Notice of Intent Application

Massachusetts Wetlands Protection Act (M.G.L. c.131 s.40)
New Bedford Wetlands Ordinance

New Bedford Regional Airport
Phases 1 through 3: Terminal Apron Reconstruction & Drainage Improvements Project



Submitted to:
New Bedford Conservation Commission
133 William Street, Room 304
New Bedford, MA 02740

MassDEP Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347

Prepared for:
New Bedford Regional Airport Commission
1569 Airport Road
New Bedford, MA 02746

Submitted by:
Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

January 23, 2020

Epsilon ASSOCIATES INC.

5639/New Bedford Airport Drainage Project/NOI

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January 23, 2020

New Bedford Conservation Commission
133 William Street, Room 304
New Bedford, MA 02740

Subject: Notice of Intent – Phases 1 through 3: Proposed Terminal Apron Reconstruction & Drainage Improvement Project, New Bedford Regional Airport, New Bedford, MA.

Dear Commissioners:

Enclosed please find two copies of the above referenced Notice of Intent ("NOI") filed in accordance with the Massachusetts Wetlands Protection Act (M.G.L. c. 131 § 40) and implementing regulations (310 CMR 10.00) and the City of New Bedford Wetlands Ordinance. As per the Commission's filing requirements please also find two full sized plan sets and two stormwater management reports. The New Bedford Regional Airport is exempt from local and state filing fees because it is a municipal agency. Abutters to the property have been notified in accordance with state and local regulations.

As explained in further detail in the enclosed NOI, the New Bedford Regional Airport Commission (the "Applicant") is proposing to reconstruct its terminal Apron and conduct associated stormwater management improvements (the "Project"). This Project was previously divided into three phases due to funding constraints and the overall size of the Apron. Phase 1 (DEP File No. SE-049-0745) received an Order of Conditions on October 19, 2017. This phase involved pavement reconstruction extending south from the Colonial Air Apron to the Airport's terminal building. More specifically, it included pavement reconstruction of approximately 191,000 square feet of the existing Apron pavement and associated grading and drainage improvements. Portions of the Phase I work were located within the 100-foot buffer zone to Bordering Vegetated Wetlands and Isolated Vegetated Wetlands, as well as the Commission's suggested 25-foot setback. The Commission additionally authorized the in-kind replacement of a culvert across an existing gravel access road within Riverfront Area. Work associated with Phase 1 did not commence.

As the Project design has advanced and undergone additional engineering review associated with other phases of construction, it was determined that a different overall drainage alignment that considered future phases of construction would better serve the

Airport in the long-term than that which was originally proposed under Phase 1. Accordingly, to minimize confusion with multiple Orders and simplify administrative efforts for the Commission, the Applicant proposes to "close-out" the initial Order of Conditions that was previously issued for Phase 1 (DEP File No. SE-049-0745), as none of this work has occurred yet, and simply file a new, comprehensive Notice of Intent that considers all phases of Apron construction and related drainage improvements. A request for a Certificate of Compliance for the Phase 1 Order of Conditions is being submitted concurrently with this Notice of Intent. As noted above, no portion of the Phase 1 construction has begun yet. The new Order of Conditions to be issued by the Commission for this filing will supersede the Phase 1 Order of Conditions and include all of the work under Phases 1 through 3.

As described in further detail in the enclosed NOI, the majority of the Phase 1 through 3 Apron reconstruction work is located outside the 100-foot buffer zone to wetland resource areas. However, portions of the Project are proposed within wetland resource areas and the 100-foot buffer zone, including:

- Portions of the Apron pavement reconstruction south and west of the Colonial Hangar;
- Drainage improvements in the vicinity of the Colonial Hangar, including: the replacement of a partially collapsed culvert under an existing gravel access road south of the Colonial Hangar, construction of two detention basins, and construction of a new section of drainage pipe with two outfalls to adjacent wetlands;
- The installation of a section of a 3' x 5' box culvert between Shawmut Avenue and the surface parking lots located south of Downey Street;
- The installation of a 24-inch diameter drainage pipe along the northern side of the Colonial Hangar, which will discharge to an existing concrete headwall located north of Shawmut Avenue; and
- The removal of an existing concrete headwall and the installation of a new 3-foot diameter concrete headwall and rip rap splash pad south of Downey Street, in the vicinity of NorEast Aviation Services Hangar and the Claremont Aviation Hangar.

The in-kind replacement of a partially collapsed culvert and the construction of two stormwater detention basins was previously permitted and approved under DEP File No. SE-049-0745 but is being requested as a part of this single and complete Notice of Intent for the entire Apron reconstruction Project.

The enclosed NOI is being submitted for the Commission's review at the **February 4, 2020** public hearing. If you have any questions about this application, please contact me at 978.461.6225 or via email at rsommers@epsilonassociates.com.

Thank you.

Sincerely,
EPSILON ASSOCIATES, INC.

Rhianna Sommers
Project Scientist

Michael D. Howard, PWS, CWS
Principal

Encl.
CC: DEP Southeast Regional Office
David Paulson, Natural Heritage and Endangered Species Program
Scot Servis, New Bedford Regional Airport Manager
Bob Mallard, Airport Solutions Group, Inc.
File

Notice of Intent Application

Massachusetts Wetlands Protection Act
New Bedford Wetlands Ordinance

New Bedford Regional Airport
Phases 1 through 3: Terminal Apron Reconstruction & Drainage Improvement Project

Prepared for:
New Bedford Regional Airport Commission
1569 Airport Road
New Bedford, MA 02746

Submitted to:
New Bedford Conservation Commission
133 William Street, Room 304
New Bedford, MA 02740

Prepared by:
Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, Massachusetts 01754

In Association With:
Airport Solutions Group, Inc.

January 23, 2020

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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):

1569 Airport Road — a. Street Address
New Bedford — b. City/Town
02746 — c. Zip Code

Latitude and Longitude:
-70.958176 — d. Latitude
41.673886 — e. Longitude

125-22, 123C-225, 124-28, 123-3, 122-3 — f. Assessors Map/Plat Number
g. Parcel /Lot Number

2. Applicant:

Scot — a. First Name
Servis — b. Last Name
New Bedford Regional Airport, Airport Manager — c. Organization
1569 Airport Road — d. Street Address
New Bedford — e. City/Town
MA — f. State
02746 — g. Zip Code
(508) 991-6160 — h. Phone Number
i. Fax Number
Scot.Servis@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
City of New Bedford — c. Organization
133 William Street — d. Street Address
New Bedford — e. City/Town
MA — f. State
02740 — g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

Rhianna — a. First Name
Sommers — b. Last Name
Epsilon Associates, Inc. — c. Company
3 Mill & Main Place, Suite 250 — d. Street Address
Maynard — e. City/Town
MA — f. State
01754 — g. Zip Code
(978) 461-6225 — h. Phone Number
(978) 897-0099 — i. Fax Number
rsommers@epsilonassociates.com — j. Email address

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

Exempt - municipal project — a. Total Fee Paid
b. State Fee Paid
c. City/Town Fee Paid

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Bureau of Resource Protection - Wetlands

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A. General Information (continued)

6. General Project Description:

The Applicant is proposing to reconstruct the terminal Apron and conduct associated improvements to the stormwater management system at the Airport.

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)
Bristol	
125-22 - Book: 1294, Page 564; 123C-225 - Book: 930, Page: 214;	122-3 - Book: 949, Page: 295
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.

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

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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	5 lf (1. linear feet)	0 (2. linear feet)
b. ☒ Bordering Vegetated Wetland	23 sf (temporary) (1. square feet)	0 (2. square feet)
c. ☒ Land Under Waterbodies and Waterways	235 sf (temporary) (1. square feet) 0 (3. cubic yards dredged)	0 (2. square feet)

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet	2. square feet
	3. cubic feet of flood storage lost	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	Unnamed tributary (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: ~344,000 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.
550 sf	550 sf	N/A (25-foot RFA)

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.

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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

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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 Limited Project Checklists – 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

2017
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: <1% (percentage/acreage)

(b) outside Resource Area: <1% (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
836 South Rodney French Blvd.
New Bedford, MA 02744
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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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

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

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

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.

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

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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.

Reconstruct Terminal Aprons, Phases 1, 2, and 3
a. Plan Title

Airport Solutions Group, LLC
b. Prepared By

RJM
c. Signed and Stamped by

1/15/20
d. Final Revision Date

varies
e. Scale

f. Additional Plan or Document Title

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:

Exempt - municipal project
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

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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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 12-10-19

3. Signature of Property Owner (if different)

4. Date

5. Signature of Representative (if any)

6. Date 1/15/20

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.

Attachment A

NOI Narrative

ATTACHMENT A – PROJECT NARRATIVE

1.0 Introduction

On behalf of the City of New Bedford Regional Airport Commission (the "Applicant" or the "Airport"), Epsilon Associates, Inc. ("Epsilon") is pleased to submit this Notice of Intent ("NOI") to the New Bedford Conservation Commission (the "Commission"). This NOI was prepared in accordance with the Massachusetts Wetland Protection Act (MGL c.131 s.40) ("Act") and implementing Regulations (310 CMR 10.00) and the City of New Bedford Wetlands Ordinance.

As explained in further detail below, the Applicant is proposing to reconstruct the terminal Apron at the Airport including significant improvements and upgrades to the existing stormwater management system (the "Project"). The Apron reconstruction will start at the Colonial Air Apron; extend around the existing airport terminal building, past Sandpiper Air to the limits of the NorEast Aviation Services Apron and the Claremont Hangar.

The majority of the Apron reconstruction work is located outside the 100-foot buffer zone to wetland resource areas. However, portions of the Project are proposed within wetland resource areas and the 100-foot buffer zone. These activities primarily consist of drainage improvements, and include:

1. Portions of the Apron pavement reconstruction south and west of the Colonial Hangar (**Area 1** on the figures in Attachment B);

2. Drainage improvements in the vicinity of the Colonial Hangar, including: the replacement of a partially collapsed culvert under an existing gravel access road south of the Colonial Hangar, construction of two detention basins, and construction of a new section of drainage pipe with two outfalls to adjacent wetlands (**Area 1** on the figures in Attachment B);

3. The installation of a 3' x 5' box culvert adjacent to an existing 36" diameter drainage pipe within a wooded property between Shawmut Avenue and the surface parking lots located south of Downey Street (**Area 2** on the attached figures), as well as the construction of an associated outlet within an existing concrete headwall north of Shawmut Avenue;

4. The installation of a 24-inch diameter drainage pipe along the northern side of the Colonial Hangar, which would discharge to the existing concrete headwall north of Shawmut Avenue (**Area 2** on the attached figures); and

5. The removal of an existing concrete headwall and the installation of a new 3-foot concrete headwall and rip rap splash pad south of Downey Street, in the vicinity of NorEast Aviation Services Hangar and the Claremont Aviation Hangar (**Area 3** on the attached figures).

The Project will result in temporary alterations to Bordering Vegetated Wetlands, Inland Bank, Land Under Water, Riverfront Area, the 100-foot buffer zone, and the Commission's suggested 25-foot setback. The proposed work has been designed to conform to the applicable Wetlands Protection Act and Ordinance performance standards. Additional information describing the proposed work is provided below.

2.0 Project Locus

The Project area is located at the New Bedford Regional Airport in New Bedford, Massachusetts (see Figure 1 – USGS Locus Map in Attachment B). Runway 5/23 is the Airport's primary and instrument landing runway, while Runway 14/32 is the Airport's crosswind runway (see Figure 2 – Aerial Map in Attachment B). The majority of the Project area consists of the existing paved airport Terminal Apron and mowed and maintained fields along the eastern edge of the Apron pavement. Wetlands are located around the majority of the Airport, including extensive wetland systems located within the Runway 5 and 14 approaches (see Figure 3 – MassGIS Wetlands in Attachment B).

The 2017 Massachusetts Natural Heritage and Endangered Species Program ("NHESP") Atlas identifies estimated and priority habitat (310 CMR 10.59) for eastern box turtle (*Terrapene carolina carolina*) within and adjacent to the Project area. See Attachment B, Figure 4. There are no NHESP-mapped Certified Vernal Pools or Potential Vernal Pools within the Project area. A small portion of the work proposed in Area 1 is located within mapped habitat. The work proposed in this area is similar to what was previously proposed and approved under DEP File No. SE-049-0745. NHESP determined that the work previously proposed and approved under Phase 1 would not adversely affect the resource areas habitat for the box turtle and would not result in a prohibited take of the species. Accordingly, as this new NOI is being filed for the entire Apron reconstruction Project, a copy has been forwarded to the NHESP for streamlined review under the Wetlands Protection Act and MESA regulations.

Wetland resource areas in the vicinity of the Project area are described below.

3.0 Wetland Resource Areas and Buffer Zones

Wetland resources on the New Bedford Regional Airport property (including portions of the locations of work described herein) were delineated and surveyed between 1996 and 2000 and in 2003 through the MassDEP Variance proceedings associated with the larger Runway 5/23 Safety Improvements Project (MassDEP File Number SE 049635). MassDEP approved a request for the extension of the Variance until February 26, 2021. The approved wetland resource area boundaries are depicted on the enclosed drawings where they exist within close proximity to the proposed work.

On November 15, 2019, wetland scientists from Epsilon Associates, Inc. delineated wetland resource areas within the vicinity of the stream crossing at Shawmut Avenue, adjacent to the surface parking lots between Shawmut Avenue and Downey Street. Wetlands were delineated

in accordance with the U.S. Army Corps of Engineers *Wetland Delineation Manual* (USACE, 1987), the "Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0" (2012), the Massachusetts Wetlands Protection Act and implementing regulations (310 CMR 10.00), the Massachusetts Department of Environmental Protection's handbook, *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act* (MADEP, 1995), and the City of New Bedford Wetlands Ordinance. Wetland resource areas delineated in this area were identified as Wetland Series A, Bank Series B, and Bank Series C.

Wetland resource areas in the vicinity of the Project area are described below.

3.1 Bordering Vegetated Wetlands

BVW is defined at 310 CMR 10.55 and, BVWs generally include freshwater wetlands that border on creeks, rivers, streams, ponds, and lakes. Types of freshwater wetlands include wet meadows, marshes, swamps, and bogs. BVWs are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the plant community that occur in each type of freshwater wetland are specified in the Act. The boundary of BVW is the line within which 50 percent or more of the plant community, based on visual inspection, consists of wetland indicator plants and saturated and inundated conditions exist. Pursuant to the Act, there is a 100-foot buffer zone associated with BVW and the Commission's suggested 25 foot minimum setback under the Ordinance.

Wetlands within the vicinity of the Project area consist of:

BVW Series A (Flags A-1 to A-8):

BVW Series A is a forested wetland located north of Shawmut Avenue and adjacent to existing parking lots. This wetland series was delineated in November 2019. The wetland borders on an unnamed perennial stream (Bank Series B, described below). Dominant species in this wetland system include red maple (*Acer rubrum*), sweet pepperbush (*Clethra alnifolia*), multiflora rose (*Rosa multiflora*), silky dogwood (*Cornus amomum*), and cinnamon fern (*Osmunda cinnamomea*). At the time of the delineation, the wetland contained pockets of standing water. U.S. Army Corps of Engineers wetland determination data forms for this wetland series are included in Attachment H.

No work is proposed within BVW Series A, however, a portion of the proposed 3' x 5' box culvert is located within the 100-foot buffer zone and 25-foot setback to this wetland.

BVW Series M:

The M series delineates an emergent, scrub-shrub and forested wetland containing areas of ponded surface water. Vegetation adjacent to the taxiway is dominated by common reed (*Phragmites australis*). Vegetation along the existing gravel access way, east of the Colonial Air

hangar includes palustrine forested and scrub-shrub wetlands. The forested wetlands east of the access road are dominated by red maple, sweet pepperbush and northern arrowwood (*Viburnum recognitum*), with sensitive fern (*Onoclea sensibilis*), tussock sedge (*Carex stricta*), greenbrier (*Smilax rotundifolia*), and poison ivy (*Toxicodendron radicans*) in the understory. An open water feature is located immediately south of the Colonial Air hangar as the access road turns west and into the fenced Airport environment. Wetland M is drained by an intermittent channel/drainage ditch, described below as Stream M.

No work will occur within BVW Series M; however, some drainage improvements are proposed within the 100-foot buffer zone and 25-foot setback to this wetland. This work includes the in-kind replacement of a partially collapsed culvert under the existing gravel access road east of the Colonial Hangar, as well as the installation of a new drainage pipe and water quality structure which will collect and treat stormwater runoff prior to discharging into wetlands located south and east of the Colonial Hangar. Two detention basins are proposed within the 100-foot buffer zone to this wetland, but outside of the 25-foot setback, to Wetland Series M.

BVW Series P:

BVW Series P delineates an emergent and scrub-shrub wetland containing areas of ponded surface water. Dominant emergent vegetation within the emergent portion of Wetland P includes common reed, boneset (*Eupatorium perfoliatum*), sensitive fern, jewelweed (*Impatiens capensis*), sedges (*Carex* spp.) and goldenrod (*Solidago* spp.). BVW P is drained by an intermittent channel / drainage ditch, described below as Bank Series L.

Minor temporary disturbance to BVW Series P will result from the installation of a temporary sandbag cofferdam to dewater the intermittent stream (Series L) south of Downey Street while removing the existing concrete headwall and constructing the rip rap splash pad for the new headwall (Area 3 on the attached figures in Attachment B). Work proposed within the 100-foot buffer zone to BVW Series P includes the installation of a new guardrail south of Downey Street, and the installation of a new concrete headwall and rip rap splash pad installed in the uplands and associated grading activities.

3.2 Inland Bank & Land Under Water

Inland Bank is defined in the Wetlands Protection Act Regulations at 310 CMR 10.54 as the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a BVW and adjacent floodplain, or, in the absence of these, it occurs between a water body and an upland. The upper boundary of bank is the first observable break in slope or the mean annual flood level, whichever is lower. The lower boundary of bank is the mean annual low flow level. There is a 100-foot buffer zone associated with Inland Bank and the Commission's suggested 25 foot minimum setback under the Ordinance.

LUW is defined in the Wetlands Protection Act Regulations at 310 CMR 10.56 as land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock. The boundary of LUW is the mean annual low water level. There is no Buffer Zone associated with LUW.

Bank Series B (Flags B-1 to B-7, B-1a to B4a):

Bank Series B delineates the northern and southern banks of an unnamed perennial tributary to the Paskamansett River on the north side of Shawmut Avenue. This Bank series was delineated in November 2019. The stream is approximately 15 feet wide and flows south under Shawmut Avenue via a concrete headwall. The stream channel in this area is lined with concrete. Dominant bank vegetation includes silky dogwood, red maple, oriental bittersweet (*Celastrus orbiculatus*), multiflora rose, Japanese barberry (*Berberis thunbergii*), and greenbrier (*Smilax rotundifolia*).

According to the USGS Stream Stats application, the stream channel, although mapped as intermittent on the current USGS quadrangle, is considered perennial in this stretch because it has a watershed size greater than one square mile. Therefore, a 25-foot Riverfront Area is prescribed (refer to the Permit Drawings provided in Attachment F).

Alterations to the existing concrete headwall (i.e., Bank) are proposed in this area as part of the Project. These impacts are associated with constructing a 3' by 5' box culvert adjacent to an existing drainage pipe associated with Bank Series B. This will involve trenching and backfilling work to install the new drainage pipe within the 100-foot buffer zone, the Commission's 25-foot setback, and the 25-foot Riverfront Area (portions of which are comprised of pavement and grass) associated with this stream. Temporary alterations to LUW will occur as a result of the installation of a temporary sheet pile cofferdam and sandbags to dewater a section of the stream in order to install the box culvert outlet within the headwall. Note that LUW in this area is comprised of concrete. These impacts are described in more detail in Section 4.2 below.

Bank Series L:

Stream L is a stormwater drainage ditch/man-made intermittent channel that drains Wetland L and flows into the Airport's stormwater system, ultimately under Runway 14/32 daylighting in Wetland P, south of Downey Street. The ditch in question was likely created pre-1971. The channel is lined with asphalt at one point and is approximately three to four feet wide. The channel is actively managed through the Airport's VMP. Dominant emergent vegetation includes woolgrass (*Scirpus cyperinus*), soft rush (*Juncus effusus*), goldenrod and cut arrowwood (*Viburnum dentatum*) and sweet fern (*Comptonia peregrina*) stalks.

No Bank impacts are proposed to this series. Minor temporary alterations to LUW will occur as a result of the installation of a sandbag dam with a temporary bypass to divert flow away from the work area while removing the existing headwall and constructing the rip rap splash pad. The rip rap splash pad will be placed in the upland buffer zone but not on the Bank. The new

headwall is proposed upgradient of the existing headwall, outside of resource areas to minimize impacts, but within the 25-foot setback. Associated grading work between the new headwall and the proposed splash pad will also occur within the 25-foot setback.

Bank Series M:

Stream M is a stormwater drainage ditch/man-made intermittent channel that drains Wetland M and is part of the Airport's stormwater system, which ultimately drains into the Apponagansett Swamp. The stream appears as an intermittent stream originating from the forested wetland located along Downey Street and flowing through the Apponagansett Swamp. Approximately 200 to 300 feet south of the construction gravel access road the stream is defined as perennial according to the Variance. The channel was likely created or channelized pre-1971. Standing or flowing water was typically noted during site visits.

No work is proposed within Bank Series M.

3.3 Bordering Land Subject to Flooding

According to the applicable Federal Emergency Management Agency - Flood Insurance Rate Maps ("FEMA-FIRM"), Community Panel Numbers #255215C0387F, Revision Dates July 7, 2009, portions of the southwestern end of the Airport are located within the 100-year floodplain (see Figure 3 in Attachment B). As part of the Variance the elevation of the 100-year flood (59.5 feet) was refined and established. No work is proposed in BLSF.

4.0 Project Description

4.1 Project Purpose

As described in further detail below, the purpose of the Project is to (1) improve the condition of the Apron area for aircraft safety; and (2) improve the quality of stormwater runoff exiting the site.

The Airport is a commercial airline service airport that is strategically located along the coastline of Southeastern Massachusetts and is a significant transportation gateway for the region and islands of Nantucket and Martha's Vineyard. Since 2006, over $50M of airport capital infrastructure funding has been invested into the Airport to make significant airfield safety, environmental, and operational improvements. Several of the key safety and environmental improvement projects completed at the Airport since 2006 included the reconstruction of both the primary and crosswind runways, Runway 5-23 and Runway 14-32. Full Length reconstruction of Taxiway A was also accomplished in 2016.

One essential airside infrastructure improvement not addressed over the past 50 years is the terminal aircraft parking aprons, including upgrades to antiquated stormwater management systems. The Airport has continuously identified this project in their Five-Year Airport Capital Improvement Plan, however traditionally this type of project has been a low priority for FAA and

MassDOT funding. However, given the poor pavement conditions within the terminal aircraft apron areas and stormwater requirements mandated by MassDEP in 2010 as part of its Wetland and Water Quality Certification Variance[1] approval for the Runway 5-23 Reconstruction Project (MassDEP File No. SE 049-0635), the Airport submitted a federal grant application in 2018 for funding to reconstruct the terminal aprons and related drainage systems. The funding program included an FAA Supplemental Appropriations Program, a newly established program under the FAA. The Airport was selected to receive $5M towards the project utilizing the 100% Supplemental funding from the FAA. However, this awarded FAA funding would only cover a portion of the entire proposed terminal apron project. Through the cooperative and diligent efforts of the Airport, FAA, MassDOT, and the City of New Bedford, the project team was able to identify additional funding sources through FAA, MassDOT, and City of New Bedford to reconstruct the entire terminal apron and its stormwater management system(s) as one comprehensive project at the Airport at an estimated cost of approximately $14M.

The majority of the existing Terminal Apron received "poor" to "failing" assessments in a Pavement Management Assessment conducted by the MassDOT Aeronautics Division in 2012. Pavement reconstruction and new construction will involve improvements to apron grading to comply with safety regulations, modifications to existing grade (a secondary reason for failing pavements) and Apron drainage improvements.

The Apron Project will ensure continued safe operation of aircraft that currently operate on the Terminal Parking Aprons. The Aprons are rapidly degrading and pavements are considered to be failing. The Project is needed to maintain the operational conditions of the Airport's Terminal Parking Aprons, alleviating multiple safety risks if the pavement continues to degrade, including issues with the structural integrity of the Apron, loss of broken pieces of pavement that could create Foreign Object Debris risks, and issues with stormwater flow that could undermine appropriate treatment and dispersal.

As part of any reconstruction effort, current design standards and legal commitments must be incorporated. Specific to the reconstruction of the Aprons at New Bedford, Apron design for aircraft are governed by the FAA which establishes grading and profile requirements, minimum width and setback requirements based upon aircraft wingspan, and fire protection standards associated with buildings supporting aircraft activities. Legal commitments include leasing agreements and government decisions.

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[1] As per Special Condition #51 of the referenced Variance, in 2010 the Airport provided MassDEP with a plan addressing runoff from existing developed areas of the Airport, including proposed measures to comply with Stormwater Standard 7 pursuant to 310 CMR 10.05(6)(k)(7). The information provided to MassDEP in 2010 included a conceptual schedule and the approximate cost of anticipated stormwater upgrades. As was permitted by MassDEP, the schedule indicated that upgrades would be phased in over time given the availability of projected funds.

Improvements to the Apron's stormwater management system are also being proposed in association with this reconstruction work. The existing drainage system was constructed from the early 1950's through the 60's and into the early 70's. Many of the current drainage pipes are undersized, and stormwater is not being treated appropriately. The Apron pavement and drainage system have long outlived their design lives and are in need of reconstruction and/or replacement. For perspective, since the issuance of MassDEP's Variance in 2010, the Airport has implemented several improvements to its facilities as funds have become available, including the elimination of approximately 8.4 acres of pavement throughout the Airport and other meaningful upgrades to the stormwater management infrastructure. The Reconstruction of Taxiway A Project completed in 2016 removed approximately 0.39 acres of impervious pavement and converted to pervious grasslands. The Reconstruction of Runway 14-32 Project completed in 2018 removed a total of approximately 7.99 acres of impervious pavement and was converted to pervious grasslands. Between the two major infrastructure projects, the Airport was able to create a net total of approximately 8.4 acres of new pervious grasslands. This Project builds upon these prior measures and commitments and proposes additional stormwater management system improvements and upgrades as part of the terminal Apron reconstruction work.

4.2 Stormwater Management System

The proposed stormwater management system described in this filing has been designed to comply with MassDEP's stormwater management standards that were incorporated into the Wetlands Protection Act Regulations on January 2, 2008 (see 310 CMR 10.05(6)(k)); FAA Advisory Circular 150/5300-13A (Airport Design); and MassDOT Aeronautics approved aeronautical rules and regulations for public use airports (pursuant to 702 CMR, as amended; for airports subject to MassDOT Aeronautics certification pursuant to M.G.L. c.90, Section 39B). The proposed stormwater improvements also specifically address Special Condition No. 51 of MassDEP's Wetland and Water Quality Certification Variance.

