoff=1.41 cfs 0.102 af

Reach 1R: (CB-1) Inflow=1.61 cfs 0.116 af
Outflow=1.61 cfs 0.116 af

Reach 3R: (DMH-1) Inflow=6.60 cfs 0.474 af
Outflow=6.60 cfs 0.474 af

Reach 4R: (CB-2) Inflow=0.83 cfs 0.060 af
Outflow=0.83 cfs 0.060 af

Reach 5R: (CB-3) Inflow=1.41 cfs 0.102 af
Outflow=1.41 cfs 0.102 af

Reach SP1: (Study Point #1) Inflow=1.79 cfs 0.076 af
Outflow=1.79 cfs 0.076 af

Reach SP2: (Study Point #2) Inflow=10.46 cfs 0.752 af
Outflow=10.46 cfs 0.752 af

Pond 1P: (DEPRESSOINAL STORAGE AREA) Peak Elev=89.06' Storage=1,221 cf Inflow=1.43 cfs 0.103 af
Outflow=1.79 cfs 0.076 af

Pond 3P: (Soccer Field Exfiltration) Peak Elev=93.88' Storage=19,571 cf Inflow=6.25 cfs 0.449 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4P: (East BB Court Exfiltration) Peak Elev=94.78' Storage=1,171 cf Inflow=2.30 cfs 0.169 af
Discarded=0.14 cfs 0.117 af Primary=2.54 cfs 0.052 af Outflow=2.68 cfs 0.169 af

Pond 5P: (North BB Court Exfiltration) Peak Elev=94.06' Storage=1,442 cf Inflow=2.54 cfs 0.052 af
Discarded=0.28 cfs 0.053 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.053 af

Total Runoff Area = 4.599 ac Runoff Volume = 1.473 af Average Runoff Depth = 3.84"
67.75% Pervious = 3.116 ac 32.25% Impervious = 1.483 ac

Summary for Subcatchment 1S: Watershed 1S

Runoff = 1.61 cfs @ 12.09 hrs, Volume= 0.116 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.159	98	Paved parking, HSG A
0.153	39	>75% Grass cover, Good, HSG A
0.061	80	>75% Grass cover, Good, HSG D
0.373	71	Weighted Average
0.214		57.37% Pervious Area
0.159		42.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, see spreadsheet**

Summary for Subcatchment 2S: Watershed 2S

Runoff = 1.43 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.260	80	>75% Grass cover, Good, HSG D
0.080	39	>75% Grass cover, Good, HSG A
0.340	70	Weighted Average
0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, See spreadsheet**

Summary for Subcatchment 2SA: Watershed 2SA

Runoff = 6.25 cfs @ 12.09 hrs, Volume= 0.449 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

	Area (ac)	CN	Description
*	1.581	68	Field turf
	1.581		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum Tc = 6 min.**

Summary for Subcatchment 2SB: (Basketball Court)

Runoff = 2.30 cfs @ 12.09 hrs, Volume= 0.169 af, Depth= 5.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

	Area (ac)	CN	Description
	0.204	98	Paved parking, HSG A
*	0.130	68	Field turf
*	0.053	76	Brick pavers
	0.387	85	Weighted Average
	0.183		47.29% Pervious Area
	0.204		52.71% Impervious Area

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

Summary for Subcatchment 3S: Watershed 3S

Runoff = 6.60 cfs @ 12.09 hrs, Volume= 0.474 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.843	98	Paved parking, HSG A
0.494	39	>75% Grass cover, Good, HSG A
1.337	76	Weighted Average
0.494		36.95% Pervious Area
0.843		63.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - Minimum**

Summary for Subcatchment 4S: Watershed 4S

Runoff = 0.83 cfs @ 12.09 hrs, Volume= 0.060 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.103	98	Paved parking, HSG A
0.108	39	>75% Grass cover, Good, HSG A
0.211	68	Weighted Average
0.108		51.18% Pervious Area
0.103		48.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, see spreadsheet**