As explained in further detail below, the stormwater management upgrades described herein will ensure additional pretreatment and treatment measures for Land Uses with Higher Potential Pollutant Loads ("LUHPPL") will be instituted to the maximum extent practicable for projects meeting the "redevelopment" criteria of MassDEP's Stormwater Standards. Specifically, this will include the installation of several water quality units, properly sized piping and best management practices designed to retain/detain and treat stormwater runoff following construction, including consideration of the approximately 8.4 acres of pavement that was previously removed from the Airport and converted to pervious grasslands. The measures described herein comply with the MassDEP Standards to the maximum extent practicable and will improve existing stormwater runoff conditions consistent with the requirements of Standard 7.

For purposes of Stormwater Management Standard 7, "redevelopment projects" are defined to include the following:

- Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving;

- Development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area; and

- Remedial projects specifically designed to provide improved stormwater management, such as projects to separate storm drains and sanitary sewers and stormwater retrofit projects.

Redevelopment projects, such as that associated with the Airport's phased terminal and apron projects, are required to meet the following Stormwater Management Standard only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

As demonstrated in the enclosed Stormwater Checklist prepared by ASG, the proposed project fully complies with Standard 1 (no untreated stormwater runoff), Standard 4 (80% TSS removal), Standard 5 (BMPs approved for use in LUHPPL areas), Standard 6 (no stormwater discharges to Critical Areas), Standard 8 (implementation of a construction period erosion, sedimentation, and pollution prevention plan), Standard 9 (adherence to a long term operations and maintenance plan), and Standard 10 (no known illicit discharges).

With regard to Standard 2, as demonstrated in the pre-and post-development runoff tables provided in this report, the stormwater management system has been designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates for the modeled storm events to the maximum extent practicable. In those few instances where there is a nominal increase between pre and post-development runoff rates, under certain modeled storm events, the differences are de minimus and will not impair the receiving wetlands ability to prevent storm damage and downstream off-site flooding.

With regard to Standard 3, the loss of annual recharge to groundwater has been minimized through the use of environmentally sensitive site design measures. While this phase of construction will result in approximately 0.98 acres of additional pavement within the terminal apron area in order to improve aircraft safety, aircraft movement, including appropriate wing tip

clearance near the existing hangars, overall more than 7.4 acres of pavement have been removed from the Airport since 2010. The loss of 7.4 acres of pavement significantly improves existing conditions by promoting infiltration and groundwater recharge throughout the entire Airport property.

Upon completion of the Reconstruction of Terminal Aprons Project, the New Bedford Regional Airport Team will have greatly enhanced the safety, environmental, and operational aspects of aircraft activities on the terminal apron areas.

Stormwater management improvements are described below, and for ease of review are organized into three different work areas, which are depicted on Figures 1 and 2 in Attachment B. Refer to the enclosed Stormwater Report prepared by ASG for additional detail.

Area 1: Drainage Improvements in the Vicinity of the Colonial Hangar and Along Existing Gravel Access Road

In-Kind Culvert Replacement:

This Project element was previously approved under the Phase 1 Order of Conditions. As background, a gravel construction access road located east of the Colonial Hangar and outside the Colonial Air fence was improved with gravel base as part of the Taxiway "A" reconstruction project. A partially collapsed culvert is located under the gravel access road. The Airport proposes to replace the culvert in-kind to replace functionality and restore hydrology between the wetland systems located on both sides of the access road. The culvert and headwalls will be replaced that carry flow from the wetland located immediately behind Colonial Air Apron to the wetland and stream located immediately east of the road. The headwalls will be replaced in-kind and stone fill will arm a small area at the culvert inlet and outlet. A de minimus amount of sediment will be excavated (approximately 10 cubic yards) in order to replace the culvert pipe and headwalls in kind. Sediment controls (compost filter tubes) will be placed in order to protect temporary impacts to wetland resource areas. This work will occur within the Commission's 25-foot setback to BVW but will not involve any work in wetlands.

Subsurface Drainage Improvements Behind the Colonial Hangar:

New drainage improvements are proposed beneath the pavement south of the Colonial Hangar, within the 100-foot buffer zone and partially within the 25-foot setback to BVW. Specifically, this would include installation of a new 12" diameter RCP, with outlets to two wetland systems south and east of the Colonial Hangar, both located along the existing gravel access road. Refer to the Sheet NOI.4 in the attached plan set for additional detail.

Detention Basins:

Two detention basins (referred to on the enclosed permit drawings as Basin 1 and 2) are proposed in the 100-foot buffer zone (outside of the 25-foot setback) to Wetland Series M. The detention basins will collect and treat runoff from the existing Apron and new Apron pavement southwest of the Colonial Hangar prior to releasing it to the adjacent wetlands. The basins are designed to infiltrate and detain stormwater to attenuate the flow of stormwater into the existing wetlands. Both basins will incorporate rip rap lined outfalls to convey stormwater into the existing wetlands. Appropriate sediment controls (compost tubes and silt fence) will be installed along the limits of the work area prior to the start of construction.

Area 2: Drainage Improvements North of Shawmut Avenue

Installation of Box Culvert Adjacent to Surface Parking Lots:

As described in the attached Stormwater Report, the current drainage system is undersized and outdated. Additionally, stormwater is not being treated under existing conditions prior to being discharged to adjacent wetlands. Accordingly, improvements to the stormwater management system are proposed as part of the Project. One of these proposed improvements is upgrading the existing 36" diameter RCP that currently conveys stormwater to an unnamed perennial tributary north of Shawmut Avenue by installing a 3' x 5' box culvert which will discharge to the existing headwall.

The existing 36" diameter RCP will be abandoned in place and the 3' x 5' box culvert will be installed parallel to the existing line, located east of the existing parking lot located between Downey Street and Shawmut Avenue. The drainage manhole for the existing 36" diameter line will be plugged and sealed using brick and mortar, and the existing 36" diameter outlet in the concrete headwall will be abandoned in place. Refer to sheet NOI.5 in the plan set in Attachment F for more detail. To access the work area, an existing chain link fence that currently separates this area from the adjacent parking lot will be removed. Staging of materials and equipment will occur within the parking lot, within the 100-foot buffer zone but outside of the 25-foot setback.

This work will occur within the Commission's 25-foot setback to BVW. Specifically, temporary alterations to the 25-foot setback that are proposed include 125 sf of brush clearing to prepare the work area, followed by the installation of the new pipe. As shown on the attached plan (NOI.5), the new pipe will be installed west of the existing chain link fence. Ground cover in this area adjacent to the fence consists of maintained grass. Woody vines cover the chain link fence (see Photo 5 in Attachment C). Any vines attached to the chain link fence will need to be cleared to remove the fence and access the work area. The only other vegetation clearing required consists of a small area east of the proposed pipe where the existing inlet for the existing 36" diameter RCP will be plugged. Brush in this area that will need to be removed consists of small saplings and vines. Dominant species consist of multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculatus*), glossy buckthorn (*Frangula alnus*),

Tartarian honeysuckle (*Lonicera tatarica*), red oak (*Quercus rubra*), and Japanese barberry (*Berberis thunbergii*) (see Photo 6 in Attachment C). No tree clearing will occur. Sediment controls (compost filter tubes and silt fence) will be installed along the limits of the work area as depicted on the plans.

Excavated material will likely be live-loaded into dump trucks and properly disposed of off-site; or, temporarily stockpiled outside the 100-foot buffer zone. After the new pipe is installed, it will be backfilled and seeded with a conservation seed mix.

Drainage Pipe Tie-in and New Box Culvert within Existing Concrete Headwall North of Shawmut Avenue:

Additionally, a new subsurface 24" diameter RCP is proposed northeast of the Colonial Hangar, which will run beneath the Apron pavement, Downey Street, and parking lots, and tie in to the proposed 3' x 5' box culvert described above via an RCP chamber that will merge the discharge flows coming from the north and west prior to discharging to the stream north of Shawmut Avenue. Once the 24" diameter RCP merges with the new box culvert described above, a new outlet will be constructed in the concrete headwall, adjacent to (west of) the existing opening from the 36" diameter line, which will be abandoned.

Constructing the new box culvert through the existing headwall will require temporary dewatering of the stream. A sheet pile cofferdam will be installed along with sandbags in the stream, perpendicular to the headwall. Because the substrate in this section of the stream consists of concrete, the sheet pile will rest on the concrete bottom but will not be toed into the substrate. For this reason, sandbags are anticipated to be required as well to supplement the sheet pile cofferdam in containing the work area. No damage to the substrate will occur since the cofferdam will not be toed into the concrete channel. An approximately 9-foot wide by 15-foot section of the stream will be temporarily dewatered using a bypass system that will divert water upstream after being pumped through a dirt bag placed on a bed of gravel. As depicted on the plan, the dirt bag will be located within the 25-foot setback and 25-foot RFA associated with the stream. The exact location of the dirt bag set-up will be sited in the field in a location where no vegetation clearing will be necessary. Turbid water will not be discharged to the stream. If a dirt bag is not sufficiently filtering the water, an additional best management practice such as a frac tank or water truck will be employed.

Permanent impacts to Inland Bank will be limited to 5 linear feet, which will result from constructing the 3' x 5' box culvert opening in the concrete headwall. It is important to note that the Bank that will be impacted in this area already consists of concrete headwall, and no natural component of the Bank will be altered. Construction of the temporary sheet pile and sandbag cofferdam will temporarily impact 150 sf of LUW. Following construction of the new drainage pipe through the headwall, flow will be restored to the stream as it traveled prior to the proposed work.

Portions of the work occurring in Area 2 will occur within RFA associated with the unnamed perennial tributary, known as the East Ditch, north of Shawmut Avenue. This work includes the installation of a portion of the subsurface drainage line improvements, associated minor brush clearing, plugging the inlet for the existing 36" diameter line, and the dirt bag set-up on crushed stone, which will be placed adjacent to the stream to filter the water during the bypass before discharging it back to the stream. The portion of the subsurface drainage line installation work underneath the existing parking lot will occur within previously developed and degraded RFA. Specifically, 160 sf of impacts will occur within previously developed RFA and 390 sf of impacts will occur within undeveloped RFA. The limits of RFA are shown on the Permit Drawings provided in Attachment F.

Area 3: Subsurface Drainage Improvements and Concrete Headwall Replacement South of Downey Street

An existing 15" diameter RCP that currently conveys stormwater flow from the Airport south between the NorEast Hangar and Claremont Aviation Hangar and beneath Downey Street is proposed to be replaced with a 24" diameter RCP to better accommodate stormwater flows. This work is depicted on Sheet NOI.6. A portion of this work will occur within the 100-foot buffer zone and 25-foot setback to BVW. The existing pavement will be sawcut and a trench will be excavated. The old pipe will be excavated and removed prior to installing the new pipe. Excavated material will be live loaded into dump trucks, taken off site and disposed of appropriately; or, temporarily stockpiled outside the 100-foot buffer zone.

As part of this work, the existing concrete headwall where this stormwater daylights south of Downey Street will be replaced with a new headwall. Removal of the existing headwall will require a portion of the stream to be temporarily dewatered. A temporary sandbag dam is proposed within the stream and partially in the adjacent wetland. The sandbags will be placed in the stream, perpendicular to the headwall. No equipment will be staged in the wetland to install the temporary dam; if necessary, equipment can be staged outside of the wetland and an extending bucket can be used to place the sandbags in the stream. A small section of the stream will be temporarily dewatered using a bypass system that will divert water downstream after being pumped through a dirt bag placed on a bed of gravel. The water will be indirectly discharged back to the stream but will be released into the wetland (BVW Series P) after being filtered through the dirt bag. If a dirt bag is not sufficiently filtering the water, an additional best management practice such as a frac tank or water truck will be employed.

Sediment controls consisting of silt fence and compost tubes will be installed along the limits of the work area prior to the start of work as depicted on the plans. The new 3-foot concrete headwall will be constructed outside of the wetland to minimize impacts to wetland resource areas. Some grading will need to occur downgradient of the headwall to divert the flow, and a rip rap splash pad will be constructed at the outlet. No grading or placement of riprap will occur in wetlands. Some of this work will need to occur within the 25-foot setback to BVW. Specifically, 360 sf of alterations to the 25-foot setback are proposed as a result of the removal

of the existing headwall, installation of the new headwall and rip rap splash pad and associated grading activities, and the installation of a new guardrail adjacent to Downey Street. The proposed work will be an improvement over existing stormwater conditions.

No impacts to Bank are proposed in this area. As previously mentioned, the only impacts to BVW are minor and temporary in nature and are a result of the sandbag dam which is necessary for the removal of the existing headwall. Specifically, 23 sf of BVW will be temporarily impacted as a result of the installation of the sandbag dam. Temporary LUW impacts will also occur as a result of the placement of the sandbag dam. Approximately 85 sf of LUW will be temporarily altered from the placement of the sandbags. The sandbags will be removed and flow will be restored following the removal of the headwall and installation of the rip rap splash pad.

The slope between Downey Street and the existing headwall will be restored with seed and mulch and secured with an erosion control blanket following construction. See the detail on Sheet NOI.11 for more information.

5.0 Compliance with General Performance Standards

Compliance with the general performance standards for BVW, Bank, LUW, and RFA are discussed below.

5.1 Bordering Vegetated Wetland

The proposed Project involves minor and temporary impacts to BVW associated with the installation of the sandbag dam south of Downey Street (Area 3). The Project satisfies the performance standards for projects affecting BVW, which are found at 310 CMR 10.55(4) and are discussed below.

[310 CMR 10.55 (4)(a)] Where the presumption set forth in 310 CMR 10.55(3) is not overcome, any proposed work in a Bordering Vegetated Wetland shall not destroy or otherwise impair any portion of said area.

The installation of the sandbag dam will result in temporary impacts to approximately 23 sf of BVW. No loss of BVW will occur. The area will be restored in kind following construction; although, no detrimental impacts are anticipated given the low impact and temporary nature of this work.

> **(b) Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of up to 5000 square feet of Bordering Vegetated Wetland when said area is replaced in accordance with the following general conditions and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area will function in a manner similar to the area that will be lost.…**

The proposed work will not result in a loss of BVW. All proposed impacts are temporary in nature and the area will be restored to pre-existing conditions after construction is complete.

(c) Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of a portion of Bordering Vegetated Wetland when;

1. said portion has a surface area less than 500 square feet;

2. said portion extends in a distinct linear configuration ("finger-like") into adjacent uplands; and

3. in the judgment of the issuing authority it is not reasonable to scale down, redesign or otherwise change the proposed work so that it could be completed without loss of said wetland.

See above.

(d) Notwithstanding the provisions of 310 CMR 10.55(4)(a),(b) and (c), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.

A copy of the NOI has been forwarded to the NHESP for review and comment relative to other aspects of the Project located in Estimated and Priority Habitat. The NHESP has previously found that work within mapped habitat is unlikely to affect rare species and their habitats.

(e) Any proposed work shall not destroy or otherwise impair any portion of a Bordering Vegetated Wetland that is within an Area of Critical Environmental Concern designated by the Secretary of Energy and Environmental Affairs under M.G.L. c. 21A, § 2(7) and 301 CMR 12.00: Areas of Critical Environmental Concern.

The Project is not located an Area of Critical Environmental Concern.

5.2 Inland Bank

Proposed impacts to Bank are limited to the construction of an outlet for the 3' x 5' box culvert within the existing concrete headwall north of Shawmut Avenue (Area 2) (i.e., the existing Bank is the concrete headwall). The Project satisfies the performance standards for projects affecting Bank, which are found at 310 CMR 10.54(4) and are discussed below.

[310 CMR 10.54 (4)(a)] Where the presumption set forth in 310 CMR 10.54(3) is not overcome, any proposed work on a Bank shall not impair the following:

1. **the physical stability of the Bank;**

The Project will not impact the physical stability of the Bank as the Bank in this area already consists of a concrete headwall, which will remain in place.

2. **the water carrying capacity of the existing channel within the Bank;**

Constructing the new outlet within the existing headwall will not impact the water carrying capacity within the stream channel. Flow will be returned to the stream after the work is complete as it traveled prior to construction.

3. **ground water and surface water quality;**

No impacts on ground or surface water quality are anticipated as part of the construction of this Project. As previously described, a dirt bag will be used to filter the water being temporarily bypassed during construction. Turbid water will not be allowed to be discharged to the stream. If the dirt bag does not adequately filter the water that is being bypassed, the contractor will be responsible for implementing a different BMP, such as a frac tank or water truck.

4. **the capacity of the Bank to provide breeding habitat, escape cover and food for fisheries;**

The existing Bank where work is proposed is comprised of concrete and does not provide breeding habitat, escape cover or food sources for fisheries.

5. the capacity of the Bank to provide important wildlife habitat functions. A project or projects on a single lot, for which Notice(s) of Intent is filed on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 50 feet (whichever is less) of the length of the bank found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. In the case of a bank of a river or an intermittent stream, the impact shall be measured on each side of the stream or river. Additional alterations beyond the above threshold may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures contained in 310 CMR 10.60.

As noted above the proposed work only proposes to alter about 5 linear feet of concrete Bank and will not therefore impact important wildlife habitat functions.

6. Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.54(4)(a) provided the work is performed in compliance with the Massachusetts Stream Crossing Standards by consisting of a span or embedded culvert

in which, at a minimum, the bottom of a span structure or the upper surface of an embedded culvert is above the elevation of the top of the bank, and the structure spans the channel width by a minimum of 1.2 times the bankfull width. This presumption is rebuttable and may be overcome by the submittal of credible evidence from a competent source. Notwithstanding the requirement of 310 CMR 10.54(4)(a)5., the impact on bank caused by the installation of a stream crossing is exempt from the requirement to perform a habitat evaluation in accordance with the procedures contained in 310 CMR 10.60.

Not applicable.

(b) Notwithstanding the provisions of 310 CMR 10.54(4)(a), structures may be permitted in or on a Bank when required to prevent flood damage to facilities, buildings and roads…

Not applicable. No new structures are proposed on the Bank.

(c) Notwithstanding the provisions of 310 CMR 10.54(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of Rare Species, as identified by procedures established under 310 CMR 10.59.

A copy of the NOI has been forwarded to the NHESP for review and comment relative to other aspects of the project located in Estimated and Priority Habitat. The NHESP has previously found that work within mapped habitat is unlikely to affect rare species and their habitats.

5.3 Land Under Water

Proposed impacts to LUW are temporary in nature and are associated with the two temporary dams where there is headwall work proposed north of Shawmut Avenue (Area 2) and south of Downey Street (Area 3). The Project satisfies the performance standards for projects affecting LUW, which are found at 310 CMR 10.56(4) and are discussed below.

[310 CMR 10.56 (4)(a)] Where the presumption set forth in 310 CMR 10.56(3) is not overcome, any proposed work within Land under Water Bodies and Waterways shall not impair the following:

1. **The water carrying capacity within the defined channel, which is provided by said land in conjunction with the banks;**

Installation of the sheet pile cofferdam with sandbags will temporarily impact 150 sf of LUW north of Shawmut Avenue, and installation of the sandbag dam south of Downey Street will temporarily alter 85 sf of LUW. This work will not impact the water carrying capacity of either portion of the stream, as flow will be restored after construction is complete in each area and the bypass system is removed.

2. Ground and surface water quality;

No impacts on ground or surface water quality are anticipated as part of the construction of this Project. As previously described, a dirt bag will be used to filter the water being temporarily bypassed during construction. Turbid water will not be allowed to be discharged to the stream. If the dirt bag does not adequately filter the water that is being bypassed, the contractor will be responsible for implementing a different BMP, such as a frac tank or water truck.

3. The capacity of said land to provide breeding habitat, escape cover and food for fisheries; and

Impacts to LUW are temporary in nature and the substrate is not anticipated to be impacted once the cofferdam is removed. Once flow is restored to the area after construction and removal of the bypass system, the LUW should function as it did prior to construction. Thus, the work will not impact the capacity of this resource area to provide these important habitat functions for fisheries. Additionally, LUW within Area 2 consists of a concrete substrate, which does not offer habitat value.

4. The capacity of said land to provide important wildlife habitat functions. A project or projects on a single lot, for which Notice(s) of intent is filed on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 5,000 square feet (whichever is less) of land in this resource area found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. Additional alterations beyond the above threshold may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures established under 310 CMR 10.60.

Impacts to LUW are limited to approximately 235 sf, are temporary in nature and will not impact the capacity of the stream to provide important wildlife habitat functions.

5. **Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.56(4)(a) provided the work is performed in compliance with the Massachusetts Stream Crossing Standards by consisting of a span or embedded culvert in which, at a minimum, the bottom of a span structure or the upper surface of an embedded culvert is above the elevation of the top of the bank, and the structure spans the channel width by a minimum of 1.2 times the bankfull width. This presumption is rebuttable and may be overcome by the submittal of credible evidence from a competent source. Notwithstanding the requirements of 310 CMR 10.56(4)(a)4., the impact on Land under Water Bodies and Waterways caused by the installation of a stream crossing is exempt from the requirement to perform a habitat evaluation in accordance with the procedures established under 310 CMR 10.60.**

Not applicable.

(b) Notwithstanding the provisions of 310 CMR 10.56(4)(a), the issuing authority may issue an Order in accordance with M.G.L. c. 131, § 40 to maintain or improve boat channels within Land under Water Bodies and Waterways when said work is designed and carried out using the best practical measures so as to minimize adverse effects such as the suspension or transport of pollutants, increases in turbidity, the smothering of bottom organisms, the accumulation of pollutants by organisms or the destruction of fisheries habitat or nutrient source areas.

Not applicable.

(c) Notwithstanding the provisions of 310 CMR 10.56(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.

A copy of the NOI has been forwarded to the NHESP for review and comment relative to other aspects of the Project located in Estimated and Priority Habitat.

5.4 Riverfront Area

Portions of the work occurring in Area 2 will occur within RFA associated with the unnamed perennial tributary north of Shawmut Avenue. This work includes the installation of a portion of the subsurface drainage line improvements, associated minor brush clearing, plugging the inlet for the existing 36" line, and the dirt bag set-up on crushed stone, which will be placed adjacent to the stream to filter the water during the bypass before discharging it back to the stream. The portion of the subsurface drainage line installation work underneath the existing parking lot will occur within previously developed and degraded RFA. Specifically, 160 sf of impacts will occur within previously developed RFA and 390 sf of impacts will occur within undeveloped RFA. The limits of RFA are shown on the Permit Drawings provided in Attachment F.

While work in RFA within Area 2 includes previously developed and degraded areas consisting of pavement, the Project nonetheless satisfies the more stringent performance standards for projects affecting RFA that are not otherwise previously developed and degraded, which are found at 310 CMR 10.58(4) and are discussed below. The RFA within New Bedford is 25 feet in width as per 310 CMR 10.58(2)(a)(3) for densely developed communities.

[310 CMR 10.58(4)(a)] The work shall meet the performance standards for all resource areas within the riverfront area, as defined in 310 CMR 10.30 (coastal bank), 10.32 (salt marsh), 10.55 (Bordering Vegetated Wetland), and 10.57 (Land Subject to Flooding). When Work in the riverfront area is also within the buffer zone to another resource area, the performance

standards for the riverfront area, shall contribute to the protection of the interests of MGL.G.L. c. 131, §40 in lieu of any additional requirements that might otherwise be imposed in the buffer zone within the riverfront area.

As described in the sections above, work proposed within RFA and other overlapping resource areas will satisfy the performance standards for those other resource areas as well.

(b) No project may be permitted within riverfront area which will have any adverse effect on specified habitat sites of rare wetland or upland vertebrate or invertebrate species, as identified by the procedures established under 310 CMR 10.59 or 10.37 or which will have any adverse effect on vernal pool habitat certified prior to the filing of the Notice of Intent.

A copy of the NOI has been forwarded to the NHESP for review and comment relative to other aspects of the Project located in Estimated and Priority Habitat. The NHESP has previously found that work within mapped habitat is unlikely to affect rare species and their habitats.

(c) There must be no practicable and substantially equivalent economic alternative to the proposed project with less adverse effects on the interests identified in M.G.L. c. 131 §40.

An alternatives analysis was conducted and it was determined that there were no feasible alternatives from an environmental and site constraints perspective. Refer to the alternatives analysis in Section 5.4.1 below.

(d)2. Within 25 foot riverfront areas, any proposed work shall cause no significant and adverse impact by:

a. Limiting alteration to the maximum extent feasible, and at a minimum, preserving or establishing a corridor of undisturbed vegetation or a maximum feasible width. Replication and compensatory storage required to meet other performance standards are allowed within this area; structural stormwater management measures shall be allowed only when there is no practicable alternative;

As discussed in the alternatives analysis in Section 5.4.1 below, there are no feasible alternatives for the work in RFA.

b. Providing stormwater management according to standards established by the Department;

Stormwater management improvements will conform to the MassDEP stormwater standards.

c. Preserving the capacity of the riverfront area to provide important wildlife habitat functions. Work shall not result in an impairment of the capacity to provide vernal pool habitat when identified by evidence from a competent source but not yet certified; and

The proposed subsurface drainage improvements will not impact the capacity of the RFA to provide important wildlife habitat functions. The dirt bag set up proposed within RFA is necessary to ensure the water being temporarily bypassed is clean before it is discharged back to the stream. There are no certified or potential vernal pools in the impact area.

d. Proposed work shall not impair groundwater or surface water quality by incorporating erosion and sedimentation controls and other measures to attenuate nonpoint source pollution.

As described above, appropriate sedimentation controls will be installed prior to construction.

5.4.1 Alternatives Analysis for Area 2 Work

Alternative 1: No Action

The No Action alternative would involve leaving the existing drainage system as is. This would not be feasible, as the current stormwater management system does not meet the DEP Stormwater Standards and current pipes are undersized and have outlived their design lives.

Alternative 2: Replacing Drainage Pipe within Existing Footprint

This alternative would involve replacing the existing 36" diameter RCP drainage pipe in the wooded area north of Shawmut Avenue with a new drainage pipe in the same location. This would require first removing the existing pipe, and then replacing it with the new pipe. While a smaller footprint would be disturbed, work would be occurring closer to the wetland than in the Preferred Alternative, described below. Additionally, replacing the drainage pipe would require temporarily taking the stormwater system out of service in this area until construction of the new pipe is complete, which is not feasible.

Alternative 3 (Preferred Alternative): Installing Box Culvert Adjacent to Existing 36" RCP

This alternative involves the proposed Project – installing a new box culvert adjacent to the existing 36" diameter RCP and abandoning the existing 36" diameter RCP. This alternative allows the stormwater system to continue to function uninterrupted throughout construction. It also requires less brush clearing in the 25-foot setback than Alternative 2 would require, as the new drainage pipe would be located in an area that currently consists of grass ground cover.

Lastly, Alternative 2 would require working much closer to the wetland (BVW Series A) than the proposed Project. The proposed Project would simply abandon the existing 36" RCP, which is located within a few feet of the wetland.

6.0 Conclusions

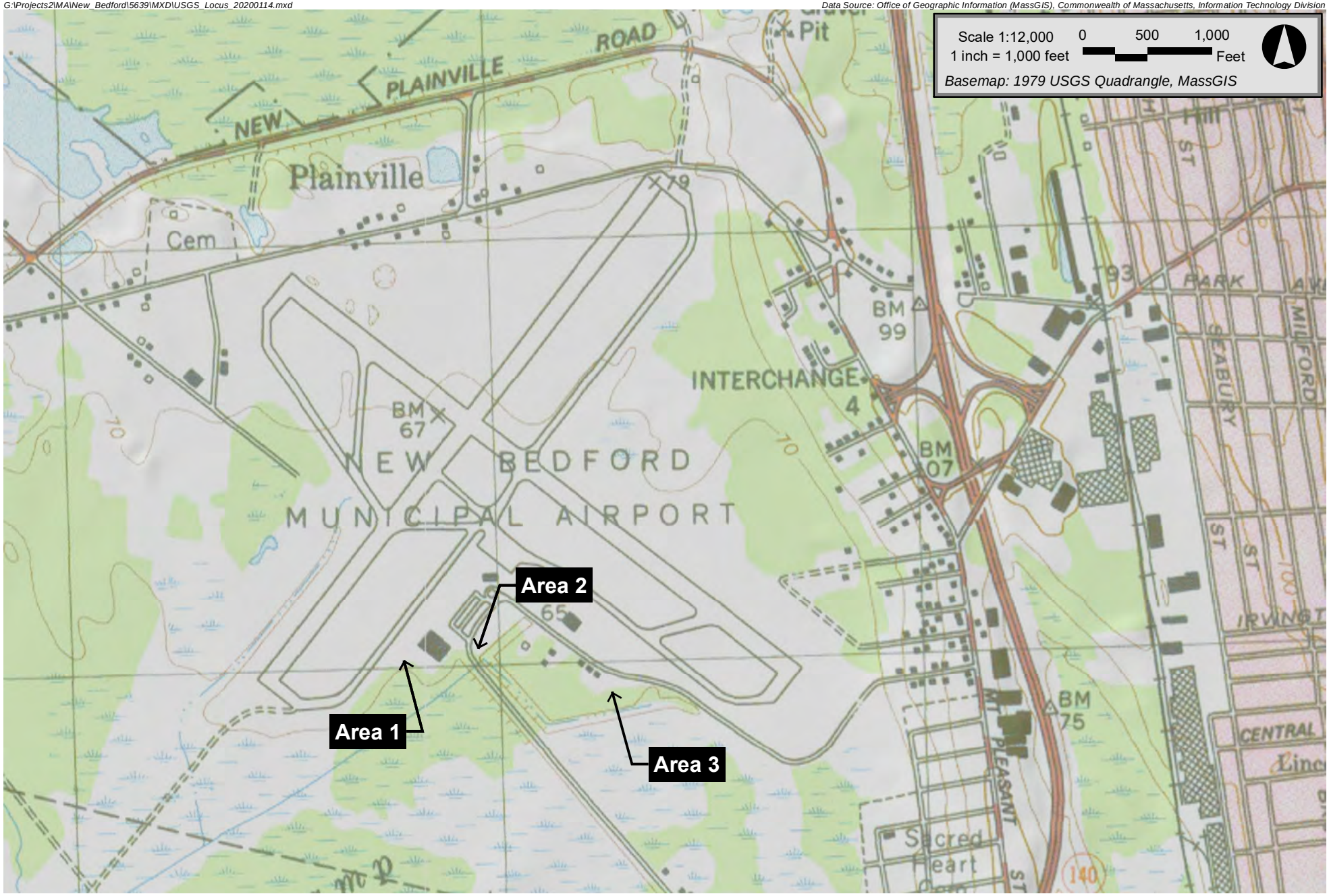
The information contained in this NOI and the accompanying plans describes the site, proposed work and compliance with the Regulations. The proposed work will contribute to the protection of the interests of the Act and Ordinance by complying with the BVW, Inland Bank, LUW, and RFA general performance standards established in the Regulations. The Applicant therefore respectfully requests that the Commission issue an Order of Conditions approving the Project with appropriate conditions to protect the interests identified in M.G.L. c. 131 §40 and the New Bedford Wetlands Ordinance.

Attachment B

Figures

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Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



New Bedford Regional Airport Terminal Aprons Redevelopment Project New Bedford, Massachusetts

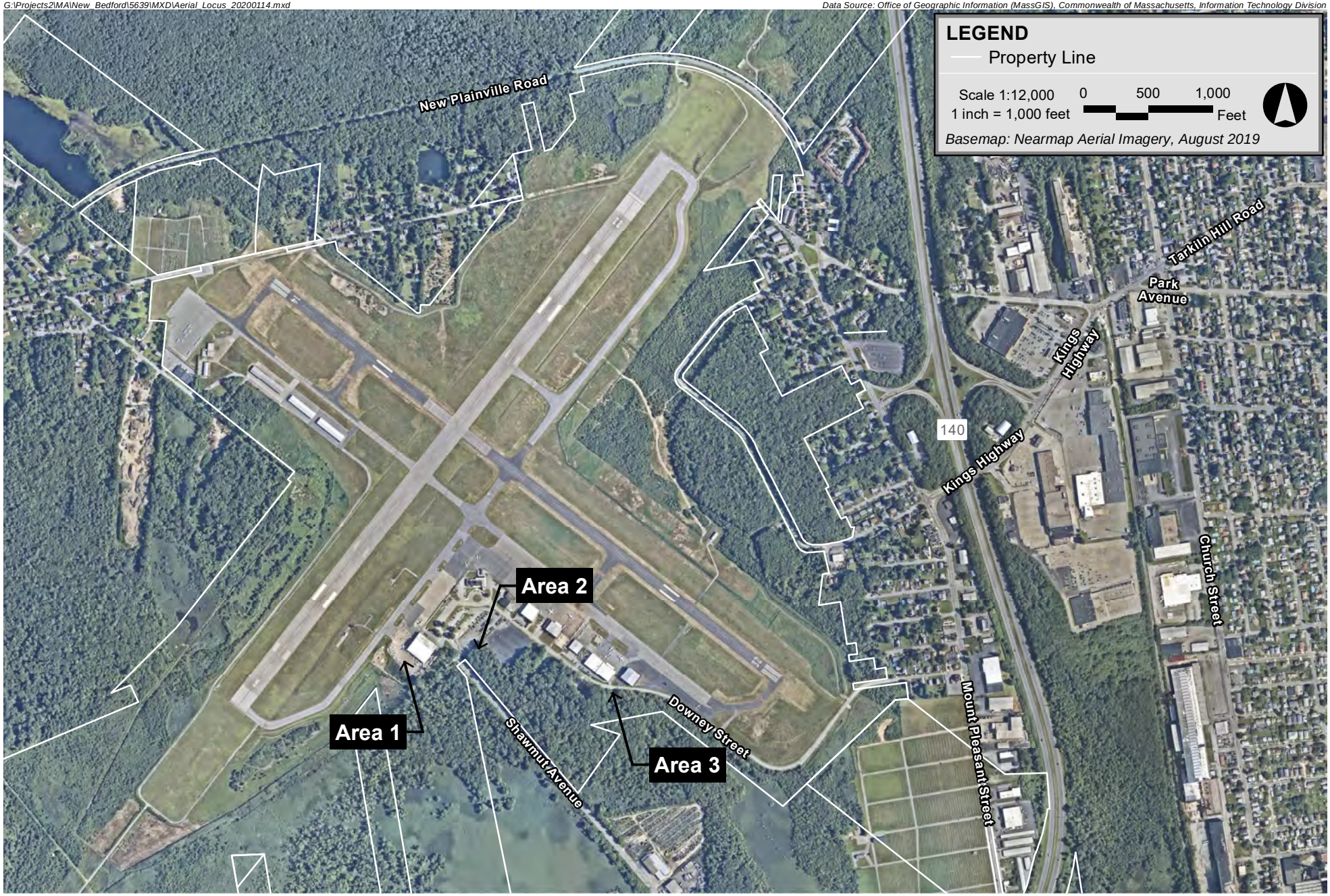
Epsilon Associates Inc.

Figure 1

USGS Locus Map

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Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



New Bedford Regional Airport Terminal Aprons Redevelopment Project New Bedford, Massachusetts

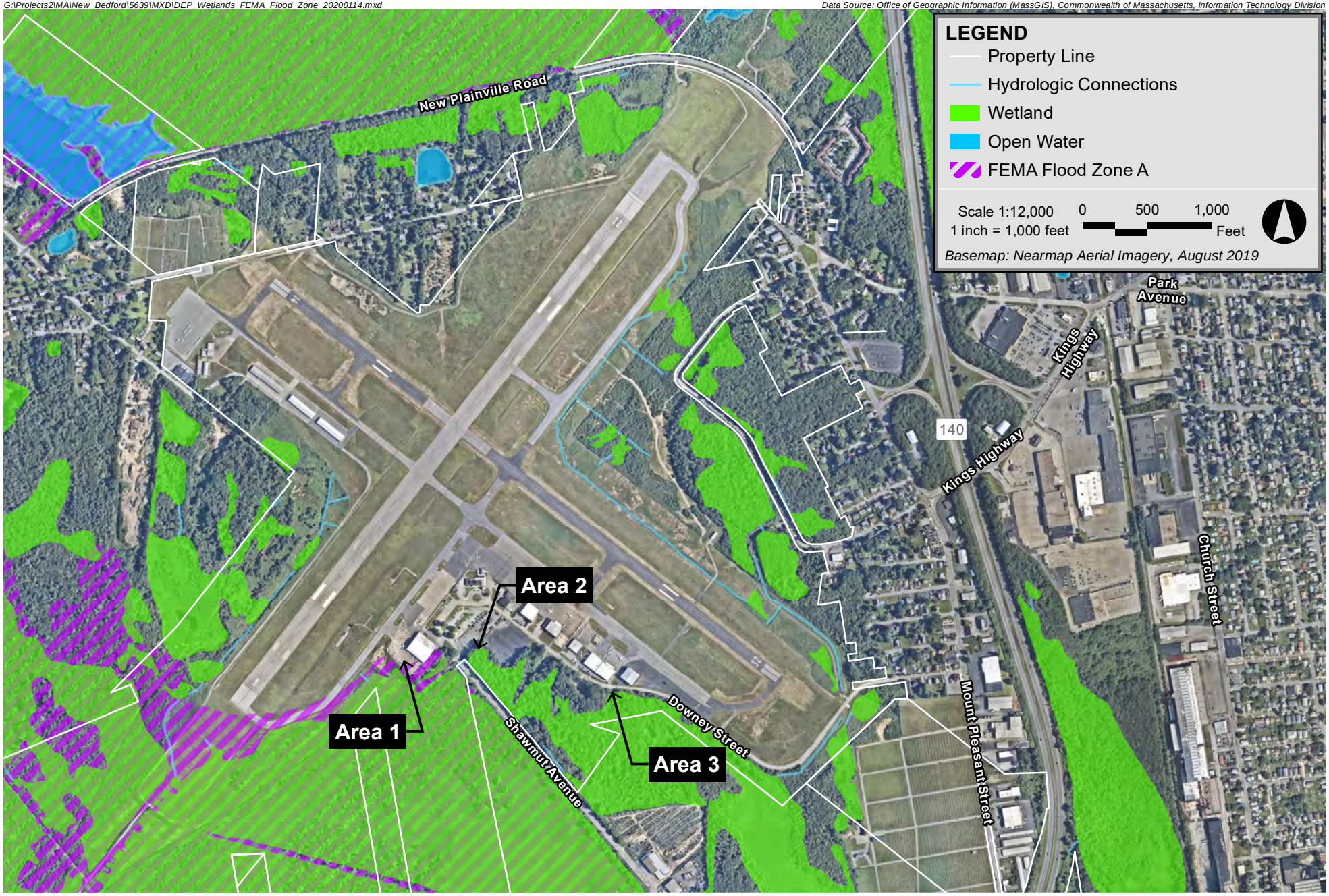
Epsilon Associates Inc.

Figure 2

Aerial Locus Map

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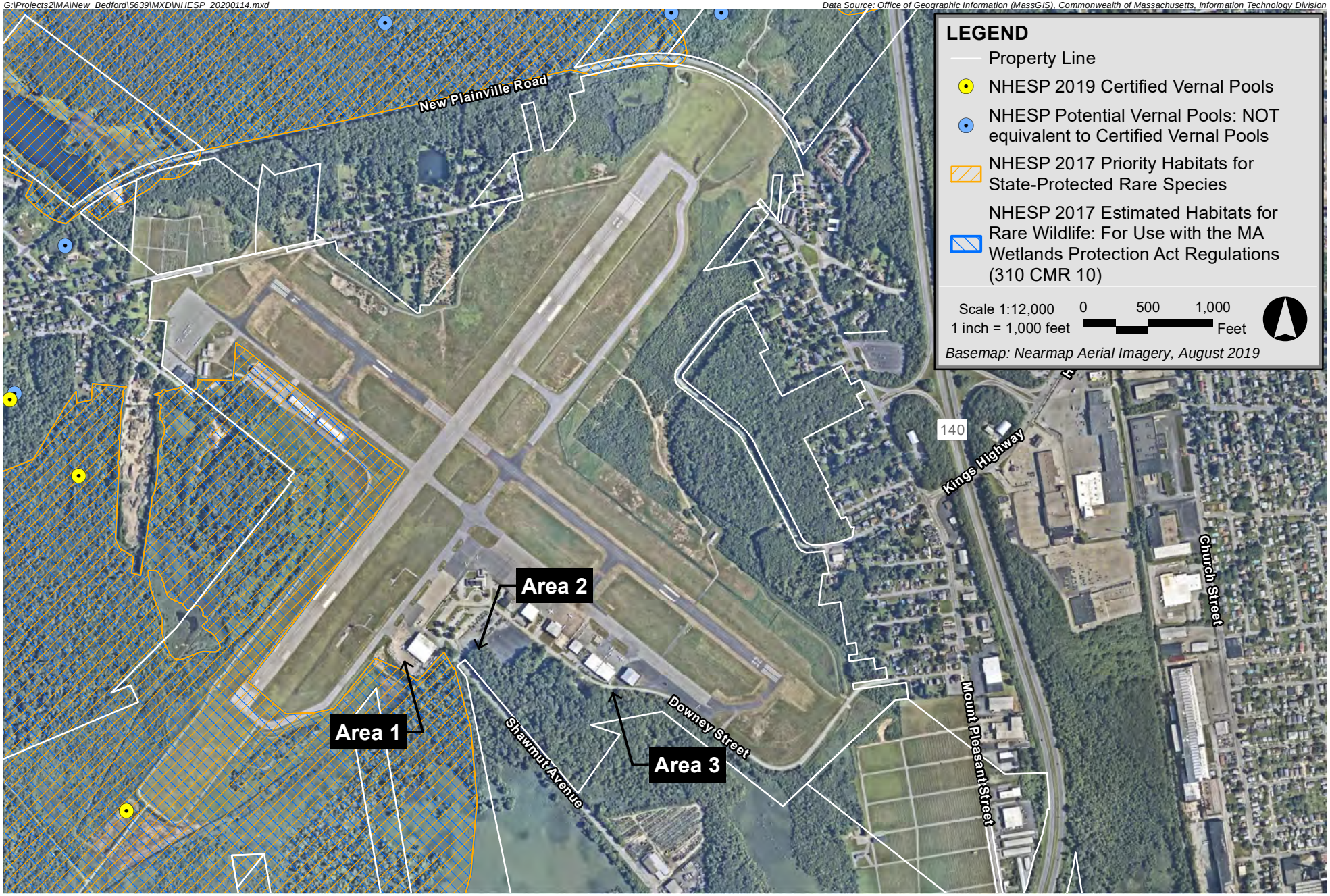
Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division



New Bedford Regional Airport Terminal Aprons Redevelopment Project **New Bedford, Massachusetts**

Epsilon Associates Inc.

Figure 3
Wetlands



New Bedford Regional Airport Terminal Aprons Redevelopment Project **New Bedford, Massachusetts**

Epsilon Associates Inc.

Figure 4
NHESP

Attachment C

Site Photographs



Photo 1: View of gravel access road in Area 1, located east of the Colonial Hangar. A partially collapsed culvert will be replaced under this road.



Photo 2: View of wetland west of access road from culvert location in Area 1.



Photo 3: View of Area 2, looking northeast at the parking lot between Downey Street and Shawmut Avenue. Box culvert installation is proposed under the parking lot and in the grassed area between the parking lot and chainlink fence shown in this photo.



Photo 4: View of Area 2, looking southeast at the concrete headwall on the north side of Shawmut Avenue conveying the unnamed perennial tributary (Bank Series B). The new box culvert outlet will be constructed beside the existing outlet in the headwall on the left side of the photo.



Photo 5: Google Maps Street View of the Area 2 work area, looking northeast from Shawmut Avenue across the parking lot. Staging will occur in this parking lot, outside of the 25-foot setback. As the photo shows, the existing fence to be removed is covered in woody vines, and no brush removal is required west of the fence because ground cover is all grass.



Photo 6: Typical view of the 25-foot setback east of the existing chainlink fence. A minor amount of brush clearing will occur to access and plug the inlet for the existing drainage pipe. This area is primarily dominated by upland woody vines, such as multiflora rose and oriental bittersweet, and small saplings.



Photo 7: Typical view of Wetland Series A.



Photo 8: Google Maps street view of Work Area 3 from Downey Street looking south into Wetland Series P. Proposed drainage pipe installation will occur beneath the pavement and new headwall installation will occur in the grassed area.



Photo 9: View of Wetland Series P and intermittent stream channel south of Downey Street (Area 3). A temporary sandbag dam will be installed in this location during construction and the existing headwall.



Photo 10: View of concrete headwall to be replaced in Area 3.

Attachment D

Filing Fee Information

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

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

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



A. Applicant Information

1. Location of Project:

1569 Airport Road	New Bedford
a. Street Address	b. City/Town
	Exempt - Municipal project
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Scot	Servis	
a. First Name	b. Last Name	
New Bedford Regional Airport, Airport Manager		
c. Organization		
1569 Airport Road		
d. Mailing Address		
New Bedford	MA	02746
e. City/Town	f. State	g. Zip Code
(508) 991-6160		Scot.Servis@newbedford-ma.gov
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

a. First Name	b. Last Name	
City of New Bedford		
c. Organization		
133 William Street		
d. Mailing Address		
New Bedford	MA	02740
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

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

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Exempt - municipal project			

Step 5/Total Project Fee: _____

Step 6/Fee Payments:

Total Project Fee: _____ a. Total Fee from Step 5

State share of filing Fee: _____ b. 1/2 Total Fee **less $**12.50

City/Town share of filling Fee: _____ c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

Attachment E

Abutter Notification Information

Notification to Abutters under the Wetlands Protection Act and 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: New Bedford Regional Airport.

The applicant has filed a Notice of Intent ("NOI") for the municipality of New Bedford, Massachusetts 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 Airport is proposing to reconstruct its terminal Apron and conduct associated improvements to the stormwater management system. Certain activities are proposed within Bordering Vegetated Wetland, Inland Bank, Land Under Water, Riverfront Area, the 100-foot Buffer Zone, and the Commission's 25-foot setback and are subject to review by the City of New Bedford Conservation Commission under the Massachusetts Wetlands Protection Act and the City of New Bedford Wetlands Ordinance.

The address of the lot where the activity is proposed is New Bedford Regional Airport, 1569 Airport Road, New Bedford, MA; Assessor's Map, Lot: 125-22, 123C-225, 124-28, 123-3, 122-3.

Copies of the NOI 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 NOI may be obtained from the applicant's representative Epsilon Associates, Inc., 3 Mill & Main Place, Suite 250, Maynard, MA, 01754 by calling this telephone number (978) 897-7100 between the hours of 9:00 AM and 5:00 PM 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.

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 #		LOT(S)#	Parcels 125-22, 123C-225, 124-28, 123-3, and 122-3
ADDRESS: 1569 Airport Road, New Bedford, MA 02746			
OWNER INFORMATION			
NAME: City of New Bedford			
MAILING ADDRESS: 133 William Street, New Bedford, MA 02740			
APPLICANT/CONTACT PERSON INFORMATION			
NAME (IF DIFFERENT): Applicant: New Bedford Regional Airport; Applicant's representative: Epsilon Associates, Inc.			
MAILING ADDRESS (IF DIFFERENT): Epsilon Associates, Inc. c/o Rhianna Sommers, 3 Mill & Main Place, Suite 250 Maynard, Massachusetts 01754			
TELEPHONE #	978-461-6225		
EMAIL ADDRESS:	rsommers@epsilonassociates.com		

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

NOV 22 2019

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

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).

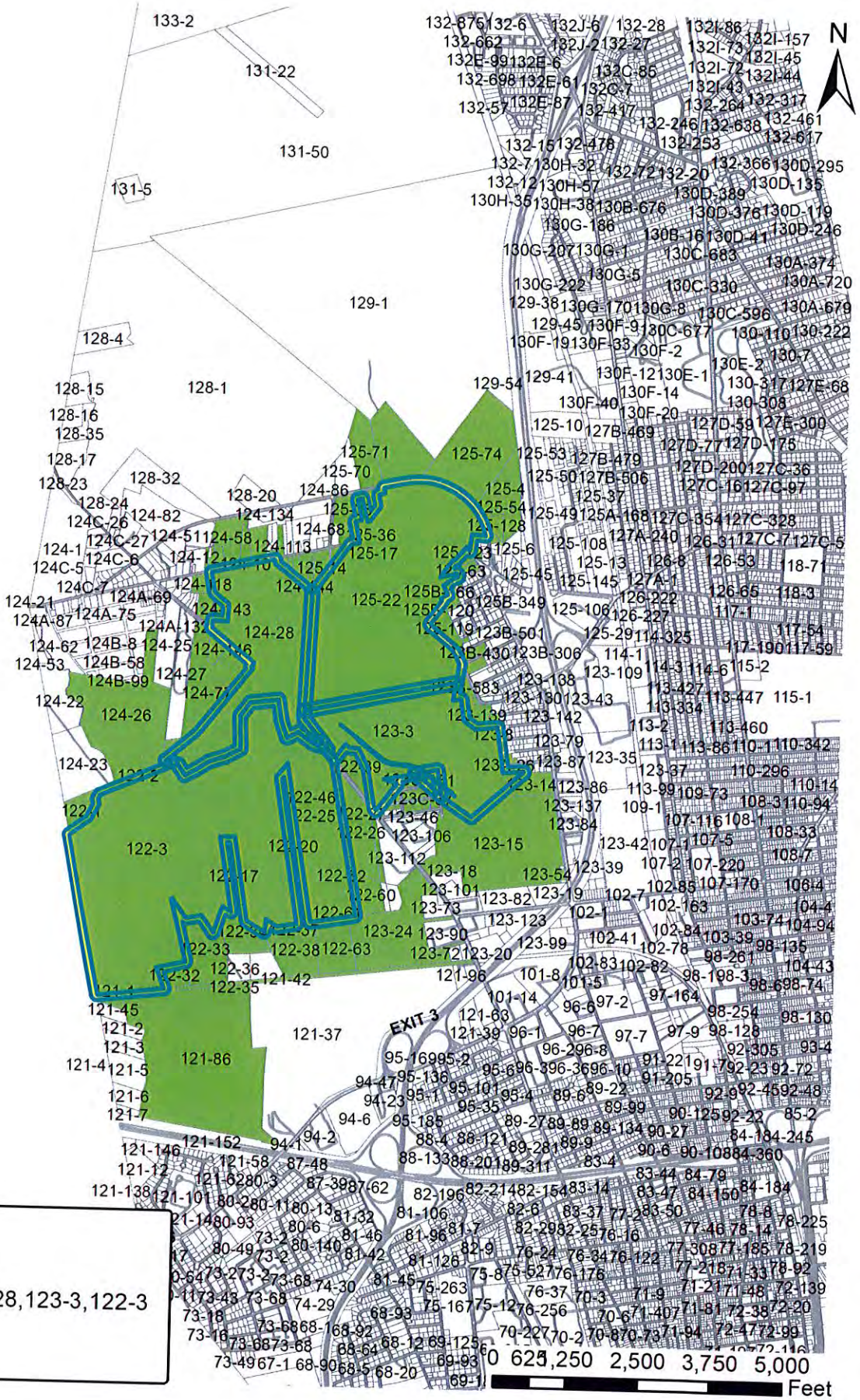
Official Use Only:

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.

Michael J. Motta		11/25/2019
Printed Name	Signature	Date

A check and a hard copy of this request will be mailed to the Assessors Office. If possible, please mail the abutters list to **Epsilon Associates, Inc. c/o Rhianna Sommers, 3 Mill & Main Place, Suite 250 Maynard, Massachusetts 01754** when complete.

Note: This map was developed using the best available data and serves a guide rather than a determination. Data should be confirmed in the field to ensure accuracy.