Summary for Subcatchment 5S: Watershed 5S

Runoff = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs
Type III 24-hr 100YR-24HR Rainfall=7.00"

Area (ac)	CN	Description
0.174	98	Paved parking, HSG A
0.196	39	>75% Grass cover, Good, HSG A
0.370	67	Weighted Average
0.196		52.97% Pervious Area
0.174		47.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minutes - minimum**

Summary for Reach 1R: (CB-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.373 ac, 42.63% Impervious, Inflow Depth = 3.72" for 100YR-24HR event
Inflow = 1.61 cfs @ 12.09 hrs, Volume= 0.116 af
Outflow = 1.61 cfs @ 12.09 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 3R: (DMH-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.337 ac, 63.05% Impervious, Inflow Depth = 4.26" for 100YR-24HR event
Inflow = 6.60 cfs @ 12.09 hrs, Volume= 0.474 af
Outflow = 6.60 cfs @ 12.09 hrs, Volume= 0.474 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 4R: (CB-2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.211 ac, 48.82% Impervious, Inflow Depth = 3.41" for 100YR-24HR event
Inflow = 0.83 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.83 cfs @ 12.09 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach 5R: (CB-3)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.370 ac, 47.03% Impervious, Inflow Depth = 3.31" for 100YR-24HR event
Inflow = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af
Outflow = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach SP1: (Study Point #1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.727 ac, 28.06% Impervious, Inflow Depth = 1.26" for 100YR-24HR event
Inflow = 1.79 cfs @ 12.13 hrs, Volume= 0.076 af
Outflow = 1.79 cfs @ 12.13 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Reach SP2: (Study Point #2)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.291 ac, 55.83% Impervious, Inflow Depth = 3.94" for 100YR-24HR event
Inflow = 10.46 cfs @ 12.09 hrs, Volume= 0.752 af
Outflow = 10.46 cfs @ 12.09 hrs, Volume= 0.752 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Summary for Pond 1P: (DEPRESSOINAL STORAGE AREA)

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.727 ac, 28.06% Impervious, Inflow Depth = 1.69" for 100YR-24HR event
Inflow = 1.43 cfs @ 12.09 hrs, Volume= 0.103 af
Outflow = 1.79 cfs @ 12.13 hrs, Volume= 0.076 af, Atten= 0%, Lag= 2.1 min
Primary = 1.79 cfs @ 12.13 hrs, Volume= 0.076 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 89.06' @ 12.13 hrs Surf.Area= 1,252 sf Storage= 1,221 cf
Flood Elev= 89.50' Surf.Area= 1,560 sf Storage= 1,842 cf

Plug-Flow detention time= 138.8 min calculated for 0.076 af (74% of inflow)
Center-of-Mass det. time= 48.6 min (879.5 - 830.9)

Volume	Invert	Avail.Storage	Storage Description
#1	87.00'	2,709 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
87.00	101	0	0
88.00	493	297	297
89.00	1,211	852	1,149
89.50	1,560	693	1,842
90.00	1,909	867	2,709

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**50.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=1.64 cfs @ 12.13 hrs HW=89.05' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.64 cfs @ 0.60 fps)

Summary for Pond 3P: (Soccer Field Exfiltration)

Inflow Area = 1.581 ac, 0.00% Impervious, Inflow Depth = 3.41" for 100YR-24HR event
Inflow = 6.25 cfs @ 12.09 hrs, Volume= 0.449 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 93.88' @ 24.36 hrs Surf.Area= 68,544 sf Storage= 19,571 cf
Flood Elev= 94.67' Surf.Area= 68,544 sf Storage= 41,126 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	50,174 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	68,544	0.0	0	0
93.67	68,544	40.0	13,709	13,709
94.67	68,544	40.0	27,418	41,126
95.00	68,544	40.0	9,048	50,174

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**336.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	94.17'	**0.335 in/hr Exfiltration over Surface area above 94.17'** Conductivity to Groundwater Elevation = 87.00' Excluded Surface area = 68,544 sf

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
└**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4P: (East BB Court Exfiltration)