Legend

- 125-22,123C-225,124-28,123-3,122-3
- 100FT

City of New Bedford, Massachusetts
Department of City Planning

Parcel within 100FT

November 2019

November 25, 2019
Dear Applicant,

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Parcel	Location	Owner and Mailing Address
122-34	NO OF F R R R	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
122-33	NO OF F R R R	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
125-36	1123 OLD PLAINVILLE RD	COACHE MEAGHAN, 1123 OLD PLAINVILLE RD NEW BEDFORD, MA 02745
124-117 WS	CARAVAN WAY	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
122-1	NO OF F R R R	CITY OF NEW BEDFORD, CONSERVATION 131 WILLIAM ST NEW BEDFORD, MA 02740
121-1	SOUTH OF F R R	CITY OF NEW BEDFORD, ADDITION TO GOLF COURSE 131 WILLIAM ST NEW BEDFORD, MA 02740
122-32	NO OF F R R R	CITY OF NEW BEDFORD, CONSERVATION 131 WILLIAM ST NEW BEDFORD, MA 02740
121-86 NS	HATHAWAY RD	WHALING CITY GOLF CLUB INC, C/O CITY OF NEW BEDFORD 133 WILLIAM STREET NEW BEDFORD, MA 02740
122-37	SWAMP N OF F R R R	CYNTHIA H RITTER LLC, PETER J HAWES LLC PO BOX 87121 DARTMOUTH, MA 02748-0702
121-42	RIGHT OF WAY	PENN CENTRAL CO, CONSOLIDATED RAIL CORP 500 WATER STREET DEPT J910 JACKSONVILLE, FL 32202
122-38	NO OF F R R R	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
122-63	NO OF F R R R	CITY OF NEW BEDFORD, CONSERVATION 131 WILLIAM ST NEW BEDFORD, MA 02740
122-62	NO OF F R R R	CITY OF NEW BEDFORD, CONSERVATION 131 WILLIAM ST NEW BEDFORD, MA 02740

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Parcel	Location	Owner and Mailing Address
122-17	NO OF F R R R	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
123-24	1103 SHAWMUT AVE	CITY OF NEW BEDFORD, BOARD OF HEALTH 131 WILLIAM ST NEW BEDFORD, MA 02740
122-60	NO OF F R R R	CITY OF NEW BEDFORD, CONSERVATION 131 WILLIAM ST NEW BEDFORD, MA 02740
122-61	NO OF F R R R	CITY OF NEW BEDFORD, CONSERVATION 131 WILLIAM ST NEW BEDFORD, MA 02740
122-27 WS	SHAWMUT AVE	A & L ENTERPRISES LLC, P O BOX 50540 NEW BEDFORD, MA 02745
122-2	NO OF F R R R	COUNTY OF BRISTOL, CONSERVATION NEW BEDFORD, MA 02740
122-25 WS	SHAWMUT AVE	CUNNINGHAM GLENN G, CUNNINGHAM DORIS I 13 QUANAPOAG ROAD E FREETOWN, MA 02717
123-15	559 MT -607 PLEASANT ST	ROMAN CATHOLIC BISHOP OF, FALL RIVER SACRED HEART NEW BEDFORD, MA 02740
122-26 WS	SHAWMUT AVE	A & L ENTERPRISES LLC, P O BOX 50540 NEW BEDFORD, MA 02745
123C-225	BERKLEY ST WS	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123-14	735 MT PLEASANT ST	ROMAN CATHOLIC BISHOP OF, FALL RIVER SACRED HEART NEW BEDFORD, MA 02740
122-46 WS	SHAWMUT AVE	CUNNINGHAM GLENN G, CUNNINGHAM DORIS I 13 QUANAPOAG ROAD E FREETOWN, MA 02717
122-20 WSR	SHAWMUT AVE	CITY OF NEW BEDFORD, PROVENCAL ADELARD 131 WILLIAM ST NEW BEDFORD, MA 02740

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Parcel	Location	Owner and Mailing Address
122-39 ES	SHAWMUT AVE	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123A-119	HASKELL ST NS	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123A-41 SS	HASKELL ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123B-574	BONIN ST R	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123A-451 WS	MT PLEASANT ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
124-146	SHAWMUT AVE WS	DUPHILY RAYMOND G "TRS", A & R REALTY TRUST 34 FLAGSWAMP ROAD NO. DARTMOUTH, MA 02747
123-3 1493-1569	~~1513~~ AIRPORT RD	~~SANDPIPER AIR, INC.,~~ ~~1529 AIRPORT ROAD~~ NEW BEDFORD, MA 02740 City of New Bedford 131 William St.
123-8	284 ENGLAND ST	VIOLET TIMOTHY J, 284 ENGLAND STREET NEW BEDFORD, MA 02745
122-3 WS	SHAWMUT AVE	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123-139 SS	JONES ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
123B-582 WS	AVIATION WAY	DECOSTA LLOYD, DECOSTA HELEN 3932 ELROVIA AVE EL MONTE, CA 91731
123B-584 WS	AVIATION WAY	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
124-77 WS	SHAWMUT AVE	CITY OF NEW BEDFORD, AIRPORT COMMISSION 133 WILLIAM ST NEW BEDFORD, MA 02740

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Parcel	Location	Owner and Mailing Address
123B-430 ES	AVIATION WAY	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123B-583 NS	AVIATION WAY	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123B-585 WS	AVIATION WAY	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
125-119 ES	AVIATION WAY	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
124-143	1800 SHAWMUT AVE	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
124-26 WS R	SHAWMUT AVE	COUNTY OF BRISTOL, CONSERVATION NEW BEDFORD, MA 02740
125B-307 WS	PELLETIER ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
124-116 ES	~~1852~~ SHAWMUT AVE	~~BRIDGE WATER STATE COLLEGE, (DCAM)~~ City of New Bedford ~~131 SUMMER STREET~~ 131 William St 02740 ~~BRIDGEWATER~~, MA ~~02325~~
125B-166 SS	AVIATION WAY	City of New Bedford, Airport Commission 131 WILLIAM ST NEW BEDFORD, MA 02740
124-28 SS	OLD PLAINVILLE RD	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
125-63	862 OLD PLAINVILLE RD	OLD PLAINVILLE COMMONS LLC, C/O R P PROPERTIES INC 396 WASHINGTON ST #292 WELLESLEY, MA 02481
125-138	33 NEW 33-35 PLAINVILLE RD	NEW BEDFORD HOUSING AUTHORITY, 134 SOUTH SECOND STREET NEW BEDFORD, MA 02740
125-124	882 OLD PLAINVILLE RD	OLD PLAINVILLE COMMONS LLC, C/O R P PROPERTIES INC 396 WASHINGTON ST #292 WELLESLEY, MA 02481

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Parcel	Location	Owner and Mailing Address
124-164	1255 OLD PLAINVILLE RD	GALLIGAN ELEANOR L, 1255 OLD PLAINVILLE ROAD NEW BEDFORD, MA 02745
125B-263 WS	LEMAY ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
125B-236 WS	PELLETIER ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
124-118 SS	OLD PLAINVILLE RD	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
125-123	878 OLD PLAINVILLE RD	OLD PLAINVILLE COMMONS LLC, C/O R P PROPERTIES INC 396 WASHINGTON ST #292 WELLESLEY, MA 02481
125-60	1115 OLD PLAINVILLE RD	COACHE ROBERT M "TRS", COACHE JANE A "TRS" 1115 OLD PLAINVILLE RD NEW BEDFORD, MA 02745
125-75	38 NEW 38-40 PLAINVILLE RD	MACHADO FRANK W, AMARAL JOHN M 40 NEW PLAINVILLE RD NEW BEDFORD, MA 02745
125-116	34 NEW PLAINVILLE RD	BOURGAULT PAMELA A, 34 NEW PLAINVILLE ROAD NEW BEDFORD, MA 02745
125-22 SS	NEW PLAINVILLE RD	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
124-163	1249 OLD PLAINVILLE RD	BOTELHO ALFRED M, BOTELHO MARIA A 1249 OLD PLAINVILLE ROAD NEW BEDFORD, MA 02745
124-144	1196 OLD PLAINVILLE RD	DUPHILY GLADYS M, 1196 OLD PLAINVILLE ROAD NEW BEDFORD, MA 02745
125-83	1146 OLD PLAINVILLE RD	FERNANDES STEPHEN, 1146 OLD PLAINVILLE RD NEW BEDFORD, MA 02745
125-5	875 OLD PLAINVILLE RD	ANDRADE FRANCISCO S, 875 OLD PLAINVILLE ROAD NEW BEDFORD, MA 02745

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Parcel	Location	Owner and Mailing Address
124-172	1248 OLD PLAINVILLE RD	~~OLIVEIRA RONALD~~, Greenwood, William & Greenwood, Linda 5 ARCHER`S WAY ACUSHNET, MA 02743
125-139	37 NEW 37-39 PLAINVILLE RD	NEW BEDFORD HOUSING AUTHORITY, 134 SOUTH SECOND STREET NEW BEDFORD, MA 02740
125-121 WS	NEW PLAINVILLE RD	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
124-173	1240 OLD PLAINVILLE RD	~~OLIVEIRA RONALD~~, Amaral Earl, Amaral Carla ~~5 ARCHER`S WAY~~ ~~ACUSHNET, MA 02743~~ 1240 Old Plainville Rd New Bedford MA 02745
124-43	1234 OLD PLAINVILLE RD	KAGAN MARK E, 1234 OLD PLAINVILLE ROAD NEW BEDFORD, MA 02745
124-174	1222 OLD PLAINVILLE RD 1222-1226	~~OLIVEIRA RONALD,~~ Mello Kenneth, Macedo Ana ~~5 ARCHER`S WAY~~ ~~ACUSHNET, MA 02743~~ 1222-1226 Old Plainville Rd New Bedford, MA 02745
124-69 NS	OLD PLAINVILLE RD	CONGREGATION TIFERETH, ISRAEL 145 BROWNELL AVE NEW BEDFORD, MA 02740
124-42 NS	OLD PLAINVILLE RD	CONGREGATION TIFERETH, ISRAEL SYNAGOGUE 145 BROWNELL AVE NEW BEDFORD, MA 02740
124-59 NS	OLD PLAINVILLE RD	TIFERETH ISRAEL CONGREGATION OF NEW BEDFORD, 145 BROWNELL AVE NEW BEDFORD, MA 02740
125-14	1172 OLD PLAINVILLE RD	DAVID OCTAVIA J, 1172 OLD PLAINVILLE RD NEW BEDFORD, MA 02745
125-62	904 OLD PLAINVILLE RD	PRATT JEREMY J, CORKUM NICOLE M 904 OLD PLAINVILLE ROAD NEW BEDFORD, MA 02745
125-17	1128 OLD PLAINVILLE RD	MCKAY LILIANNE S, 1128 OLD PLAINVILLE RD NEW BEDFORD, MA 02745
124-58 SS	NEW PLAINVILLE RD	CONGREGATION TIFERETH, ISRAEL 145 BROWNELL AVE NEW BEDFORD, MA 02740

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124-10 NS	OLD PLAINVILLE RD	TIFERETH ISRAEL CONGREGATION, OF NEW BEDFORD INC 145 BROWNELL AVE NEW BEDFORD, MA 02740
124-113 NS	OLD PLAINVILLE RD	TIFERETH ISRAEL CONGREGATION OF NEW BEDFORD, 145 BROWNELL AVE NEW BEDFORD, MA 02740
124-61	1243 OLD PLAINVILLE RD	VIEIRA LUIS, 1243 OLD PLAINVILLE ROAD NEW BEDFORD, MA 02745
125-38	42 LEBOEUF ST	SARGENT MARY E, 42 LEBOEUF STREET NEW BEDFORD, MA 02745
125-128	52 NEW PLAINVILLE RD	WILLOWS PROPERTY LLC, 941 DYER AVENUE CRANSTON, RI 02920
125-74 NS	NEW PLAINVILLE RD	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
125-71 NS	NEW PLAINVILLE RD	CITY OF NEW BEDFORD, 133 WILLIAM ST NEW BEDFORD, MA 02740
125-4	54 NEW PLAINVILLE RD	FRIAS LUIS "TRUSTEE", SAYED KAMAL "TRUSTEE" GHAZALEH-ABU SAMER "TRS" P O BOX 390430 CAMBRIDGE, MA 02139-0005
124-41	1194 OLD PLAINVILLE RD	SHERIDAN CAROL ANN SHERIDAN PATRICK J 1194 OLD PLAINVILLE RD NEW BEDFORD, MA 02745
125-58	SS NEW PLAINVILLE RD	LIVINGSTONE EDWIN PIRES MARY LOU 261 UNION STREET NEW BEDFORD, MA 02740
124-71	1210 OLD PLAINVILLE RD	BULLOCK CARLTON 1210 PLAINVILLE RD NEW BEDFORD, MA 02745

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123A-452 WS	MT PLEASANT ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123A-453 WS	MT PLEASANT ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST. NEW BEDFORD, MA 02740
123A-122 NS	HASKELL ST	POLK ANN M "TRUSTEE", ANN M POLK REVOCABLE TRUST 2007 (THE) 245 HASKELL ST NEW BEDFORD, MA 02745-4814
123A-16	234 DOWNEY ST	BOUTIN JANE, BARCELLOS JOHN 234 DOWNEY ST NEW BEDFORD, MA 02745
123A-192 SS	COX ST	CITY OF NEW BEDFORD, HERBERT EDWARD 131 WILLIAM ST. NEW BEDFORD, MA 02740
123A-197 NS	COX ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
123A-201 NS	COX ST	CITY OF NEW BEDFORD, 131 WILLIAM ST. NEW BEDFORD, MA 02740
123A-26 SS	DOWNEY ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123A-270 SS	HAMMOND ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
123A-275 NS	HAMMOND ST	CITY OF NEW BEDFORD, 133 WILLIAM STREET NEW BEDFORD, MA 02740
123B-330 ES	AVIATION WAY	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
123B-539 SS	RAYNO ST	CITY OF NEW BEDFORD, 131 WILLIAM ST NEW BEDFORD, MA 02740
123C-117 NS	CONNELLY ST	CITY OF NEW BEDFORD, WATKINS CHARLES S. 131 WILLIAM ST. NEW BEDFORD, MA 02740

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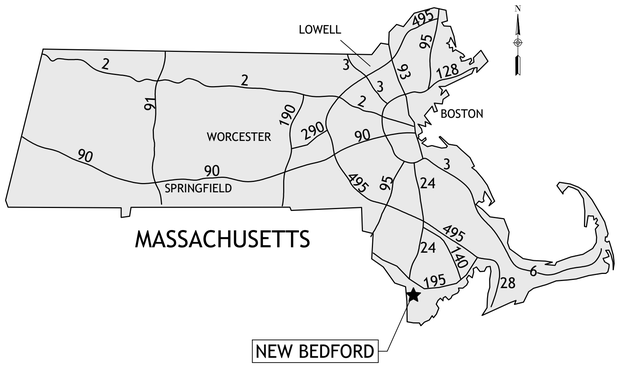
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Parcel	Location	Owner and Mailing Address
123C-131 NS	CONNELLY ST	CITY OF NEW BEDFORD, WATKINS CHARLES S. 131 WILLIAM ST. NEW BEDFORD, MA 02740
123C-18 ES	SHAWMUT AVE	MIRANDA ALVARINO, MIRANDA EMMA T FERNANDES ABEL 24 TEMPLETON STREET NEW BEDFORD, MA 02745-1756
123C-199 NS	MURPHY ST	CITY OF NEW BEDFORD, WATKINS CHARLES S. 131 WILLIAM ST. NEW BEDFORD, MA 02740
123C-202 NS	MURPHY ST	CITY OF NEW BEDFORD, MURPHY FRANCES ANNA 131 WILLIAM ST. NEW BEDFORD, MA 02740
123C-37 ES	MCNABOE ST	CITY OF NEW BEDFORD, WATKINS CHARLES S. 131 WILLIAM ST. NEW BEDFORD, MA 02740
123C-67 ES	SHAWMUT AVE	CITY OF NEW BEDFORD, DEPARTMENT OF PUBLIC INFRASTRUCTURE 1105 SHAWMUT AVENUE NEW BEDFORD, MA 02745
123C-69 SS	CONNELLY ST	CITY OF NEW BEDFORD, 131 WILLIAM ST. NEW BEDFORD, MA 02740
125B-271 NS	LANG ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
125B-313 NS	AVIATION WAY	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740
125B-314 END OF	MARCOTTE ST	CITY OF NEW BEDFORD, AIRPORT COMMISSION 131 WILLIAM ST NEW BEDFORD, MA 02740

Attachment F

Permit Drawings, prepared by Airport Solutions Group

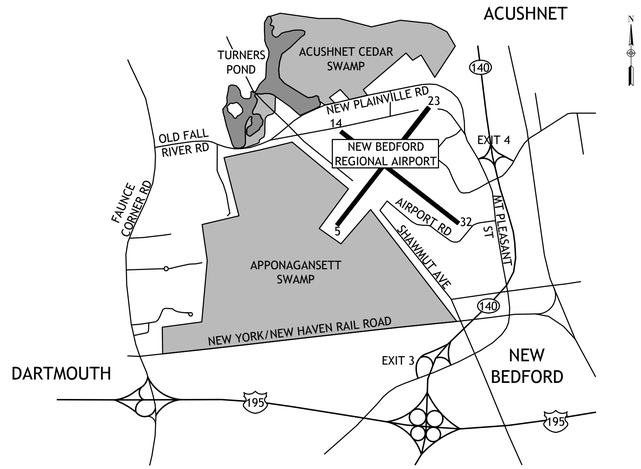
NOI PERMIT DRAWINGS



LOCATION MAP

newbedford
regional airport

NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MASSACHUSETTS 02746



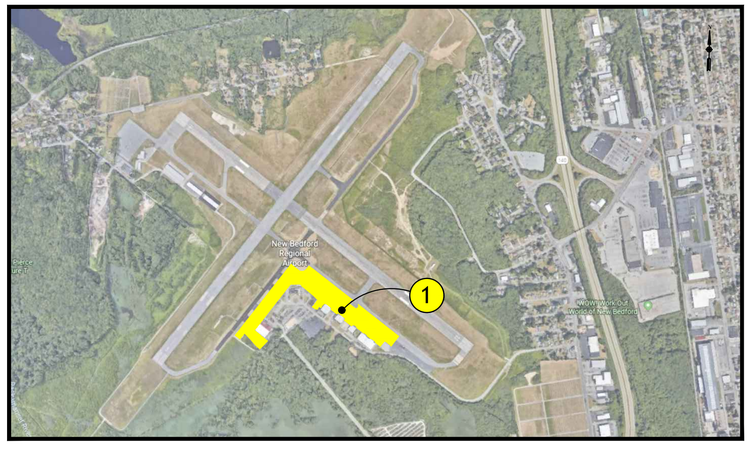
LOCUS MAP

RECONSTRUCT TERMINAL APRONS
PHASES 1, 2, AND 3
NOTICE OF INTENT (NOI) SUBMISSION

JANUARY 2020
AIP NO. 3-25-0034-XX-2020

GENERAL NOTES

1. THE INFORMATION INCLUDED IN THIS NOI PLAN SET IS CONSIDERED PRELIMINARY AND IS INTENDED FOR PERMITTING PURPOSES ONLY; IT IS NOT INTENDED FOR FINAL LAYOUT OR CONSTRUCTION. THE CONSTRUCTION BID SET WILL INCLUDE THE ORDER OF CONDITIONS ISSUED BY THE NEW BEDFORD CONSERVATION COMMISSION (NBCC). THE ORDER OF CONDITIONS WILL TAKE PRECEDENCE OVER ANY CONFLICTING INFORMATION INCLUDED IN THIS NOI PLAN SET OR CONSTRUCTION BID SET.
2. DE-WATERING WILL BE REQUIRED DURING CONSTRUCTION. DE-WATERING MEASURES LOCATED WITHIN A JURISDICTIONAL RESOURCE AREA SHALL CONFORM TO THE REQUIREMENTS NOTED IN THESE PLANS AND INCLUDED IN THE ORDER OF CONDITIONS ISSUED BY THE NBCC. DE-WATERING MEASURES LOCATED OUTSIDE OF A JURISDICTIONAL RESOURCE AREA (E.G. BEYOND 100' FROM BVW) SHALL EMPLOY APPROPRIATE MEASURES TO ASSURE THAT CONSTRUCTION ACTIVITY DOES NOT ADVERSELY IMPACT JURISDICTIONAL RESOURCE AREAS.
3. EROSION CONTROL MATTING SHALL BE USED FOR SLOPE STABILIZATION ON ALL PROPOSED GRADING EXCEEDING A SLOPE OF 4:1 (H:V).
4. ALL CATCH BASIN REQUIRE INLET PROTECTION FOR SEDIMENT REMOVAL AND WATER QUALITY PURPOSES, AT ALL TIMES THROUGHOUT CONSTRUCTION, PURSUANT TO THE DETAIL INCLUDED IN THIS NOI PLAN SET.



PROPOSED CONSTRUCTION

1 - RECONSTRUCT TERMINAL APRONS

PREPARED BY

ASG
AIRPORT SOLUTIONS GROUP, LLC
Innovation By Design
AIRPORT CONSULTANTS • BURLINGTON, MASSACHUSETTS
PHONE (781) 491-0083 FAX (781) 491-0360

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO AIRPORT SOLUTIONS GROUP, LLC AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF AIRPORT SOLUTIONS GROUP, LLC
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NOI PERMIT DRAWINGS
NOT FOR CONSTRUCTION

DRAWING NO.
NOI.1
1 OF 11

01/15/2020 NOI SUBMISSION FOR NBCC

1/15/2020 1:53:07 PM \\nas201\Companydata\ASG Data\Projects\nbd - new bedford\046 design only - terminal aprons phases 123\CAD\nbd submission\01-103-046_NO COVER SHEET.dwg (PEJ)

New Bedford Regional Airport
Reconstruct Terminal Aprons / NOI Submission

Summary Impacts to Land Under Water (sf)

Area On Map	Description of Impact	Total Impact
1	NA - No BVW or LUW Impacts	0
2	NA - No BVW or LUW Impacts	0
3	NA - No BVW or LUW Impacts	0
4	Temp cofferdam work (LUW)	150
5	Temp cofferdam work (LUW)	85
	Total Proposed Impact (sf):	**235**

Summary of Change (cfs): Post vs. Pre

Analysis Point	2-Year Storm	10-Year Storm	100-Year Storm
1	-0.04	-0.06	-0.03
2	-1.83	-1.96	2.40
3	-0.04	-0.05	-0.03
4	0.36	0.72	1.39
5	2.22	2.08	1.79

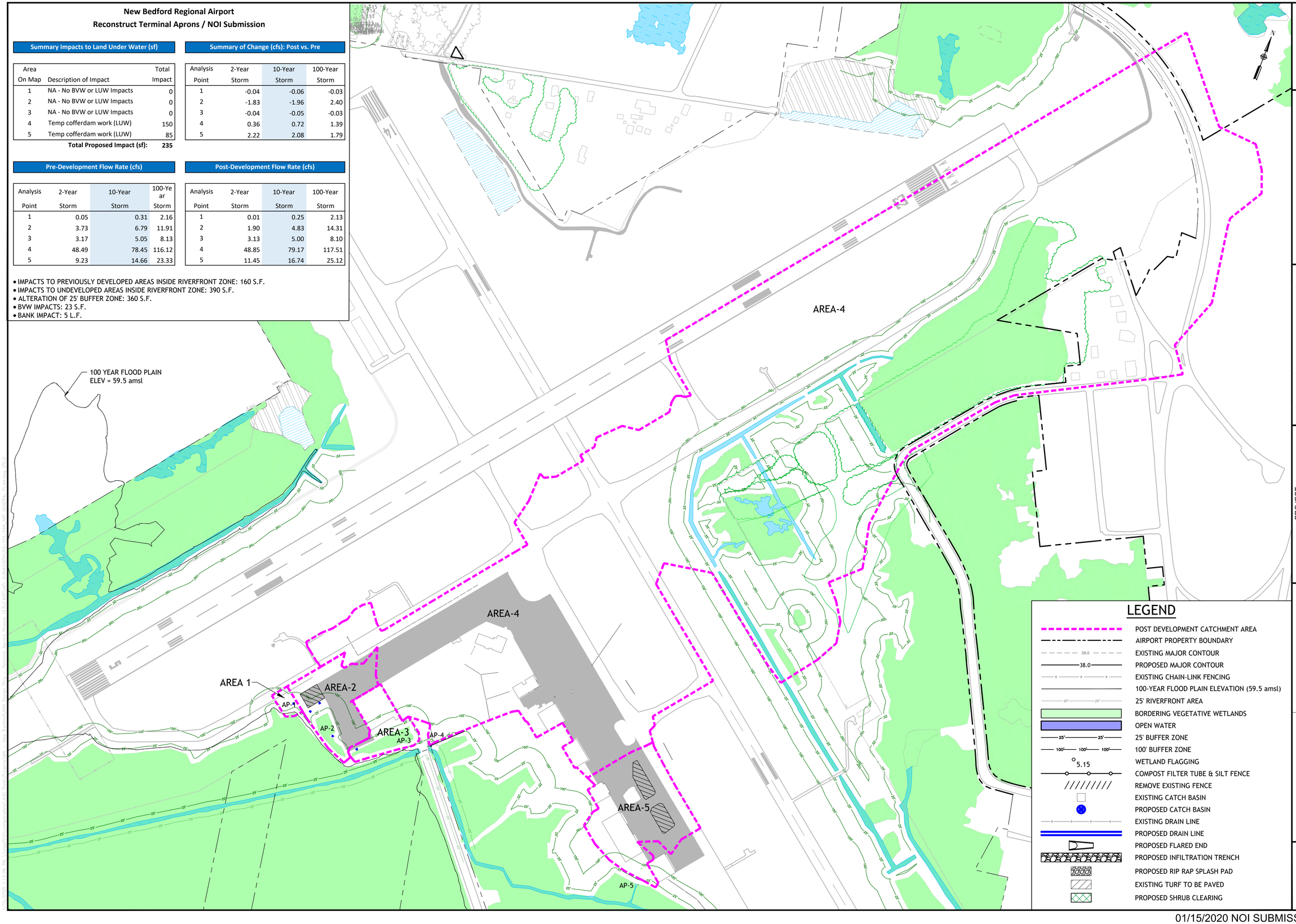
Pre-Development Flow Rate (cfs)

Analysis Point	2-Year Storm	10-Year Storm	100-Year Storm
1	0.05	0.31	2.16
2	3.73	6.79	11.91
3	3.17	5.05	8.13
4	48.49	78.45	116.12
5	9.23	14.66	23.33

Post-Development Flow Rate (cfs)

Analysis Point	2-Year Storm	10-Year Storm	100-Year Storm
1	0.01	0.25	2.13
2	1.90	4.83	14.31
3	3.13	5.00	8.10
4	48.85	79.17	117.51
5	11.45	16.74	25.12

- IMPACTS TO PREVIOUSLY DEVELOPED AREAS INSIDE RIVERFRONT ZONE: 160 S.F.
- IMPACTS TO UNDEVELOPED AREAS INSIDE RIVERFRONT ZONE: 390 S.F.
- ALTERATION OF 25' BUFFER ZONE: 360 S.F.
- BVW IMPACTS: 23 S.F.
- BANK IMPACT: 5 L.F.



COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PEDUSTER
CIVIL
No. 52939
REGISTERED
PROFESSIONAL ENGINEER

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PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

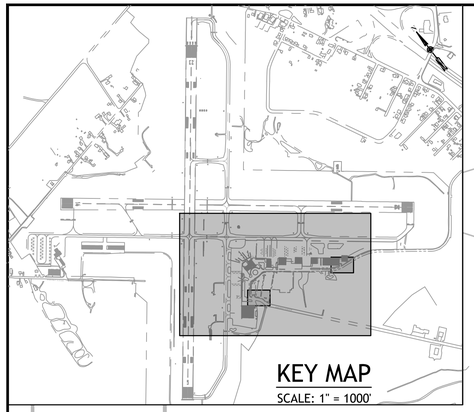
OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=200'

SHEET TITLE
CATCHMENT AREAS

GRAPHIC SCALE
0 100' 200' 400'

DRAWING NO.
NOI.2
2 OF 11



GRASS AREAS TO BE PAVED (TYP)

TAXIWAY B

TAXIWAY E

TAXIWAY A

T/W A1

T/W A2

T/W A3

RUNWAY 5-23

TERMINAL

MAINTENANCE BUILDING

SANDPIPER AIR

SANDPIPER AIR

HANGAR 8

NOR EAST HANGAR

CLAREMONT AVIATION

AP-5

SEE SHEET NOI.6

DOWNEY ST

PROPOSED WATER QUALITY STRUCTURE #4 SEE DETAIL SHEET NOI.8

SEE INSET THIS SHEET

AP-4

AP-3

COLONIAL HANGAR

SHAWMUT AVE

SEE SHEET NOI.5

100 YEAR FLOOD PLAIN ELEV 59.5 amsl

SEE SHEET NOI.4

AP-2

AP-1

AIRPORT GRAVEL ACCESS ROAD

AIRPORT PROPERTY LINE

PROPOSED VEGETATION REMOVAL

FENCE REMOVAL (TYP)

CONTRACTOR STAGING AREA

COMPOST FILTER TUBE & SILT FENCE SEE DETAIL NOI.11

25' BUFFER ZONE BRUSH CLEARING = 125 S.F.

IMPACTS TO PREVIOUSLY DEVELOPED AREAS INSIDE RIVERFRONT ZONE: 160 S.F.
IMPACTS TO UNDEVELOPED AREA INSIDE RIVERFRONT ZONE: 390 S.F.

SCALE: 1" = 20'

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PRUSTER
CIVIL
No. 37899
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PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	SE
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=80'

SHEET TITLE
CATCHMENT AREA & ANALYSIS POINTS

GRAPHIC SCALE
0 40' 80' 160'

DRAWING NO.
NOI.3
3 OF 11

01/15/2020 NOI SUBMISSION FOR NBCC

PROPOSED HW-2
INV = 57.20 (IN)

PROPOSED HW-3
INV = 56.92 (OUT)

RIP RAP SPLASH PAD (TYP.)
USE MHD SPEC. M2.02.3 STONE
DIMENSIONS: 5'6" x 2'6"
SEE DETAIL SHEET NOI.9

PROPOSED 12" RCP

FLOW

INSTALL COMPOST FILTER TUBE
AT BOTH ENDS OF NEW CULVERT
OUTSIDE OF WETLAND LIMITS

REMOVE AND REPLACE EXIST.
COLLAPSED 12" CONC. CULVERT
WITH NEW 12" RCP CULVERT

SCALE: 1" = 10'

SILL=61.58

SILL=61.61

COLONIAL HANGAR

FUEL FILL

FUEL PUMPS

FUEL TANK

SEE INSET THIS SHEET

PROPOSED COMPOST
FILTER TUBE & SILT
FENCE (TYP)

AIRPORT GRAVEL ACCESS ROAD

PROPOSED WATER QUALITY STRUCTURE #2
SEE DETAIL SHEET NOI.7
RIM = 59.65
INV OUT = 57.32

PROPOSED DIVERSION MANHOLE WITH OUTLET CONTROL
SEE DETAIL SHEET NOI.10
RIM = 59.73
INV IN = 57.30
INV OUT (W) = 57.27
INV OUT (E) = 57.29

PROPOSED 12" RCP

12" FLARED END
INV = 57.23

TRIPLE FRAME CATCH BASIN
SEE DETAIL SHEET NOI.9
RIM = 60.06
INV OUT = 57.38

PROPOSED 15" RCP

15" FLARED END
INV = 57.25

PROPOSED WATER QUALITY STRUCTURE #1
SEE DETAIL SHEET NOI.7
RIM = 59.70
INV IN = 57.3
INV OUT = 57.3

BOTTOM OF BASIN
ELEV = 56.5' amsl

PROPOSED 18' x 2' RIP-RAP
EMERGENCY OVERFLOW
SPILLWAY
SEE DETAIL SHEET NOI.7

PROPOSED DETENTION BASIN #1

PROPOSED FLARED END WITH
STONE SPLASH PAD (TYP)
SEE DETAIL SHEET NOI.9

PROPOSED 12" FLARED END
INV = 57.00

OVER
FLOW

PROPOSED 15" RCP

PROPOSED 15" RCP

15" FLARED END
INV = 57.26

AIRPORT GRAVEL ACCESS ROAD

15" FLARED END
INV = 57.08

PROPOSED COMPOST FILTER
TUBE & SILT FENCE (TYP)

BOTTOM OF BASIN
ELEV = 56.5' amsl

100 YEAR FLOOD PLAIN
ELEV = 59.5 amsl

PROPOSED DETENTION BASIN #2

KEY MAP
SCALE: 1" = 1000'

COMMONWEALTH OF MASSACHUSETTS
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CIVIL
No. 53595
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PHASES 2, AND 3
DESIGN ONLY

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1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

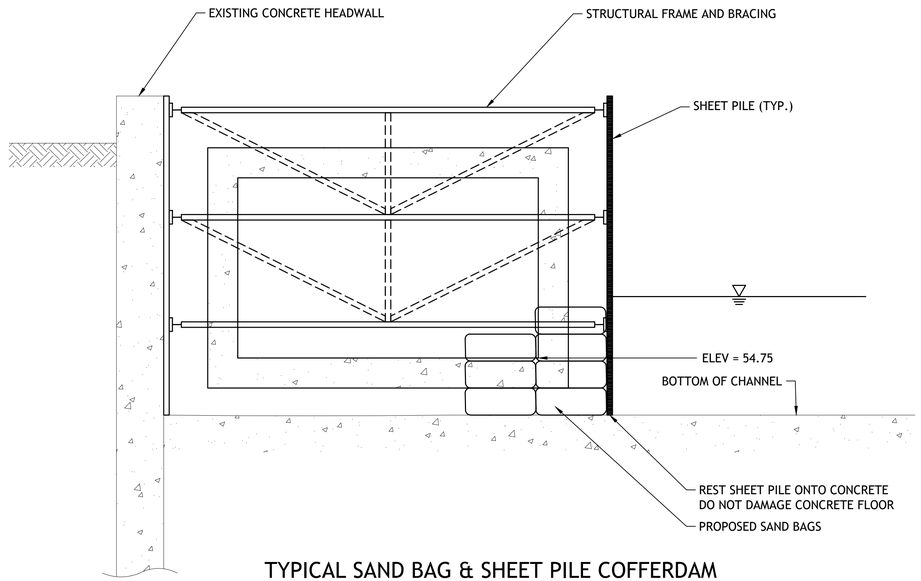
PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=20'

SHEET TITLE
CATCHMENT AREAS #1,2,3
ANALYSIS POINTS #1,2,3

GRAPHIC SCALE
0 10' 20' 40'

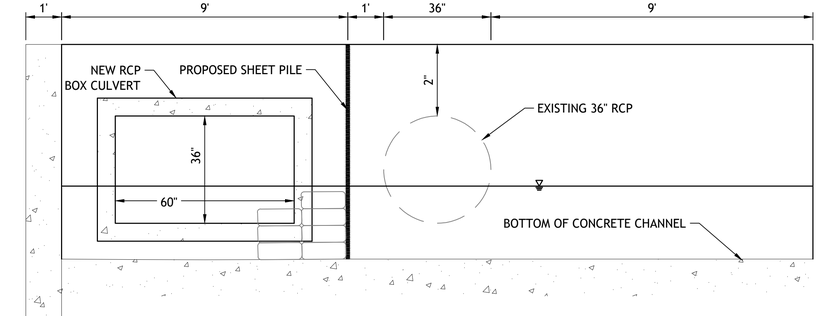
DRAWING NO.
NOI.4

01/15/2020 NOI SUBMISSION FOR NBCC



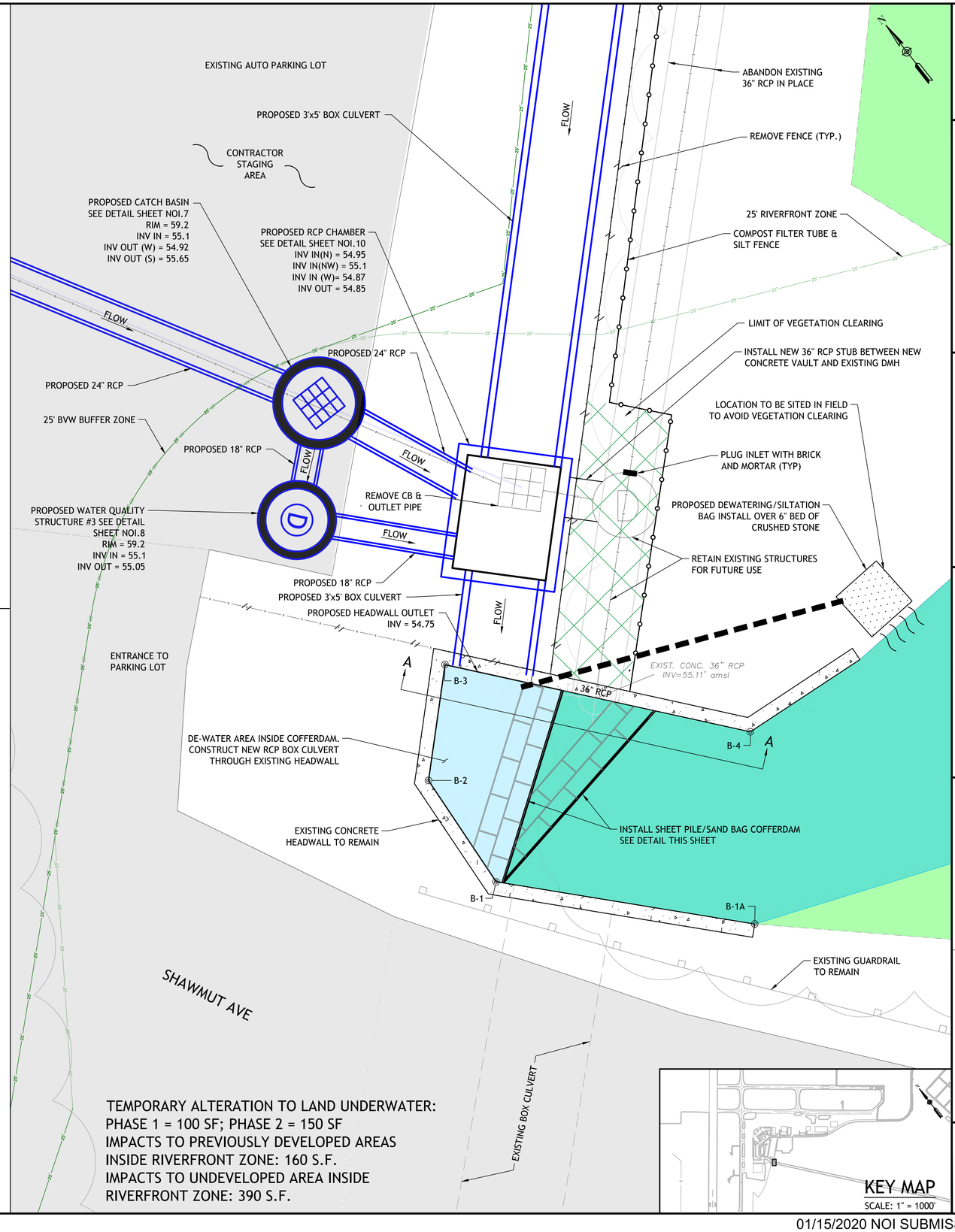
TYPICAL SAND BAG & SHEET PILE COFFERDAM

SCALE: N.T.S.



SECTION A-A

SCALE: N.T.S.



TEMPORARY ALTERATION TO LAND UNDERWATER:
PHASE 1 = 100 SF; PHASE 2 = 150 SF
IMPACTS TO PREVIOUSLY DEVELOPED AREAS
INSIDE RIVERFRONT ZONE: 160 S.F.
IMPACTS TO UNDEVELOPED AREA INSIDE
RIVERFRONT ZONE: 390 S.F.

SCALE: 1" = 1000'

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PRUSTER
CIVIL
No. 52939
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PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=4'

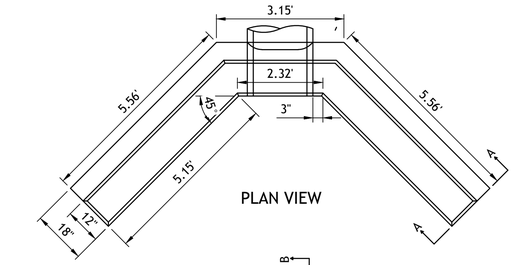
SHEET TITLE
CATCHMENT AREA #3
ANALYSIS POINT #3

GRAPHIC SCALE
0 2 4 8"

DRAWING NO.
NOI.5

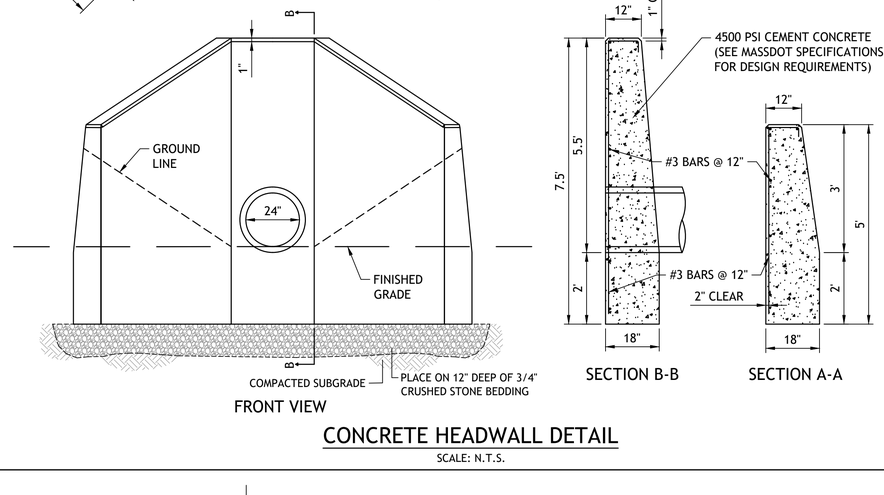
5 OF 11

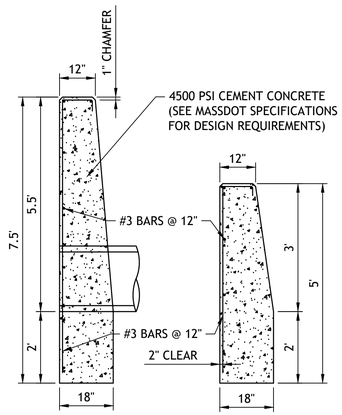
1/15/2020 1:41:41 PM \\oss2012\company\data\ASG Data\Projects\MA - New Bedford\046 Design Only - Terminal Aprons Phases 123\C-ADD\N0I SUBMISSION\03-103-046_N0I GENERAL PLAN.dwg (PEJ)



NOTES:

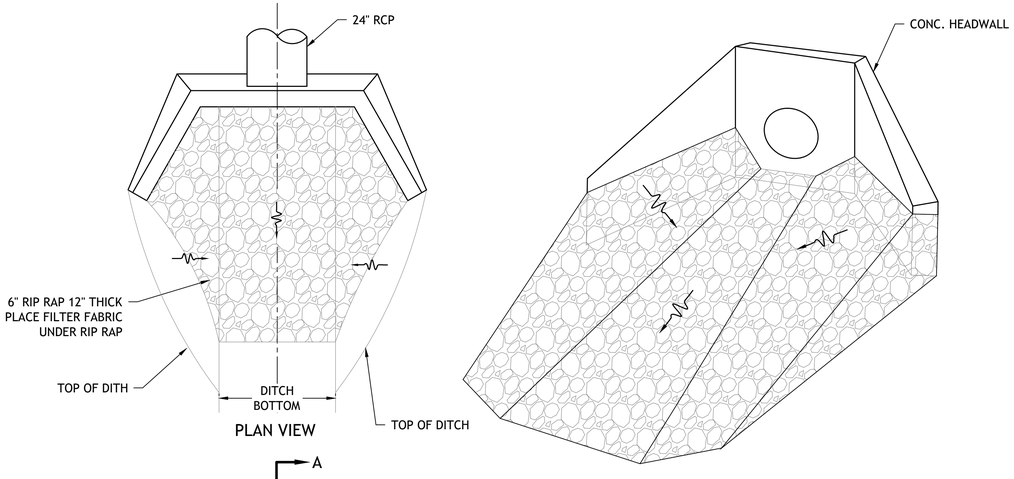
1. CONCRETE: 28 DAY COMPRESSIVE STRENGTH F'c = 4,500 PSI.
2. STEEL REINFORCEMENT: ASTM A 615, GRADE 60.
3. MINIMUM REINFORCING COVER - 2".
4. 3/4" CHAMFER ON ALL EXPOSED EDGES.
5. DIMENSIONS AS SHOWN MAY VARY DEPENDING ON MANUFACTURER.





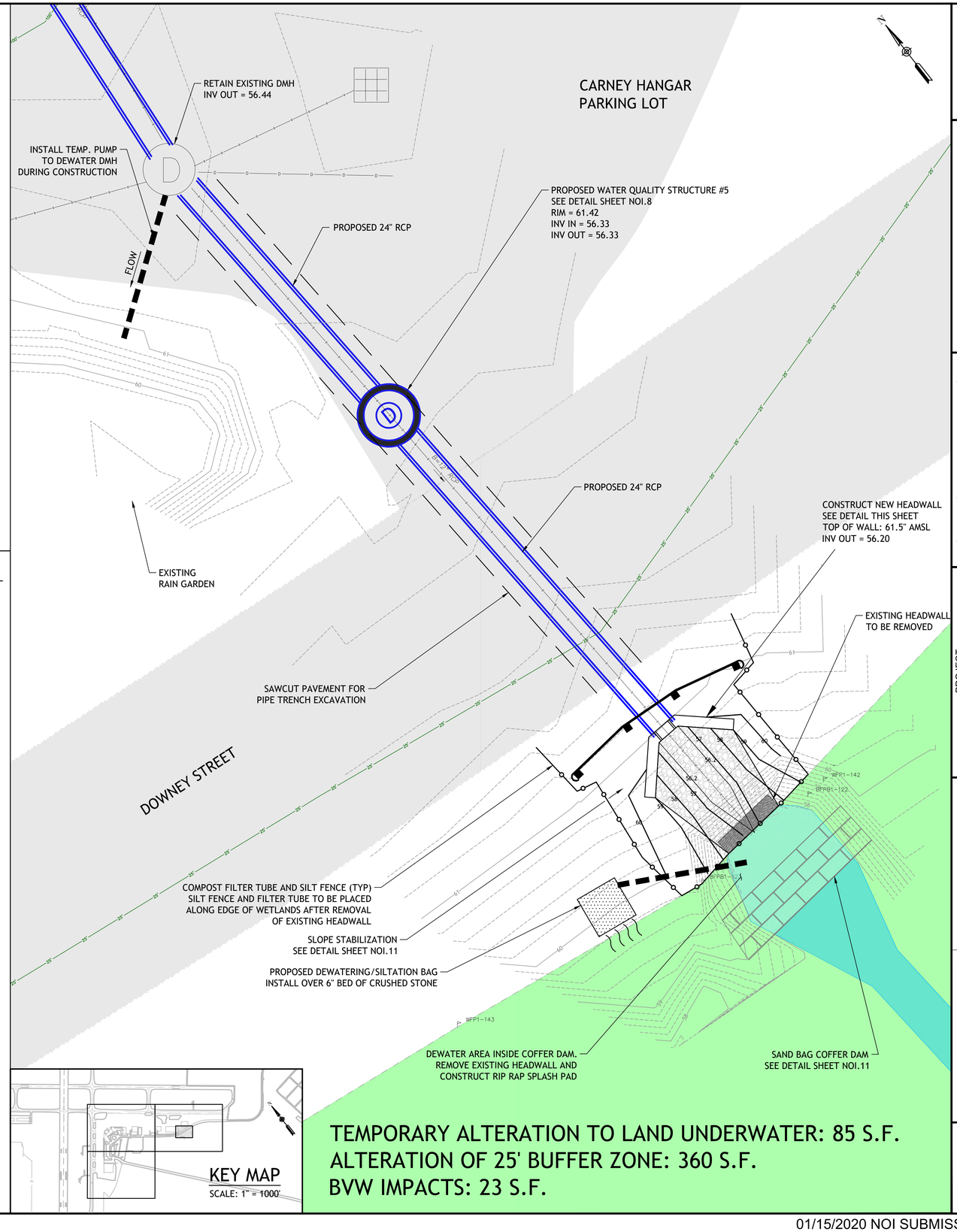
CONCRETE HEADWALL DETAIL

SCALE: N.T.S.



CONCRETE HEADWALL AND RIP RAP DETAIL

SCALE: N.T.S.



KEY MAP

SCALE: 1" = 1000'

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PROUSTER
CIVIL
No. 52939
REGISTERED
PROFESSIONAL ENGINEER

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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

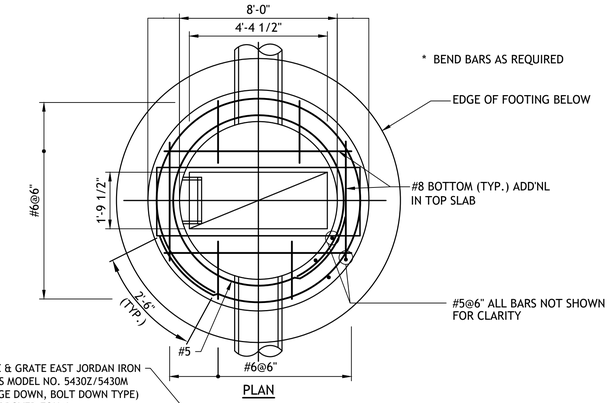
OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=5'

SHEET TITLE
ANALYSIS POINT #5

GRAPHIC SCALE
0 2.5 5 10'

DRAWING NO.
NOI.6

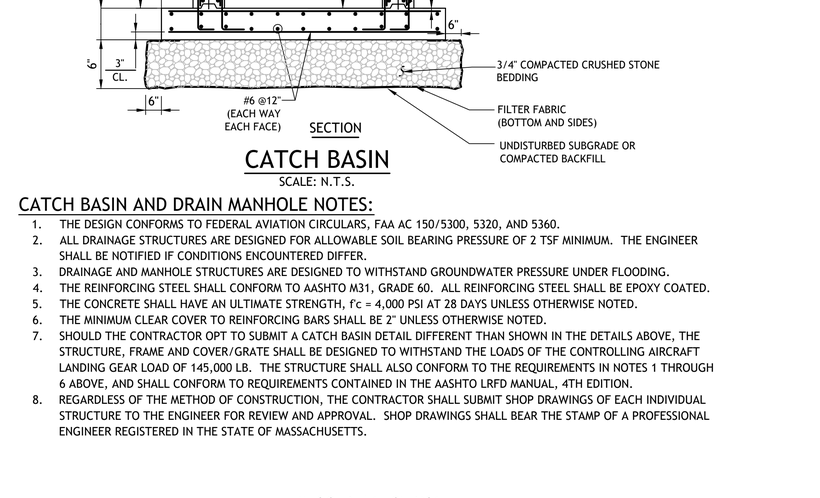


CATCH BASIN

SCALE: N.T.S.

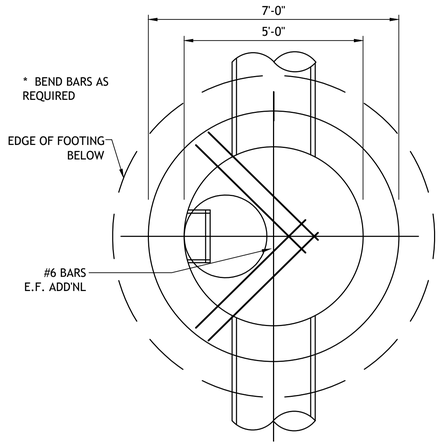
CATCH BASIN AND DRAIN MANHOLE NOTES:

1. THE DESIGN CONFORMS TO FEDERAL AVIATION CIRCULARS, FAA AC 150/5300, 5320, AND 5360.
2. ALL DRAINAGE STRUCTURES ARE DESIGNED FOR ALLOWABLE SOIL BEARING PRESSURE OF 2 TSF MINIMUM. THE ENGINEER SHALL BE NOTIFIED IF CONDITIONS ENCOUNTERED DIFFER.
3. DRAINAGE AND MANHOLE STRUCTURES ARE DESIGNED TO WITHSTAND GROUNDWATER PRESSURE UNDER FLOODING.
4. THE REINFORCING STEEL SHALL CONFORM TO AASHTO M31, GRADE 60. ALL REINFORCING STEEL SHALL BE EPOXY COATED.
5. THE CONCRETE SHALL HAVE AN ULTIMATE STRENGTH, f'c = 4,000 PSI AT 28 DAYS UNLESS OTHERWISE NOTED.
6. THE MINIMUM CLEAR COVER TO REINFORCING BARS SHALL BE 2" UNLESS OTHERWISE NOTED.
7. SHOULD THE CONTRACTOR OPT TO SUBMIT A CATCH BASIN DETAIL DIFFERENT THAN SHOWN IN THE DETAILS ABOVE, THE STRUCTURE, FRAME AND COVER/GRATE SHALL BE DESIGNED TO WITHSTAND THE LOADS OF THE CONTROLLING AIRCRAFT LANDING GEAR LOAD OF 145,000 LB. THE STRUCTURE SHALL ALSO CONFORM TO THE REQUIREMENTS IN NOTES 1 THROUGH 6 ABOVE, AND SHALL CONFORM TO REQUIREMENTS CONTAINED IN THE AASHTO LRFD MANUAL, 4TH EDITION.
8. REGARDLESS OF THE METHOD OF CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF EACH INDIVIDUAL STRUCTURE TO THE ENGINEER FOR REVIEW AND APPROVAL. SHOP DRAWINGS SHALL BEAR THE STAMP OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF MASSACHUSETTS.



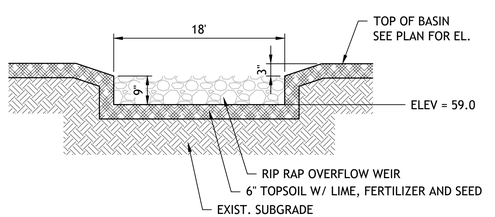
DETENTION BASIN DETAIL

SCALE: N.T.S.



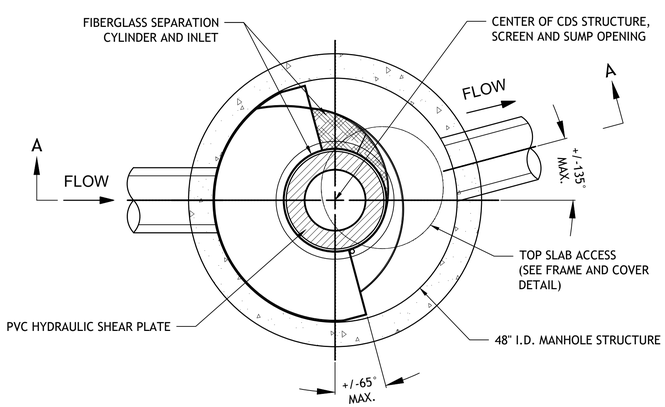
DRAIN MANHOLE

SCALE: N.T.S.

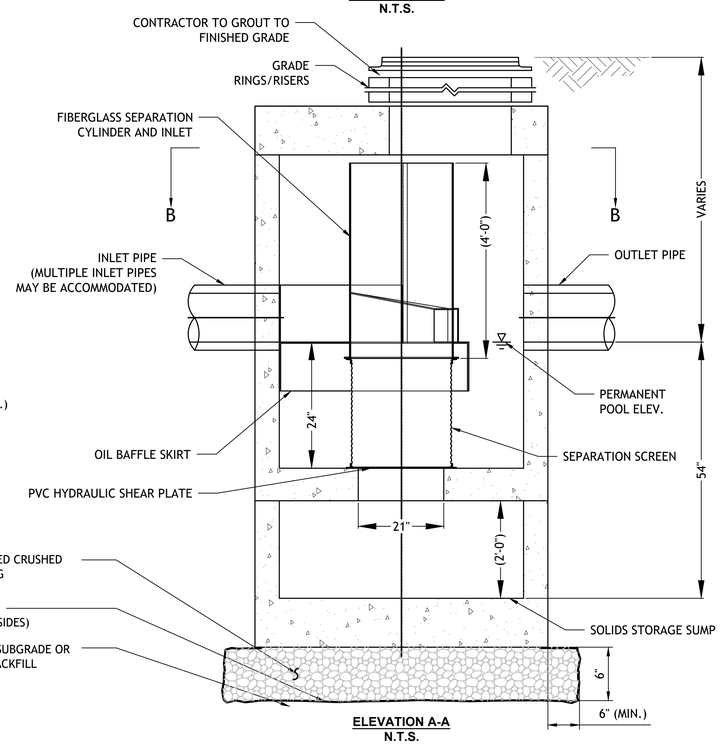


RIP RAP OVERFLOW DETAIL

SCALE: N.T.S.



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

WATER QUALITY STRUCTURE DETAIL (STRUCTURES 1 & 2)

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. POLLISTER
CIVIL
No. 52339
REGISTERED PROFESSIONAL ENGINEER

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PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

SHEET TITLE
DRAINAGE & EROSION CONTROL DETAILS (1 OF 5)

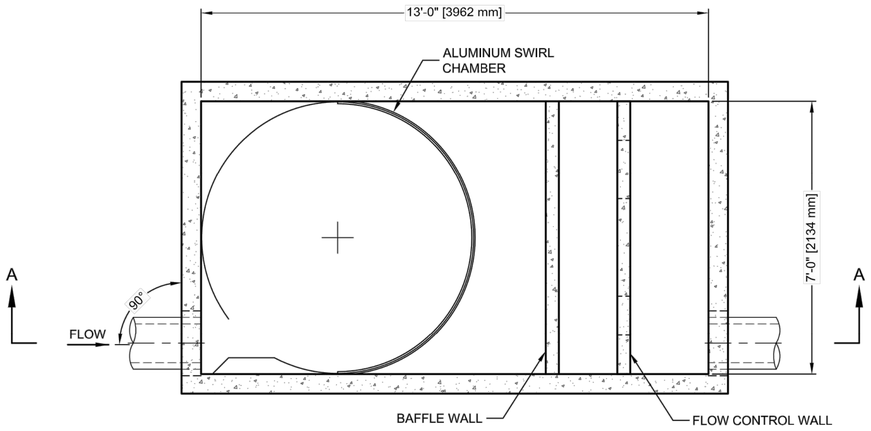
GRAPHIC SCALE
NOT TO SCALE

DRAWING NO.
NOI.7

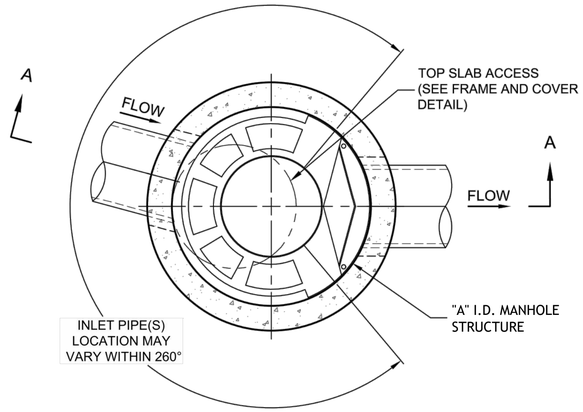
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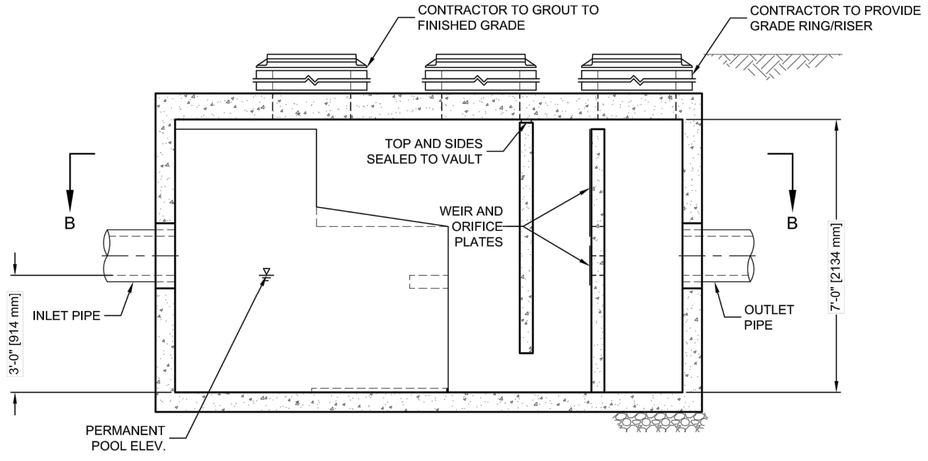
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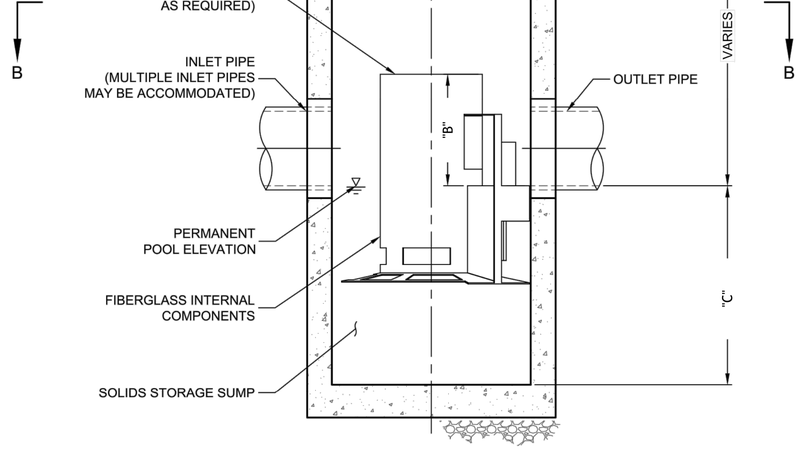
SECTION B-B



PLAN VIEW B-B
NOT TO SCALE



SECTION A-A



ELEVATION A-A
NOT TO SCALE

STRUCTURAL I.D.	DIAMETER "A"	"B"	"C"
OW-3	48"	2'-3"	4'-0"
OW-5	60"	2'-10"	4'-6"

WATER QUALITY STRUCTURE DETAIL
STRUCTURE 4
SCALE: N.T.S.

WATER QUALITY STRUCTURE DETAIL
(STRUCTURES 3 & 5)
SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PEDERSEN
CIVIL
No. 37339
REGISTERED PROFESSIONAL ENGINEER

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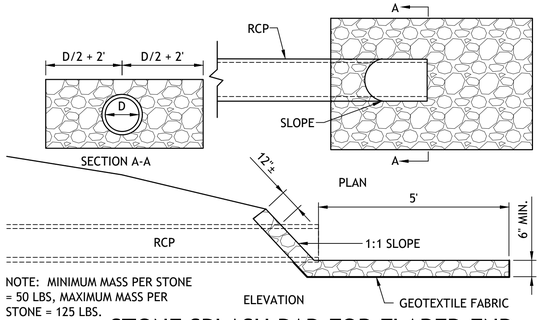
PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

SHEET TITLE
DRAINAGE & EROSION CONTROL DETAILS (2 OF 5)

GRAPHIC SCALE
NOT TO SCALE

DRAWING NO.
NOI.8

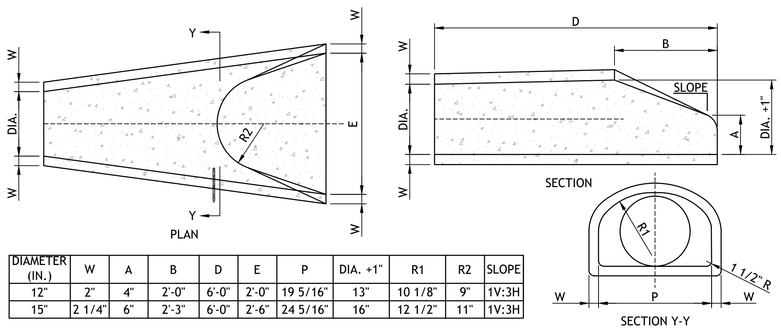
1/15/2020 1:28:33 PM \\asg2012\companydata\ASG Data\Projects\MA - New Bedford\046 Design Only - Terminal Aprons Phases 123\CADD\02 SUBMISSION\1-1-103-046_NOI DRAINAGE DETAILS.dwg (PEJ)



NOTE: MINIMUM MASS PER STONE = 50 LBS, MAXIMUM MASS PER STONE = 125 LBS.

STONE SPLASH PAD FOR FLARED END

SCALE: N.T.S.

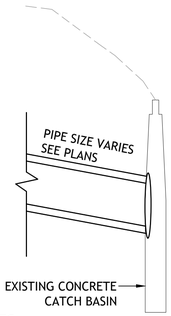


DIAMETER (IN.)	W	A	B	D	E	P	DIA. +1"	R1	R2	SLOPE
12"	2"	4"	2'-0"	6'-0"	2'-0"	19 5/16"	13"	10 1/8"	9"	1V:3H
15"	2 1/4"	6"	2'-3"	6'-0"	2'-6"	24 5/16"	16"	12 1/2"	11"	1V:3H

NOTES:
1. DIMENSIONS SHALL CONFORM TO MASSDOT CONSTRUCTION STANDARDS, DRAWING NO. E 206.8.0

REINFORCED CONCRETE PIPE FLARED END

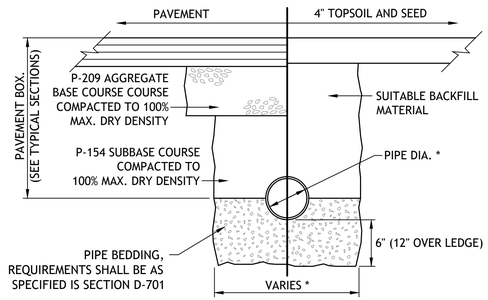
SCALE: N.T.S.



NOTES:
1. CORE HOLE MAX. OF 3" GREATER THAN O.D. OF PIPE.
2. INSERT PIPE SUCH THAT PIPE PENETRATES CATCH BASIN A MIN. OF 3".
3. FILL OPENING WITH NON-SHIRNK MORTAR.

CORE EXISTING CATCH BASIN / DMH

SCALE: N.T.S.

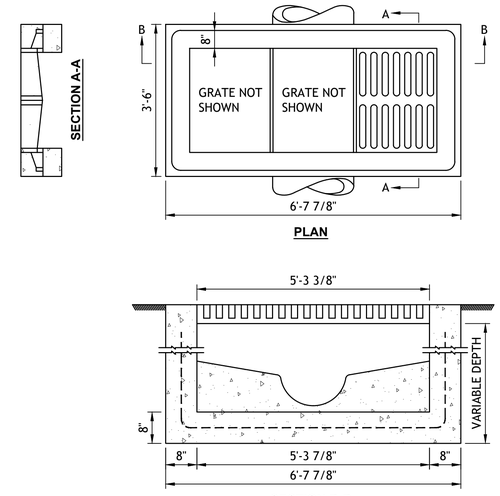


* PIPE DIA.	TRENCH WIDTH
UP TO 12"	36"
12" TO 24"	I.D. PLUS 24"
GREATER THAN 24"	2 x I.D.

NOTE: CONTRACTOR SHALL SHORE TRENCH SIDES WHEN REQUIRED.

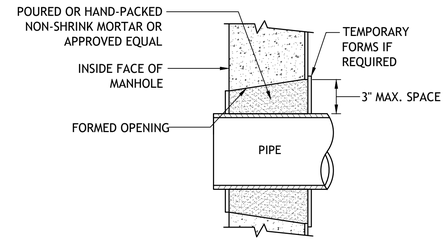
TYPICAL DRAINAGE PIPE TRENCH DETAIL

N.T.S.



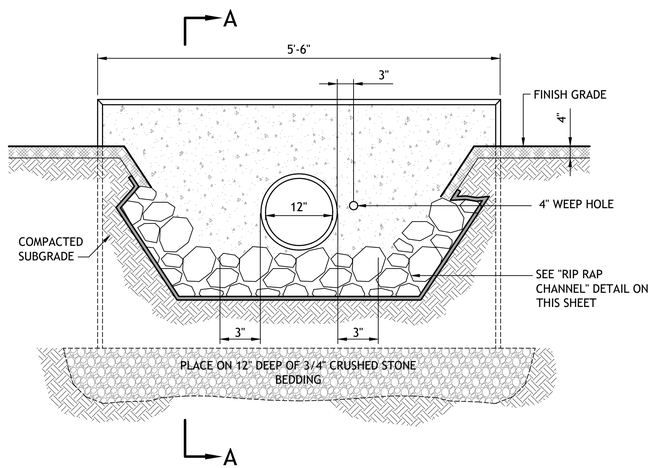
THREE-GRATE INLET STRUCTURE

SCALE: N.T.S.



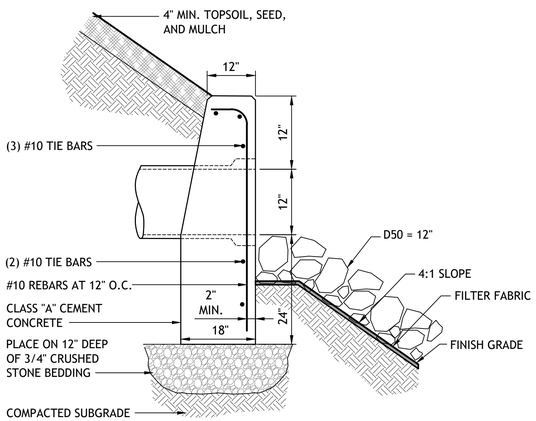
MORTAR PIPE CONNECTION AT STRUCTURES

SCALE: N.T.S.

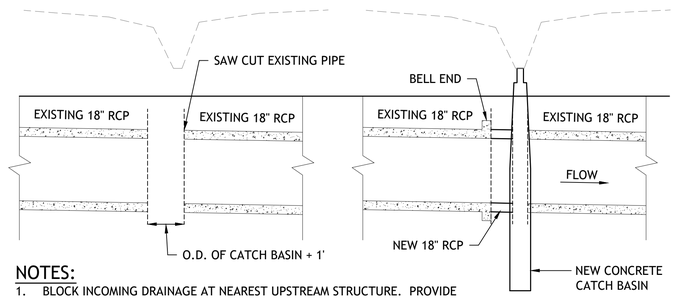


FRONT ELEVATION CONCRETE HEADWALL DETAIL

N.T.S.



SECTION A-A



NOTES:
1. BLOCK INCOMING DRAINAGE AT NEAREST UPSTREAM STRUCTURE. PROVIDE TEMPORARY PUMPING OR DEWATERING AS NECESSARY.
2. CUT EXISTING DRAINAGE PIPE 1' LARGER THAN O.D. OF CATCH BASIN.
3. INSERT CATCH BASIN, SLIDE TOWARD DOWNSTREAM.
4. INSERT SECTION OF PIPE ON UPSTREAM SIDE ALLOWING FOR MINIMUM 3" PENETRATION OF BOTH PIPE SECTIONS INTO STRUCTURE.
5. WORK REQUIRED TO INTERCEPT EXISTING PIPE SHALL BE CONSIDERED INCIDENTAL TO NEW CONCRETE CATCH BASIN.

INTERCEPT EXISTING PIPE

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PRUISTER
CIVIL
No. 37339
REGISTERED PROFESSIONAL ENGINEER

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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

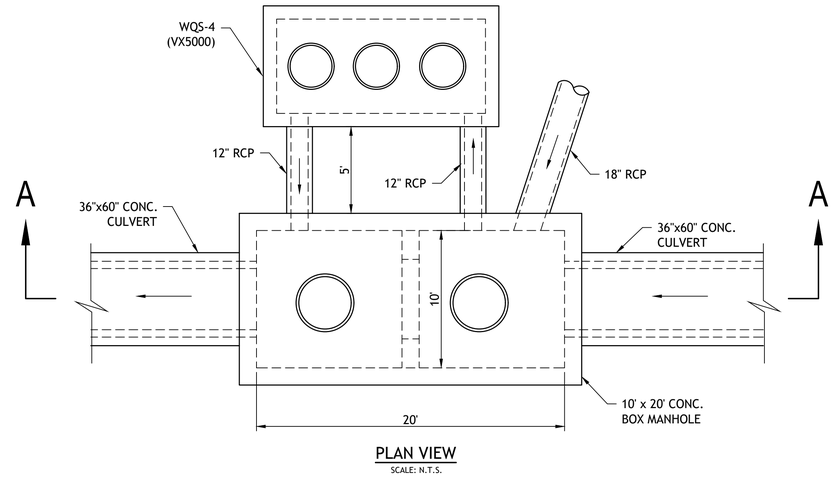
SHEET TITLE
DRAINAGE & EROSION CONTROL DETAILS (3 OF 5)

GRAPHIC SCALE
NOT TO SCALE

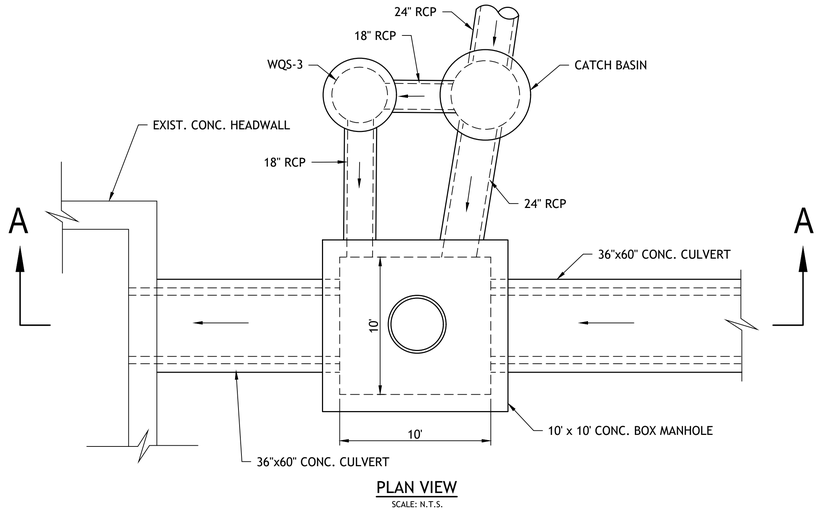
DRAWING NO.
NOI.9

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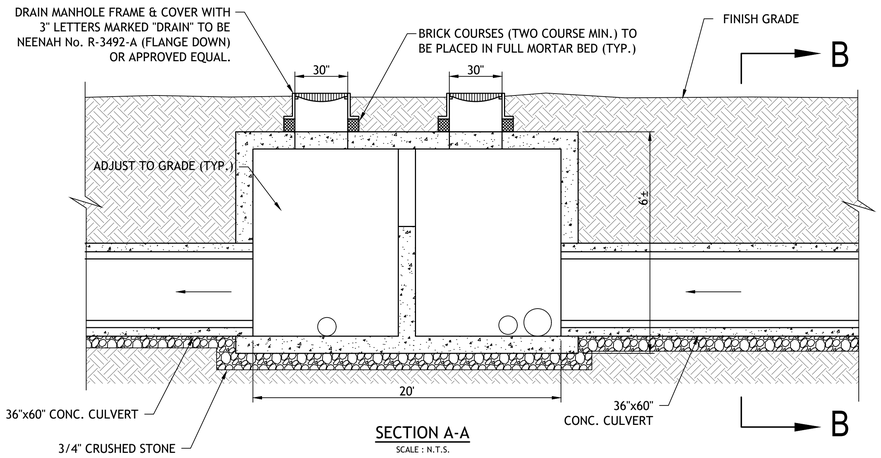
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PLAN VIEW
SCALE: N.T.S.

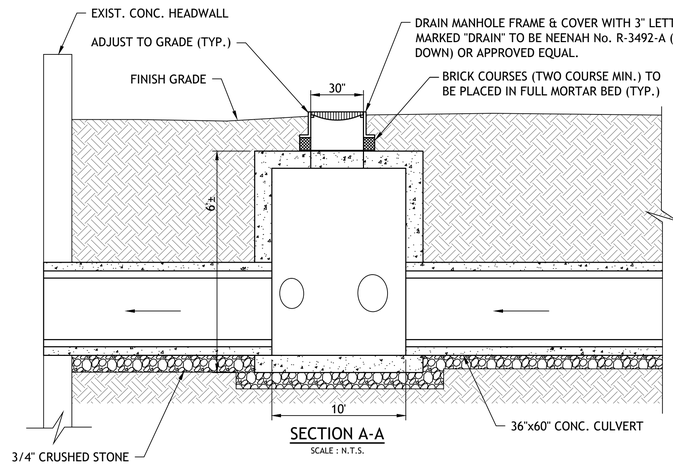


PLAN VIEW
SCALE: N.T.S.



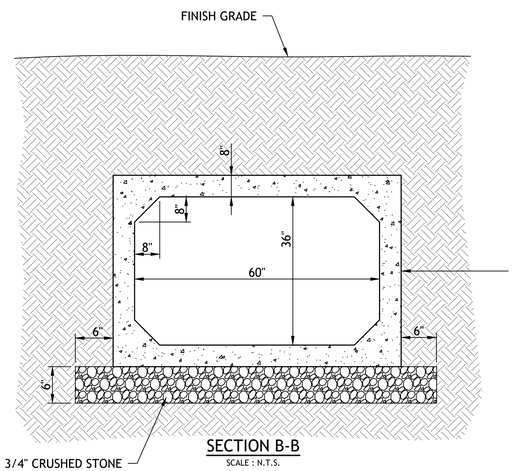
SECTION A-A
SCALE : N.T.S.

BYPASS MANHOLE WITH WEIR (OUTLET CONTROL) VAULT A
SCALE: N.T.S.

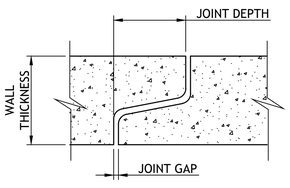


SECTION A-A
SCALE : N.T.S.

BOX MANHOLE VAULT B
SCALE: N.T.S.

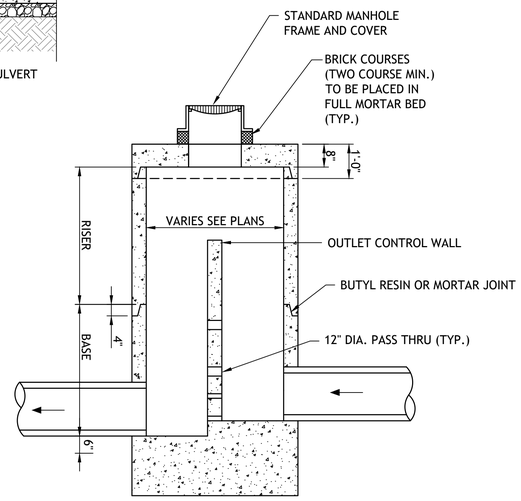


SECTION B-B
SCALE : N.T.S.



SECTION THROUGH BOX JOINT
SCALE : N.T.S.

SECTION THROUGH CULVERT



DIVERSION MANHOLE DETAIL
SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PICHUSTER
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REGISTERED
PROFESSIONAL ENGINEER

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SHEET TITLE
DRAINAGE AND EROSION CONTROL DETAILS (4 OF 5)

GRAPHIC SCALE
NOT TO SCALE

DRAWING NO.
NOI.10

01/15/2020 NOI SUBMISSION FOR NBCC

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NEW ENGLAND WETLAND PLANTS, INC

820 WEST STREET, AMHERST, MA 01002
PHONE: 413-548-8000 FAX 413-549-4000
EMAIL: INFO@NEWP.COM WEB ADDRESS: WWW.NEWP.COM

New England Conservation/Wildlife Mix

Botanical Name	Common Name	Indicator
Elymus virginicus	Virginia Wild Rye	FACW-
Schizachyrium scoparium	Little Bluestem	FACU
Andropogon gerardii	Big Bluestem	FAC
Festuca rubra	Red Fescue	FACU
Sorghastrum nutans	Indian Grass	UPL
Panicum virgatum	Switch Grass	FAC
Chamaecrista fasciculata	Partridge Pea	FACU
Desmodium canadense	Showy Tick Trefoil	FAC
Asclepias tuberosa	Butterfly Milkweed	NI
Bidens frondosa	Beggar Ticks	FACW
Eupatorium purpureum (Eutrochium maculatum)	Purple Joe Pye Weed	FAC
Rudbeckia hirta	Black Eyed Susan	FACU-
Aster pilosus (Symphyotrichum pilosum)	Heath (or Hairy) Aster	UPL
Solidago juncea	Early Goldenrod	

PRICE PER LB. $39.50 MIN. QUANITY 2 LBS. **TOTAL:** $79.00 APPLY: 25 LBS/ACRE :1750 sq ft/lb

The New England Conservation/Wildlife Mix provides a permanent cover of grasses, wildflowers, and legumes
For both good erosion control and wildlife habitat value. The mix is designed to be a no maintenance seeding, and is appropriate for cut and fill slopes, detention basin side slopes, and disturbed areas adjacent to commercial and residential projects.

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.