[58] Hint: Peaked 0.11' above defined flood level
[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=58)

Inflow Area = 0.387 ac, 52.71% Impervious, Inflow Depth = 5.25" for 100YR-24HR event
Inflow = 2.30 cfs @ 12.09 hrs, Volume= 0.169 af
Outflow = 2.68 cfs @ 12.09 hrs, Volume= 0.169 af, Atten= 0%, Lag= 0.1 min
Discarded = 0.14 cfs @ 12.09 hrs, Volume= 0.117 af
Primary = 2.54 cfs @ 12.09 hrs, Volume= 0.052 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 94.78' @ 12.09 hrs Surf.Area= 1,815 sf Storage= 1,171 cf
Flood Elev= 94.67' Surf.Area= 1,815 sf Storage= 1,089 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 47.8 min (842.9 - 795.1)

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	1,329 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	1,815	0.0	0	0
93.67	1,815	40.0	363	363
94.67	1,815	40.0	726	1,089
95.00	1,815	40.0	240	1,329

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**25.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	93.17'	**2.610 in/hr Exfiltration over Surface area**

Conductivity to Groundwater Elevation = 87.00'

Discarded OutFlow Max=0.14 cfs @ 12.09 hrs HW=94.78' (Free Discharge)
2=Exfiltration (Controls 0.14 cfs)

Primary OutFlow Max=2.36 cfs @ 12.09 hrs HW=94.78' TW=93.37' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 2.36 cfs @ 0.88 fps)

Summary for Pond 5P: (North BB Court Exfiltration)

Inflow Area = 0.387 ac, 52.71% Impervious, Inflow Depth = 1.62" for 100YR-24HR event
Inflow = 2.54 cfs @ 12.09 hrs, Volume= 0.052 af
Outflow = 0.28 cfs @ 12.56 hrs, Volume= 0.053 af, Atten= 89%, Lag= 28.1 min
Discarded = 0.28 cfs @ 12.56 hrs, Volume= 0.053 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.04 hrs / 2
Peak Elev= 94.06' @ 12.56 hrs Surf.Area= 4,033 sf Storage= 1,442 cf
Flood Elev= 94.67' Surf.Area= 4,033 sf Storage= 2,420 cf

Plug-Flow detention time= 53.1 min calculated for 0.052 af (100% of inflow)
Center-of-Mass det. time= 53.4 min (792.0 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1	93.17'	2,952 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.17	4,033	0.0	0	0
93.67	4,033	40.0	807	807
94.67	4,033	40.0	1,613	2,420
95.00	4,033	40.0	532	2,952

Device	Routing	Invert	Outlet Devices
#1	Primary	94.67'	**100.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	93.17'	**2.615 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 87.00'

Discarded OutFlow Max=0.28 cfs @ 12.56 hrs HW=94.06' (Free Discharge)
2=Exfiltration (Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.17' TW=87.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Attachment D
BMP Long-Term Operations and Maintenance Plan

STORMWATER MANAGEMENT SYSTEM
OPERATION AND MAINTENANCE PLAN

Prepared for the

NEMASKET STREET RECREATIONAL AREA

Location

225 Hathaway Boulevard
New Bedford, Massachusetts

Owner

City of New Bedford
133 Williams Street, Room 304
New Bedford MA 02740

Prepared by

650 Suffolk Street
Lowell, MA 01854
(978) 656-3680

May 2016

TABLE OF CONTENTS

Appendices

1.0 Objective

This document is the Stormwater Operation and Maintenance Plan for the Nemasket Street Recreational Area. Per the Massachusetts stormwater requirements, The City of New Bedford is responsible for the long term maintenance of all components of the stormwater management system. These components must be periodically inspected and maintained in effective operating condition. This plan is designed to provide guidance to properly inspect and maintain the Nemasket Street Recreational Area stormwater facilities.

2.0 Facilities to be Maintained

The stormwater management facilities to be maintained at the Nemasket Street Recreational Area Project include:

- Paved Basketball Court;
- Stormwater Chamber System and Outfall Control Structure;
- Infiltration trench and underdrains
- Other permeable cover areas and embankments;
- Field Turf Surface;

The Stormwater Management System Inspection & Maintenance Log is provided in Appendix A.