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PHONE: 413-548-8000 FAX 413-549-4000
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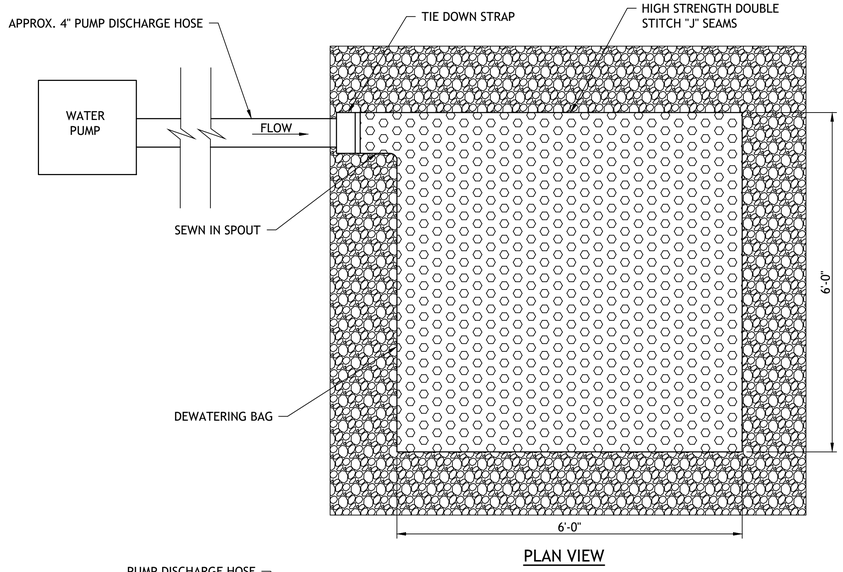
New England Erosion Control/Restoration Mix For Detention Basins and Moist Sites

Botanical Name	Common Name	Indicator
Elymus riparius	Riverbank Wild Rye	FACW
Schizachyrium scoparium	Little Bluestem	FACU
Festuca rubra	Red Fescue	FACU
Andropogon gerardii	Big Bluestem	FAC
Panicum virgatum	Switch Grass	FAC
Vernonia noveboracensis	New York Ironweed	FACW+
Agrostis perennans	Upland Bentgrass	FACU
Bidens frondosa	Beggar Ticks	FACW
Eupatorium maculatum (Eutrochium maculatum)	Spotted Joe Pye Weed	OBL
Eupatorium perfoliatum	Boneset	FACW
Aster novae-angliae (Symphyotrichum novae-anglia	New England Aster	FACW-
Scirpus cyperinus	Wool Grass	FACW
Juncus effusus	Soft Rush	FACW+

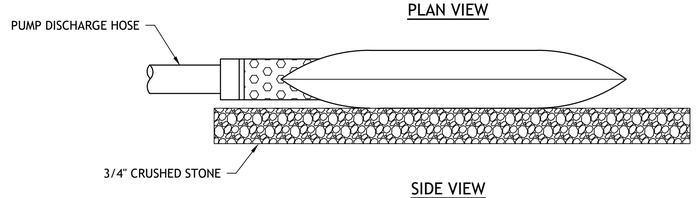
PRICE PER LB. $37.00 MIN. QUANITY 3 LBS. **TOTAL:** $111.00 APPLY: 35 LBS/ACRE :1250 sq ft/lb

The New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites contains a selection of native grasses and wildflowers designed to colonize generally moist, recently disturbed sites where quick growth of vegetation is desired to stabilize the soil surface. It is an appropriate seed mix for ecologically sensitive restorations that require stabilization as well as long-term establishment of native vegetation. This mix is particularly appropriate for detention basins that do not hold standing water. Many of the plants in this mix can tolerate infrequent inundation, but not constant flooding. The mix may be applied by hand, by mechanical spreader, or by hydro-seeder. After sowing, lightly rake, roll or cultipack to insure good seed-to-soil contact. Best results are obtained with a Spring or late Summer seeding. Late Fall and Winter dormant seeding requires an increase in the application rate. A light mulching of clean, weed-free straw is recommended

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.



PLAN VIEW

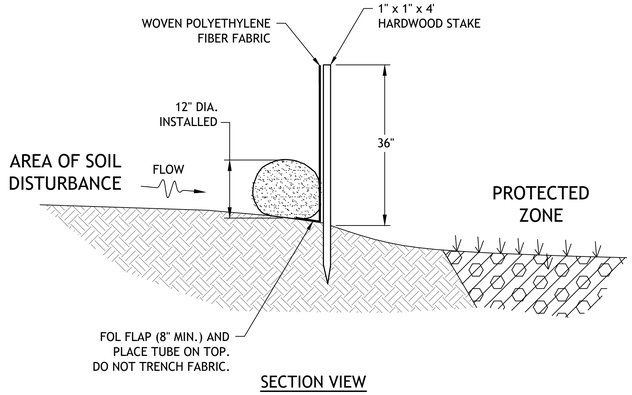


SIDE VIEW

NOTES:
1. SEAMS MUST BE HIGH STRENGTH DOUBLE STITCHED "J" SEAMS
2. SEAMS MUST BE TESTED UNDER ASTM D-4884, ACF TEST RESULTS AVAILABLE UPON REQUEST.

DEWATERING BAG FOR SEDIMENT CONTROL

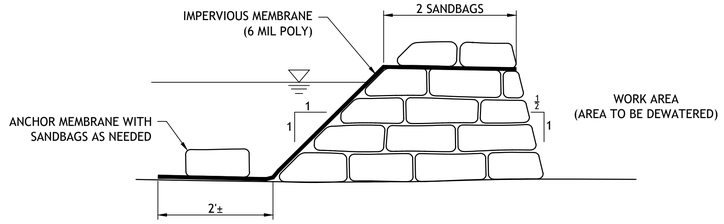
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SECTION VIEW

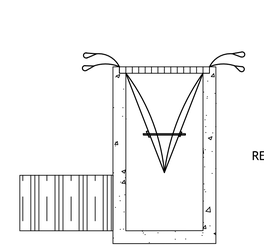
COMPOST FILTER TUBE AND SILT FENCE

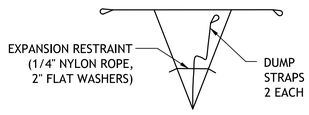
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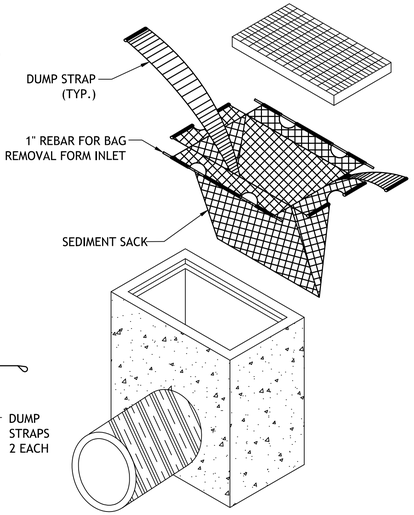


SECTION OF SANDBAG COFFERDAM USING SMALL SANDBAGS

SCALE: N.T.S.





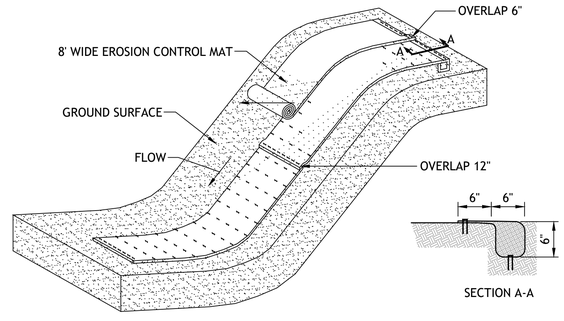


CATCH BASIN INLET NOTES:

1. CONTRACTOR SHALL REMOVE SEDIMENT AS NECESSARY TO MAINTAIN LEVEL BELOW OVERFLOW HOLES IN SEDIMENT SACK.
2. SEDIMENT SACK SHALL BE USED ON ALL CATCH BASINS WITHIN THE CONSTRUCTION ZONE, INCLUDING NEW STRUCTURES, OR AS DIRECTED BY THE ENGINEER.
3. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING SEDIMENTATION SACKS THROUGHOUT THE DURATION OF THE PROJECT.
4. CONTRACTOR SHALL REMOVE AND LEGALLY DISPOSE OF SEDIMENT AS REQUIRED.
5. CONTRACTOR SHALL REMOVE SEDIMENT SACKS AND LEGALLY DISPOSE OF THEM OFF-SITE, UPON COMPLETION OF THE PROJECT AND AS REQUIRED.
6. 1" REBAR FOR BAG REMOVAL SHALL BE REMOVED DURING WINTER MONTHS AT LOCATIONS WHERE THERE IS PLOW ACTIVITY. BARS SHALL BE REINSTALLED AFTER SNOW SEASON IS COMPLETE.

CATCH BASIN INLET PROTECTION

SCALE: N.T.S.



EROSION CONTROL MATTING NOTES:

1. PRIOR TO PLACING EROSION CONTROL MATTING, PREPARE THE SOIL BY RAKING AREA FREE OF CLODS AND LARGE STONES.
2. SEED, MULCH AND FERTILIZER SHALL BE DISTRIBUTED AS SPECIFIED OVER THE PREPARED SOIL PRIOR TO PLACING THE EROSION CONTROL MATTING.
3. ALL SEAMS SHALL BE OVERLAPPED A MINIMUM OF 6" AND SECURED WITH STAPLES 18" ON CENTER.
4. TO SECURE MAT TO GROUND, STAPLE RANDOMLY AT 24" INTERVALS THROUGHOUT
5. APPROXIMATELY 200 STAPLES PER ROLL
6. PLACE EROSION CONTROL MATTING AS DIRECTED BY THE ENGINEER AND ON SLOPES GREATER THAN 5:1.

EROSION CONTROL MATTING

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PROUSTER
CIVIL
No. 52939
REGISTERED PROFESSIONAL ENGINEER

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1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

SHEET TITLE
DRAINAGE AND EROSION CONTROL DETAILS (5 OF 5)

GRAPHIC SCALE
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DRAWING NO.
NOI.11

11 OF 11

01/15/2020 NOI SUBMISSION FOR NBCC

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Attachment G

Stormwater Report, prepared by Airport Solutions Group

EWB

New Bedford Regional Airport

RECONSTRUCT TERMINAL AREA APRON
PHASE I, II & III
STORMWATER MANAGEMENT REPORT



Prepared By:

Airport Solutions Group

39 Winn Street,

Burlington, MA 01803

January 2020

TABLE OF CONTENTS

STORMWATER MANAGEMENT REPORT 1

1. INTRODUCTION 1
2. METHODOLOGY 3
3. EXISTING CONDITIONS 4
4. PROPOSED CONDITIONS 8
5. COMPLIANCE WITH MASSDEP STORMWATER STANDARDS: 13
6. DRAINAGE SUMMARY TABLES 18

APPENDICES

A – NOI DRAWINGS

B – EXISTING HYDROCAD DRAINAGE CALCULATIONS

C – PROPOSED HYDROCAD DRAINAGE CALCULATIONS

D – TSS REMOVAL CALCULATIONS

E – GEOTECH REPORT

F – STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN

G – CHECKLIST FOR STORMWATER REPORT

STORMWATER MANAGEMENT REPORT

1. INTRODUCTION

The New Bedford Regional Airport ("Airport") is a commercial airline service airport that is strategically located along the coastline of Southeastern Massachusetts and is a significant transportation gateway for the region and islands of Nantucket and Martha's Vineyard. Since 2006, over $50M of airport capital infrastructure funding has been invested into the Airport to make significant airfield safety, environmental, and operational improvements. Several of the key safety and environmental improvement projects completed at the Airport since 2006 include the reconstruction of both the primary and crosswind runways, Runway 5-23 and Runway 14-32. Full Length reconstruction of Taxiway A was also accomplished in 2016.

One essential airside infrastructure improvement not addressed over the past 50 years is the terminal aircraft parking aprons, including upgrades to antiquated stormwater management systems. The Airport has continuously identified this project in their Five-Year Airport Capital Improvement Plan, however traditionally this type of project has been a low priority for FAA and MassDOT funding. However, given the poor pavement conditions within the terminal aircraft apron areas and the stormwater requirements mandated by MassDEP in 2010 as part of its Wetland and Water Quality Certification Variance[1] approval for the Runway 5-23 Reconstruction Project, (MassDEP File No. SE 049-0635), the Airport submitted a federal grant application in 2018 for funding to reconstruct the terminal aprons and related drainage systems. The funding program included an FAA Supplemental Appropriations Program, a newly established program under the FAA. The Airport was selected to receive $5M towards the project utilizing the 100% Supplemental funding from the FAA. However, this awarded FAA funding would only cover a portion of the entire proposed terminal apron project. Through the cooperative and diligent efforts of the Airport, FAA, MassDOT, and the City of New Bedford, the project team was able to identify additional funding sources through FAA, MassDOT, and the City of New Bedford to reconstruct the entire terminal apron and its stormwater management system(s) as one comprehensive project at an estimated cost of approximately $14M.

For perspective, since the issuance of MassDEP's Variance in 2010, the Airport has implemented several improvements to its facilities as funds have become available, including the elimination of approximately 8.4 acres of impervious pavement throughout the Airport and other meaningful upgrades to the stormwater management infrastructure.[2] This project builds upon these prior measures and commitments and proposes additional stormwater management system improvements and upgrades as part of the terminal apron reconstruction work.

[1] As per Special Condition #51 of the referenced Variance, in 2010 the Airport provided MassDEP with a plan addressing runoff from existing developed areas of the Airport, including proposed measures to comply with Stormwater Standard 7 pursuant to 310 CMR 10.05(6)(k)(7). The information provided to MassDEP in 2010 included a conceptual schedule and the approximate cost of anticipated stormwater upgrades. As was permitted by MassDEP, the schedule indicated that upgrades would be phased in over time given the availability of projected funds.

[2] The Reconstruction of Taxiway A Project completed in 2016 removed approximately 0.39 acres of impervious pavement and converted to pervious grasslands. The Reconstruction of Runway 14-32 Project completed in 2018 removed a total of approximately 7.99 acres of impervious pavement and was converted to pervious grasslands. Between the two major infrastructure projects, the Airport was able to create a net total of approximately 8.4 acres of new pervious grasslands.

Specifically, the Airport is seeking to reconstruct their existing bituminous concrete apron pavement (approximately 14 acres) and replace the existing, antiquated and undersized subsurface drainage system for the entire terminal apron. The existing apron and drainage system was constructed in various stages between the early 1950's through the early 1970's. The apron pavement and drainage system has long since outlived their useful design life and are in need of reconstruction and replacement to meet current FAA and MassDOT Aeronautics standards. The existing drainage system was designed utilizing common engineering practices of the 1950's and 1970's which do not meet current MassDEP stormwater standards and other current engineering design criteria including best management practices.

Accordingly, the proposed stormwater management system described herein has been designed to comply with MassDEP's stormwater management standards that were incorporated into the Wetlands Protection Act Regulations on January 2, 2008 (see 310 CMR 10.05(6)(k)); FAA Advisory Circular 150/5300-13A Airport Design; and MassDOT Aeronautics approved aeronautical rules and regulations for public use airports (pursuant to 702 CMR, as amended; for airports subject to MassDOT Aeronautics certification pursuant to M.G.L. c.90, Section 39B). The proposed stormwater improvements also specifically address Special Condition No. 51 of MassDEP's Wetland and Water Quality Certification Variance.

As explained in further detail below, the stormwater management upgrades described herein will ensure additional pretreatment and treatment measures for Land Uses with Higher Potential Pollutant Loads ("LUHPPL") will be instituted to the maximum extent practicable for projects meeting the "redevelopment" criteria of MassDEP's Stormwater Standards. Specifically, this will include the installation of several water quality units, properly sized piping and best management practices designed to retain/detain and treat stormwater runoff following construction, including consideration of the approximately 8.4 acres of pavement that was previously removed from the Airport and converted to pervious grasslands. The measures described herein comply with the MassDEP Standards to the maximum extent practicable and will improve existing stormwater runoff conditions consistent with the requirements of Standard 7.

For purposes of Stormwater Management Standard 7, redevelopment projects are defined to include the following:

- Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving;
- Development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results *in no net increase in impervious area*; and
- Remedial projects specifically designed to provide improved stormwater management, such as projects to separate storm drains and sanitary sewers and stormwater retrofit projects.

Redevelopment projects, such as that associated with the Airport's phased terminal and apron projects, are required to meet the following Stormwater Management Standard only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project

shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

As described in further detail in the balance of this report and on the enclosed Stormwater Checklist, the proposed project fully complies with Standard 1 (no untreated stormwater runoff), Standard 4 (80% TSS removal), Standard 5 (BMPs approved for use in LUHPPL areas), Standard 6 (no stormwater discharges to Critical Areas), Standard 8 (implementation of a construction period erosion, sedimentation, and pollution prevention plan), Standard 9 (adherence to a long term operations and maintenance plan), and Standard 10 (no known illicit discharges).

With regard to Standard 2, as demonstrated in the pre-and post-development runoff tables provided in this report, the stormwater management system has been designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates for the modeled storm events to the maximum extent practicable. In those few instances where there is a nominal increase between pre and post-development runoff rates, under certain modeled storm events, the differences are de minimus and will not impair the receiving wetlands ability to prevent storm damage and downstream off-site flooding.

With regard to Standard 3, the loss of annual recharge to groundwater has been minimized through the use of environmentally sensitive site design measures. While this phase of construction will result in approximately 0.98 acres of additional pavement within the terminal apron in order to improve aircraft safety, aircraft movement, including appropriate wing tip clearance near existing hangars, overall more than 7.48 acres of pavement have been removed from the Airport since 2010. The loss of 8 acres of pavement significantly improves existing conditions by promoting infiltration and groundwater recharge throughout the entire Airport property

Upon completion of the Reconstruction of Terminal Aprons Project, the New Bedford Regional Airport Team will have greatly enhanced the safety, environmental, and operational aspects of aircraft activities on the terminal apron areas while improving treatment of stormwater runoff.

2. METHODOLOGY

This drainage analysis conducted by ASG considers five (5) distinct points of analysis (AP-1 through AP-5) that discharge stormwater from the terminal apron as depicted on Drawing D1.2, *Existing Drainage Plan (Terminal Apron),* in Appendix B. Drawing D1.1, *Existing Drainage Plan*, indicates the watershed on the airport which contributes stormwater runoff to the terminal apron.

The existing and proposed watersheds were modeled utilizing HydroCad stormwater software, version 10.00-24. The watersheds were analyzed utilizing SCS TR-20 methodology for hydrograph development and TR-55 methodology for Time of Concentration (T_c) determination. Type III, 24-hour hydrographs were developed for the 2-year, 10-year, and 100-year storm events corresponding to 3.4", 4.8", and 7.0" of rainfall respectively as directed by the SCS *Technical Paper 40* (TP-40) and the MASS DEP *Hydrology Handbook for Conservation Commissioners*.

Existing topography and site features were obtained through a combination of aerial topography, on the ground survey, MASS GIS system, and USGS Topographical Mapping. Existing soil conditions were derived from a combination of geotechnical investigations performed by R.W. Gillespie & Associates, test pits performed by ASG, MASS GIS soils, and the Natural Resources Conservation Services (NRCS) Web Soil Service Mapping Tool. The wetland resource area boundaries depicted on the enclosed drawings were reviewed and approved under MASS DEP File No. 049-0635 and remain valid.

3. EXISTING CONDITIONS

The existing airport watershed for this analysis consists of approximately 144.4 acres which consists of the apron and contributing airport infield areas north of the apron.

The airport is located in the north-east corner of the Apponagansett Swamp, between I-195 and New Plainville Road in New Bedford, MA. The airport watershed is located northeast of the Paskamanset River and includes portions of Turner Pond to the north and the Smith Mills Dam to the south. The existing airport watershed contains a mixture of forest, brush lands associated with immature woods, maintained grassed areas, shrub scrub wetlands, paved areas, and buildings. Watershed soils were determined to be a mixture of Hydrologic Soil Group (HSG) "A", "B", "C", & "D". All wetlands were classified hydrologic soil group "D". Runoff curve numbers associated with developed areas are based upon land usage.

Existing Drainage Areas and Analysis Points are depicted on Sheets D1.1. and D1.2, of Appendix B. HydroCAD Pre and Post Development Routing Diagrams are shown in Appendix B and C.

Stormwater runoff from the redevelopment area (terminal apron) is collected in a closed drainage system, discharges into an open drainage channel, flows southwest into the Paskamansett River and ultimately crosses the airport property line.

As previously noted, this drainage analysis considers five (5) distinct points (AP-1 through AP-5) that discharge stormwater from the terminal apron as depicted on Drawing D1.2, *Existing Drainage Plan (Terminal Apron)*. The location of the discharge points are as follows:

- Analysis Point AP-1 is located at subcatchment 77S west of Colonial hangar.
- Analysis Point AP-2 is located at the existing isolated wetlands immediately southwest of the existing Colonial Air apron
- Analysis Point AP-3 is located at the 12" outlet pipe to isolated wetlands immediately behind (southeast) of the Colonial Air hangar.
- Analysis Point AP-4 is located at the existing headwall on the north side of Shawmut Avenue.
- Analysis Point AP-5 is located at an existing outlet headwall at the south side of Downey Street south of the Claremont hangar.

For analysis purposes, the total contributing drainage area of 144.4 acres was divided into several sub-catchments depicted on Drawings D1.1 and D1.2. Below are detailed descriptions of the individual sub-catchment areas:

Drawing D1.1 Existing Drainage Plan

- 40S - "EX-TWA-E1" contains 1.194 acres located west side of Taxiway A and is part of the graded area near the glide slope. Runoff from this area is collected in the apron drainage system and discharges at the headwall at Shawmut Avenue.
- 47S - "EX-RW23-E2" contains 22.469 acres located along the east side of Runway 23 End. Drainage from this watershed drains to the Infiltration Trench "23-C". Overflow is discharged to the existing Wetland "H", overland to a drainage ditch that flows to the drainage system in the terminal ramp.
- 48S - "EX-RW23-E6" contains 3.464 acres located east of Runway 14-32 between Taxiway "A" and Taxiway "F". Runoff from this watershed is conveyed to the terminal apron drainage system.
- 49S - "EX-RW23-E3" contains 9.450 acres. Runoff from this watershed is collected in a vegetated drainage channel and then to the terminal apron drainage system.
- 50S - "EX-RW23-E1" contains 51.158 acres. Runoff from this watershed flows overland through existing wetlands and open drainage system to the terminal apron drainage system.
- 51S - "EX-RW32-NE-1" contains 7.120 acres located in the infield between Runway 14-32 and Taxiway B. Runoff from this area flows under the east end of the Terminal Apron into the open airport drainage system and outlets at the headwall at Shawmut Avenue.
- 52S - "EX-RW23-E4" contains 10.361 acres located at the RW 23 End consisting of a portion of the runway pavement and grassed area between the runway and Taxiway A. Runoff from this watershed flows overland to the closed drainage system on Runway 14-32 and to the terminal apron drainage system and discharges at the Shawmut Avenue headwall.
- 53S - "EX-TWA-W1" contains 4.726 acres located between Runway 23 and Taxiway A north of Taxiway F. Runoff from this watershed is conveyed to the terminal apron drainage system via open channel and closed drainage under RW 14-32 and discharges at the Shawmut Avenue headwall via the terminal apron closed drainage system.
- 54S - "EX-RW5-E5" contains 2.132 acres located on the east side of Runway 5 between Taxiway "B" and Runway 14-32. Runoff is collected in a vegetated drainage channel and conveyed to the Shawmut Avenue headwall via the terminal apron drainage system.
- 74S - "EX-RW32-NE-2" contains 2.900 acres located between Runway 14-32 and Taxiway B. Runoff is collected in an existing trench drain located on the west side of Taxiway E. A new catch basin will be constructed adjacent to the drainage trench to accept overflow and connect to the apron drainage system.

Terminal Area Drawing D1.2 Existing Drainage Plan (Terminal Apron)

- 1S - "CB-1" contains 0.751 acres located on the northwest side of colonial hangar, Runoff from this watershed is conveyed to an existing sewer manhole located to the east of the northeast corner of the Colonial Hangar.
- 2S - "CB-2" contains 0.520 acres located between taxiway A and the apron immediately north of Taxiway A4. Runoff from this area is collected in the existing CB 7434 and flows to CB 7519 and discharges into the existing 36" pipe immediately north of the headwall at Shawmut Avenue.

- 3S - “CB-3” contains 0.892 acres located between taxiway A and the apron immediately north of Taxiway A4. Runoff from this area is collected in the existing CB 7519 and discharges into the existing 36” pipe immediately north of the headwall at Shawmut Avenue.
- 4S - “CB-4” contains 1.014 acres located on the east edge of the apron north of the Colonial hangar. Runoff from this area is collected in the existing CB 7267 and discharges into the existing 36” pipe immediately north of the headwall at Shawmut Avenue.
- “5S - CB-5” contains 1.180 acres located on the east side of parking lot in playground. Runoff from this area is discharges into the existing 36” pipe immediately north of the headwall at Shawmut Avenue via closed drainage.
- 6S -“CB-6” contains 0.392 acres located on the southeast side of parking lot. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 8S - “CB-8” contains 1.278 acres located on the north side of the Colonial Hangar. Runoff from this watershed is collected in the closed drainage system conveyed to the existing headwall at Shawmut Avenue.
- 9S- “CB-9” contains 1.080 acres located on the southeast side of parking lot. Runoff from this watershed is collected in the closed drainage system conveyed to the existing headwall at Shawmut Avenue.
- 10S - “CB-10” contains 0.182 acres located on the east side of Taxiway A west of the terminal building. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 11S - “CB-11” contains 0.179 acres located on the east side of Taxiway A and northwest of the terminal building Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 12S - “CB-12” contains 0.812 acres located in the apron west of the terminal building. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 13S - “CB-13” contains 0.066 acres located adjacent to the terminal building. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 14S – “TERMINAL ROOF” contains 0.210 acres located north of terminal building. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 15S - “CB-15” contains 0.829 acres located north side of terminal building. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 16S – “CB-16” contains 0.459 acres located north side of terminal building. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 17S - “CB-17” contains 0.745 acres located between terminal building and maintenance building. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 18S - “CB-18” contains 0.044 acres located northeast side of maintenance building. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.