3.0 General Inspection and Maintenance Requirements

The components of the stormwater management system must be adequately maintained to ensure that the system operates as designed, and as approved by the state of Massachusetts. At a minimum, The City of New Bedford or its designated contractor will inspect stormwater conveyance, control and treatment structures at the site on a quarterly basis. Additional inspections may occur, as needed, depending on the results of routine inspections and site conditions. More frequent inspections will be made, as needed, by on-site personnel under the direction of the City of New Bedford. Stormwater system maintenance and repairs will be performed on an as-needed basis, in accordance with recommendations made by the site inspector. Routine maintenance will include, as needed: the immediate repair of newly-formed channels or gullies; reseeding or sodding of bare ground; removal of trash, leaves and sediment; and control of woody vegetation.

4.0 Maintenance Issues

Maintenance issues associated with specific areas and facilities at the site are identified in the following paragraphs.

Paved Basketball Court

The basketball court will typically require little on-going maintenance, owing to the limited use on any vehicles. The surface will be inspected annually, and signs of rutting, frost heaves, potholes, ponding, trash or unwanted vegetation will be removed/repaired as needed. Repaving will be done as needed.

Infiltration trench and underdrains

The infiltration trench and underdrains will be inspection annually. Routinely remove grass clippings leaves and accumulated sediment and debris from the surface of the trench. All sediment and debris will be removed and disposed of properly.

Field Turf Surface

The field turf surface will be inspected annually. This surface will typically require little on-going maintenance. Care and maintenance of the field turf should be per manufacturer recommendations. The surface will be kept free of trash and debris.

Revegetated Areas and Embankment Slopes

Revegetated areas and embankment slopes that are vegetated shall be inspected annually. Any signs of erosion, concentrated flow, or channelized flow will be repaired and reseeded as needed. Vegetation should be mown no less than three (3) inches tall.

APPENDIX A

STORMWATER MANAGEMENT SYSTEM
INSPECTION & MAINTENANCE LOG

Nemasket Street Recreation Area, New Bedford, MA Stormwater Management System Inspection & Maintenance Log				
	Schedule		Inspector Initials and Date	Inspector Comments
	Quarterly Inspection	Maintenance		
Paved Basketball Court:				
Inspect court to ensure that there is no rutting, frost heaves, potholes, or ponding occurring.	**X**			
Repair by replacing pavement and re-grade as necessary.		**As Required**		
Infiltration Trench and Underdrains:				
Inspect trench for excessive sediments and debris.	**X**	**As Required**		
Flush underdrains so all sediment and debris will be removed and disposed of properly.	**X**	**As Required**		
Field Turf Surface:				
Inspect stone surface for irregularities in the surface. Rake as rubber fill as necessary.	**X**	**As Required**		
Inspect for any rutting, trash or debris. Remove and correct as necessary.	**X**	**As Required**		

Nemasket Street Recreation Area, New Bedford, MA				
Stormwater Management System Inspection & Maintenance Log				
	Schedule		**Inspector Initials and Date**	**Inspector Comments**
	Quarterly Inspection	**Maintenance**		
Revegetated areas and Embankment Slopes:				
Inspect revegetated areas for evidence of erosion, concentrated flow, or channelization. Repair and re-seed as necessary.	**X**	**As Required**		
Inspect revegetated areas for bare ground/sparse vegetation. Re-seed and mulch as necessary.	**X**	**As Required**		
Monitor vegetative growth. Mow vegetation no less than three inches.	**X**	**As Required**		
Maintenance Needed and when:				

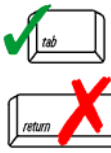
Attachment E
Checklist for Stormwater Report

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

---

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Field Truf and pervious brick pavers, a portion within wetland buffer zone

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☒ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

☒ The ½" or 1" Water Quality Volume or

☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☒ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☒ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Attachment F
Permit Drawing Set