- 19S - “CB-19” contains 0.367 acres located east side of fuel area. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 20S - “CB-20” contains 0.290 acres located on the south side of the intersection of Taxiway A and Taxiway B. Runoff is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 21S - “CB-21” contains 0.650 acres located near the intersection Taxiway A and Taxiway B. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 22S - “CB-22” contains 0.720 acres located on the south side of Taxiway B north of the terminal building. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 23S - “CB-23” contains 0.500 located on the south side of Taxiway B north of the terminal building. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 24S - “CB-24” contains 0.605 acres located north of the maintenance building on the south side of Taxiway B north of the terminal building. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 26S - “CB-25” contains 3.345 acres located on the south side of Taxiway B and north of the Sandpiper hangars. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 27S - “CB-27” contains 0.020 acres located northwest side of Sandpiper Hangar. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 28S – “28” contains 1.100 acres located northwest side of Sandpiper Hangar. Runoff from this area is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 30S - “CB-30” contains 1.990 acres located on the south side of Taxiway B north of Hangar 8. Runoff from this area is collected in the terminal apron closed drainage system and conveyed to analysis point AP-5 at the Claremont Hangar.
- 31S - “CB-31” contains 1.500 acres located on the south side of Taxiway B north of Nor East Hangar. Runoff from this area is collected in the apron conveyed to analysis point AP-5.
- 38S - “CB-38” contains 0.178 acres located on the south side of Sandpiper Hangar. Runoff from this area is collected in the apron closed drainage system and discharges at the Shawmut Avenue headwall.
- 39S – “COLONIAL ROOF” contains 0.658 acres and discharges into AP-3.
- 40S - “EX-TWA-E1” contains 1.194 acres located west side of Taxiway A and is part of the graded area near the glide slope. Runoff from this area is collected in the apron drainage system and discharges at the headwall at Shawmut Avenue.
- 41S -“ROOFS” contains 0.619 acres of the all existing building roofs. Runoff is collected in the respective closed drainage system and conveyed to the existing headwall at Shawmut Avenue.
- 42S – “EX-DMH-3” contains 1.062 acres located in the parking lot south of the terminal building. Runoff from this area drains to AP-4.

- 44S – "ROOFS" contains 0.697 acres. Nor East hangar roofs contributing to AP-5.
- 45S – "EX-PARKING" contains 0.213 acres located at the Claremont hangar parking lot.
- 51S - "EX-RW32-NE-1" contains 7.120 acres located in the infield between Runway 14-32 and Taxiway B. Runoff from this area flows under the east end of the Terminal Apron into the open airport drainage system and outlets at the headwall at Shawmut Avenue.
- 74S – "EX-RW32-NE-2" contains 2.900 acres located on the north side of Taxiway B and west side of Taxiway E. Runoff from this area drains into the apron drainage system and discharges to AP-4.
- 76S - "EX-COLONIAL-2" contains 2.610 acres of existing apron and turf areas and wetlands located adjacent to and southwest of the Colonial Hangar. This area discharges to analysis point AP-2 existing wetlands.
- 77S - "EX-COLONIAL-1" contains 0.282 acres southwest of the Colonial Air apron. Runoff from this area discharges into an existing wetlands to analysis point AP-2. During heavy rainfall events stormwater will overflow into the wetlands (AP-3) behind the Colonial hangar.
- 78S - "EX-COLONIAL-3" contains 0.933 acres located behind the Colonial hangar. Runoff from this area flows into the airport drainage ditch via an existing 12" culvert under the gravel airport access road.

EXISTING DRAINAGE SUMMARY (Pre-development)			
ANALYSIS POINT	**2-YR**	**10-YR**	**100 YR**
	PEAK DISCHARGE (CFS)	**PEAK DISCHARGE (CFS)**	**PEAK DISCHARGE (CFS)**
AP-1	0.1	0.3	2.2
AP-2	3.7	6.8	11.9
AP-3	3.2	5.1	8.1
AP-4	48.5	78.5	116.1
AP-5	9.2	14.7	23.3

4. PROPOSED CONDITIONS

Proposed Drainage Areas and Analysis Points AP-1 through AP-5 are depicted on drawings D2.1. and D2.2, of Appendix C. HydroCAD Pre and Post Development Routing Diagrams in Appendix B and C.

Below are detailed descriptions of individual sub-catchment areas.

Drawing D2.1 Proposed Drainage Plan

- 40S - "PR-TWA-E1" contains 1.194 acres located west side of Taxiway A and is part of the graded area near the glide slope. Runoff from this area is collected in the apron drainage system and discharges at the headwall at Shawmut Avenue.
- 47S - "PR-RW23-E2" contains 22.469 acres located along the east side of Runway 23 End. Drainage from this watershed drains to the Infiltration Trench "23-C", overflow from the drainage trench is flows through existing Wetland "H", and then open channel

flow to the Runway 14-32 closed drainage system, then into the terminal apron drainage system.

- 48S - "PR-RW23-E6" contains 3.464 acres located between Runway 5-23 Runway 14-32, Taxiway A and Taxiway F. Runoff from this watershed is conveyed to the terminal apron drainage system via Runway 14-32 closed drainage system.
- 49S - "PR-RW23-E3" contains 9.450 acres located between Runway 23 end and Taxiway A. Runoff from this watershed flows to the terminal apron drainage system via overland, open channel and closed drainage under Runway 14-32.
- 50S - "PR-RW23-E1" contains 51.158 acres located east of Runway 23 and consists of woodlands and Wetland H. Runoff from this watershed flows across existing wetlands into an open drainage channel prior to entering the closed drainage system on Runway 14-32 and then into the terminal apron drainage system.
- 51S – "PROP-RW32-NE-1" contains 7.120 acres located north of the apron. Runoff from this area drains into the apron drainage system and to AP-4.
- 52S – PROP-RW23-E4 contains 10.361 acres located between Runway 23 and Taxiway A consisting of a portion of the runway pavement and grassed area between the runway and Taxiway A. Runoff from this watershed flows overland to the closed drainage system on Runway 14-32 and to the terminal apron drainage system and discharges at the Shawmut Avenue headwall.
- 53S - "PR-TWA-W1" contains 4.726 acres located in the infield area between Runway 23 and Taxiway A. Runoff from this watershed is conveyed to the terminal apron drainage system via overland flow and closed drainage system under Runway 14-32.
- 54S - "PR-RW5-E5" contains 2.132 acres located on the east side of Runway 5 between Taxiway "B", Taxiway A and Runway 14-32. Runoff is conveyed into the terminal apron drainage system.
- 74S - "PR-RW32-NE-2" contains 2.900 acres located between Runway 14-32 and Taxiway B. Runoff is collected in an existing trench drain located on the west side of Taxiway E. A new catch basin will be constructed adjacent to the drainage trench to accept overflow and connect to the apron drainage system.

Drawing D2.2 Proposed Drainage Plan - Terminal Apron:

- 1S - "CB-1" contains 1.146 acres located on the northwest side of the Colonial hangar. Runoff from this area will be discharged into a reconstructed drainage system from the terminal apron to analysis point AP-4.
- 2S - "CB-2" contains 0.344 acres located on the east side of Taxiway A and northwest of the Colonial hangar. Runoff from this area will be collected and will flow to AP-4 via the closed drainage system.
- 3S - "CB-3" contains 1.030 acres located on the east side of Taxiway A and a portion of the reconstructed terminal apron. Runoff is collected in the taxiway drainage system and will discharge via closed drainage to analysis point AP-4.
- 5S - "CB-5" contains 1.180 acres located on the east side of parking lot and Downey Street. Runoff flows into a reconstructed drainage system and will discharge at analysis point AP-4.

- 6S - “CB-6” contains 0.392 acres located in the existing parking area south of the terminal building. Runoff is collected in the newly reconstructed drainage system into a water quality treatment structure prior to discharging to analysis point AP-4.
- 8S - “CB-8” contains 1.278 acres located on in a parking lot south of the terminal building. Runoff from this lot drains into the newly constructed drainage system through a water quality treatment structure prior to discharging to analysis point AP-4.
- 9S - “CB-9” contains 1.080 acres of existing parking lot located south of the terminal building. Runoff is collected via sheet flow into the newly constructed drainage system through a water quality treatment structure prior to discharging to analysis point AP-4.
- 10S - “CB-10” contains 0.265 acres located on the east side of Taxiway A west of the terminal building. Runoff from this area is collected in CB-10, conveyed to analysis point AP-4 after being treated in a water quality treatment unit.
- 11S - “CB-11” contains 0.170 acres located between Taxiway A and the terminal ramp northwest of the terminal building. Runoff from this area is collected CB-11 and conveyed to analysis point AP-4 after being treated in a water quality treatment unit.
- 12S - “CB-12” contains 0.930 acres is a portion of the reconstructed apron located southwest of terminal building. Runoff from this watershed will be collected in CB-12, discharged to analysis point AP-4.
- 13S - “CB-13” contains 0.110 acres located immediately north of the terminal building. Runoff from this area is collected in CB-13, conveyed via closed drainage to the main trunk line to analysis point AP-4 prior to treatment in a storm water treatment unit.
- 14S “TERMINAL ROOF” contains 0.210 acres and drains to AP-4.
- 15S - “CB-15” contains 0.720 acres located north of terminal building. Runoff is collected in CB-15, conveyed to analysis point AP-4.
- 16S - “CB-16” contains 0.460 acres located north side of terminal building. Runoff is collected in CB-16, conveyed to analysis point AP-4.
- 17S - “CB-17” contains 0.900 acres located between the terminal building and maintenance building. Runoff from this watershed is collected in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue (AP-4).
- 19S - “CB-19” contains 0.450 acres located between the maintenance building and the Sandpiper hangar. Runoff from this area will be collected in CB-19, conveyed to analysis point AP-4.
- 20S - “CB-20” contains 0.290 acres located immediately southeast of the intersection of Taxiway A and Taxiway B. Runoff from this area is collected in CB-20 and is conveyed to the main trunk line and discharges at analysis point AP-4.
- 21S - “CB-21” contains 0.650 acres of turf located on the south side of Taxiway B and north of the terminal building. Runoff from this area is collected in CB-21, conveyed to the main trunk line and discharges at analysis point AP-4.
- 22S - “CB-22” contains 0.740 acres located on the south side of Taxiway B and north of the terminal building. Runoff is collected in CB22, conveyed to the main trunk line and discharges at analysis point AP-4.
- 23S - “CB-23” contains 0.610 acres located on the south side of Taxiway B and northeast of the terminal building. Runoff from this area is collected in CB-23, conveyed to the main trunk line and discharges at analysis point AP-4.
- 24S - “CB-24” contains 0.614 acres located north of the maintenance building on the south side of Taxiway B north of the terminal building. Runoff from this area is collected

in the closed drainage system and conveyed to the existing headwall at Shawmut Avenue.

- 26-1S “CB-25 contains 0.952 aces acres located on the south side of Taxiway B and north of the Sandpiper hangar. Runoff from this area is collected in CB-25, conveyed to the main trunk line and discharges at analysis point AP-4.
- 26-2S “CB-26 contains 0.574 aces acres located on the south side of Taxiway B and north of the Sandpiper hangar. Runoff from this area is collected in CB-26, conveyed to the main trunk line and discharges at analysis point AP-4.
- 26-3S “CB-27 contains 0.958 aces acres located on the south side of Taxiway B and north of the Sandpiper hangar. Runoff from this area is collected in CB-27, conveyed to the main trunk line and discharges at analysis point AP-4.
- 26-4S “CB-29 contains 0.290 aces acres located on the south side of Taxiway B and north of the Sandpiper hangar. Runoff from this area is collected in CB-29, conveyed to the main trunk line and discharges at analysis point AP-4.
- 26-5S “CB-30 contains 0.390 aces acres located on the south side of Taxiway B and north of the Sandpiper hangar. Runoff from this area is collected in CB-30, conveyed to the main trunk line and discharges at analysis point AP-4.
- 28-S1 - “CB-28” contains 0.825 acres located on the south side of Taxiway B and northeast of the Sandpiper hangar. Runoff from this area is collected in CB-28, conveyed to the main trunk line and discharges at analysis point AP-4.
- 28-2S - “CB-30A” contains 0.226 acres located on the south side of Taxiway B and northeast of the Sandpiper hangar. Runoff from this area is collected in CB-30A conveyed to the main trunk line and discharges at analysis point AP-4.
- 30-1S - “CB-32A” contains 0.448 acres located immediately north of Sandpiper hangar. Runoff from this area is collected in CB-32A, conveyed to the main trunk line and discharges at analysis point AP-4.
- 30-2S - “CB-32C” contains 1.129 acres located immediately north of Sandpiper hangar. Runoff from this area is collected in CB-32C, conveyed to the main trunk line and discharges at analysis point AP-4.
- 30-3S – “CB-32B” contains 0.414 acres located north of Nor East hangar and discharges to AP-5.
- 31-1S - “CB-33” contains 0.343 acres located immediately south Sandpiper hangar. Runoff from this area is collected in CB-31, conveyed to the main trunk line and discharges at analysis point AP-4.
- 31-2S - “CB-34” contains 1.180 acres located immediately south Sandpiper hangar. Runoff from this area is collected in CB-34, conveyed to the main trunk line and discharges at analysis point AP-4.
- 38S – “CB-31” contains 0.178 acres located behind Sandpiper hangar and outlets at Ap-4.
- 39S – “COLONIAL ROOF” contains 0.658 acres and discharges to AP-3.
- 40S – “PROP-TWA-E1” contains 1.194 acres located west of the Colonial hangar. Runoff from this area drains to AP-4 via the parking lot closed drainage system.
- 41S - “ROOF” maintenance building contains 0.619 acres Runoff from this area drains to AP-4
- 42S – “PR-WQS-4” contains 1.062 acres located in the parking lot south of the terminal building. Runoff from this area drains to AP-4.

- 44S – “ROOFS” contains 0.697 acres. Nor East hangar roofs contributing to AP-5.
- 45S – “PR-PARKING” contains 0.205 acres located at the Claremont hangar parking lot.
- 48S - “PROP-RW23-E6” contains 3.464 acres of paved parking lot located immediately south of the terminal building. Runoff from this area is collected in the catch basins and flows to the main trunk line and discharges to analysis point AP-4.
- 51S – “PROP-RW32-NE-1” contains 7.120 acres located north of the apron. Runoff from this area drains into the apron drainage system and to AP-4.
- 74S - “PR-RW32-NE-2” contains 2.900 acres located between Runway 14-32 and Taxiway B. Runoff is collected in an existing trench drain located on the west side of Taxiway E. A new catch basin will be constructed adjacent to the drainage trench to accept overflow and connect to the apron drainage system.
- 76-1S - “PR-WQS-1” contains 0.539 acres of existing apron and new apron pavement located immediately southwest of the Colonial hangar. Runoff from this area will be conveyed overland to a water quality treatment structure prior to discharging into detention/infiltration basins (two in series) to reduce discharge into the adjacent wetlands. Excess treated stormwater will flow into the adjacent wetlands at analysis points AP-1 and AP-2 AP-3.
- 76-2S - “PR-WQS-2” contains 0.584 acres located immediately south of the Colonial hangar. This area consists of apron pavement. Runoff from this area flows into a water quality treatment unit prior to discharging into two separate wetlands located adjacent to the apron. Runoff is being split between the two wetlands with a diversion device within the water quality unit.
- 76-3S - “PR-COLONIAL-4” contains 0.568 acres of turf and wetlands located west of the paved apron. Runoff from this watershed remains within the confines of the wetland except during a heavy rain event. Rainfall will drain into the adjacent wetlands behind the hangar when water elevation reaches 58.3 or above.
- 76-4S – “PR-DIRECT TO DP#1” contains 0.123 acres and drains into detention basin No. 1 and discharges to AP-2.
- 76-5S - “PR-WQS-1A” contains 1.309 acres of existing apron. Runoff from this area will be conveyed overland to a water quality treatment structure prior to discharging into detention/infiltration basins (two in series) to reduce discharge into the adjacent wetlands. Excess treated stormwater will flow into the adjacent wetlands at analysis points AP-1 and AP-2 AP-3.
- 77-1S - “PR-DIRECT TO DP#2” contains 0.178 acres of turf and wetlands located southwest of the Colonial Air apron. Runoff from this area drains directly into detention basin No. 2. This detention basin drains into detention basin No. 1 and then into AP-2. Runoff will remain in AP-2 unless a storm approaching a 100-yr storm event occurs and then will flow into AP-3.
- 77-2S - “PR-COLONIAL-1” contains 0.103 acres of turf and wetlands located southwest of the Colonial Air apron. Runoff from this area drains directly into the adjacent wetland complex (AP-3) to the open channel.
- 78S - “PR-COLONIAL-6” contains 0.867 acres immediately south of the Colonial hangar. Runoff from this watershed discharges into the open channel via a 12” culvert beneath the airport gravel access road (analysis point AP-3).

The following table illustrates post development drainage conditions.

PROPOSED DRAINAGE SUMMARY (Post-development)			
ANALYSIS POINT	**2-YR**	**10-YR**	**100-YR**
	PEAK DISCHARGE (CFS)	**PEAK DISCHARGE (CFS)**	**PEAK DISCHARGE (CFS)**
AP-1	0.0	0.3	2.1
AP-2	1.9	4.8	14.3
AP-3	3.1	5.0	8.1
AP-4	48.9	79.2	117.5
AP-5	11.5	16.7	25.1

5. COMPLIANCE WITH MASSDEP STORMWATER STANDARDS:

Standard #1: *No new stormwater conveyance (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

The Project does not propose to discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. Rather, the Project proposes to improve existing stormwater runoff discharges through the installation of two (2) new outfalls and three (3) modified outfalls with appropriate pre-treatment BMPs and scour protection at the outlets. The new outfalls will replace and mitigate existing untreated sheet flow discharging from existing pavement at the Colonial hangar (AP-1, AP-2 and AP-3). In addition, pre-treatment will be provided prior to the point of discharge within each analysis point as follows:

AP-1 is a portion of the existing large wetland southwest of the Colonial hangar. There is a small area (approximately 0.282 acres) identified as Subcatchment 77S that flows into the wetlands. Under proposed conditions a detention basin will be constructed to attenuate the rate of stormwater flow into wetland AP-2.

AP-1, AP-2 and AP-3 Existing sheet flow to AP-2 will now be collected and treated by conveying the stormwater through detention basin #1 and detention basin #2 with a connecting pipe between the two basins. The reason for the two basins is to maintain an existing gravel access road which must remain for airport maintenance purposes. Detention basin #1 will have a riprap outflow weir located on the east side of the basin to provide overflow out of the basin and into the adjacent wetland (AP-2). Runoff to detention basin #1 will be pretreated by a water quality unit.

An additional water treatment unit will be installed at AP-3 to treat runoff prior to discharge into the wetlands at AP-3. The water quality structure will also have a diversion component to divert a portion of the runoff to AP-2 after treatment. The purpose of this diversion component is to match post development flows with predevelopment flows to the extent practicable (see Standard #2 discussion below).

The 2-yr and 10-yr storm volumes are retained in the wetlands at AP-2 as in existing conditions. A larger storm event will discharge runoff from AP-2 into AP-3 at an existing natural low area

between AP-2 and AP-3 when water elevation exceeds 58.3'. This is what currently occurs between AP-2 and AP-3. Wetland AP-2 will experience an increase in the rate of flow of 2.1 CFS. The only difference that this makes in AP-2 and AP-3 is that the runoff arrives and departs the system approximately eight (8) minutes quicker than existing conditions with virtually no difference in the surface water elevations.

An existing 12" diameter culvert located under the gravel airport access road at analysis point AP-3 will be replaced in-kind. This pipe appears to have been crushed and is not flowing properly. Rip Rap will be placed at all outfalls within the uplands to prevent scour and deposition of eroded materials in the downgradient wetlands.

AP-4 Analysis Point No. 4 is an existing 36" diameter pipe outfall at an existing concrete headwall located on the north side of Shawmut Avenue east of the Colonial hangar. This pipe will be replaced with a 36" x 60" concrete box culvert. The box culvert is necessary as the drainage design must meet DEP standards for the 10-YR 24 HR Type III storm event which the current system does not while providing adequate cover. The existing 36" diameter drain pipe serves as the outfall for a large portion of the terminal apron as well as a significant portion of the airport north of Taxiway B.

AP-5 The existing 15" diameter pipe and headwall at AP-5 will be removed and replaced with a 24" diameter RCP and new headwall. The larger pipe is necessary as the drainage design must meet MassDEP standards for the 10-YR 24 HR Type III storm event which the current system does not. A water quality treatment device will be installed on the north side of Downey Street to treat the incoming runoff from the apron area prior to discharge.

Standard #2: *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

Consistent with the redevelopment requirements of Standard 7, the proposed stormwater design demonstrates that post development peak discharge rates do not exceed pre development discharge rates to the extent practicable. As detailed in the following table, the post-development peak discharge rates for Analysis Points AP-1, through AP-5 generally remain the same as pre-development conditions. There are modest increases in peak runoff rates for AP-2 under the 100 year storm event and AP-4 and AP-5 for the 2-year, 10-year and 100-year storm events. This represents an increase of less than 1% of peak flows over existing conditions. Construction of detention or infiltration facilities beyond that already proposed in the design to attenuate these increases is not practicable due to the high water table and unique space limitations associated with airport operations.

Drawing D1.1 illustrates the primary analysis points.

The following is a comparison of the Pre-development versus the Post-development peak stormwater discharge rates for the 2, 10- and 100-year storm events.

	RETURN PERIOD					
	2-YR		10-YR		100 YR	
ANALYSIS POINT	PRE	POST	PRE	POST	PRE	POST
AP-1	0.1	0.0	0.3	0.3	2.2	2.2
AP-2	3.7	1.9	6.8	4.8	11.9	14.3
AP-3	3.2	3.1	5.1	5.0	8.1	8.1
AP-4	48.5	48.9	78.5	79.2	116.1	117.5
AP-5	9.2	11.5	14.7	16.7	23.3	25.1

Standard #3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices and good operation and maintenance. At a minimum, the annual recharge from the post development site shall approximate the annual recharge from the pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

The loss of annual recharge to groundwater has been minimized through the use of environmentally sensitive site design measures. While this phase of construction will result in approximately 0.97 acres of additional pavement within the terminal apron area in order to improve aircraft safety, aircraft movement, including appropriate wing tip clearance near the existing hangars. Overall more than 7.48 acres of impervious pavement have been removed from the Airport since 2010. The loss of more than 7.48 acres of pavement significantly improves existing conditions by promoting infiltration and groundwater recharge throughout the entire Airport property.

In addition to the above, the required recharge volume for this phase of construction is 2,113 CF. The water volume provided is 8,690 CF within the two detention basins at the Colonial hangar. Despite the challenges of high ground water throughout the terminal apron area, the two proposed detention basins will provide some recharge based upon turf and associated soils. Based upon the soil conditions and modeling, the standing water within the basins will infiltrate over a period of approximately 25 hours.

The supporting recharge calculations are summarized as follows:

Impervious Area = 0.97 Acres

Soil Type (A) = 0.6

Rv = 0.97(43560)(0.6/12) = 2,113 CF

Standard #4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when (a) Suitable practices for source control and pollution prevention are identified in a long-term*

pollution prevention plan and thereafter are implemented and maintained; (b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with Massachusetts Stormwater Handbook; and (c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

The terminal apron drainage system has been designed to remove between 87% and 90% TSS from stormwater runoff with the use of water quality structures and deep sump catch basins. Five (5) separate stormwater treatment units will be provided as indicated on the drawings.

TSS removal calculations are included in Appendix D.

Standard #5: *Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs. The use of infiltration practices without pre-treatment is prohibited.*

Typical airports include land that is considered Land Use with Higher Potential Pollutant Loads (LUHPPL). These areas are defined as aircraft apron, plane storage, and maintenance areas. The terminal apron reconstruction will be treated with water quality treatment units approved for use in LUHPPL areas before being discharged as required by this standard.

Standard #6: *Stormwater discharges to critical areas must utilize certain stormwater BMPs approved for critical areas. Critical areas are Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold water fisheries, and recharge areas for public water supplies.*

This Standard is not applicable.

Standard #7: *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

Work associated with reconstructing the terminal apron and drainage system is considered to be a redevelopment project. The proposed work conforms to the requirements of Standard 7 as described above and below. In addition, the loss of more than 7.48 acres of pavement significantly improves existing conditions by promoting infiltration and groundwater recharge throughout the entire Airport property.

Standard #8: *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

Erosion and sediment controls have been incorporated into the construction plan set. A General Permit Construction Phase SWPPP will be developed by the Contractor for this construction project. The construction SWPPP will be prepared prior to the start of construction.

Standard #9: *A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

ASG previously prepared a long-term operation and maintenance plan entitled "New Bedford Regional Airport – Storm Water Operations and Maintenance Plan" for the entire New Bedford Regional Airport facility. This Operations and Maintenance plan has been updated over time to reflect upgrades and improvements to the stormwater management system as different phases of construction have been completed. The referenced Operations and Maintenance plan has been updated again to reflect the improvements described herein (see Appendix F for additional detail).

Standard #10: *All illicit discharges to the stormwater management system are prohibited.*

All known existing illicit discharges associated with the Airport were removed / eliminated as part of the Variance Order issued by MASS DEP (e.g. , floor drains at various hangar facilities).

6. DRAINAGE SUMMARY TABLES

Watershed Area Comparison							
Pre-development Conditions				Post-development Conditions			
Watershed	Area (AC)	Watershed	Area (AC)	Watershed	Area (AC)	Watershed	Area (AC)
1S	0.751	26S	3.345	1S	1.146	30-3S	0.414
2S	0.520	27S	0.020	2S	0.344	31-1S	0.343
3S	0.892	28S	1.100	3S	1.030	31-2S	1.180
4S	1.014	30S	1.990	5S	1.180	38S	0.178
5S	1.180	31S	1.500	6S	0.392	39S	0.658
6S	0.392	38S	0.178	8S	1.278	40S	1.194
8S	1.278	39S	0.658	9S	1.080	41S	0.619
9S	1.080	40S	1.194	10S	0.265	42S	1.062
10S	0.182	41S	0.619	11S	0.170	44S	0.697
11S	0.179	42S	1.062	12S	0.930	45S	0.205
12S	0.812	44S	0.697	13S	0.110	47S	22.469
13S	0.066	45S	0.213	14S	0.210	48S	3.464
14S	0.210	47S	22.469	15S	0.720	49S	9.450
15S	0.829	48S	3.464	16S	0.460	50S	51.158
16S	0.459	49S	9.450	17S	0.900	51S	7.120
17S	0.745	50S	51.158	19S	0.450	52S	10.361
18S	0.044	51S	7.120	20S	0.290	53S	4.726
19S	0.367	52S	10.361	21S	0.650	54S	2.132
20S	0.290	53S	4.726	22S	0.740	74S	2.900
21S	0.650	54S	2.132	23S	0.610	76-1S	0.539
22S	0.720	74S	2.900	24S	0.614	76-2S	0.584
23S	0.500	76S	2.610	26-1S	0.952	76-3S	0.568
24S	0.605	77S	0.282	26-2S	0.574	76-4S	0.123
		78S	0.933	26-3S	0.958	76-5S	1.309
				26-4S	0.290	77-1S	0.178
				26-5S	0.390	77-2S	0.103
				28-1S	0.825	78S	0.867
				28-2S	0.226		
				30-1S	0.448		
				30-2S	1.129		
Total			143.946				143.962

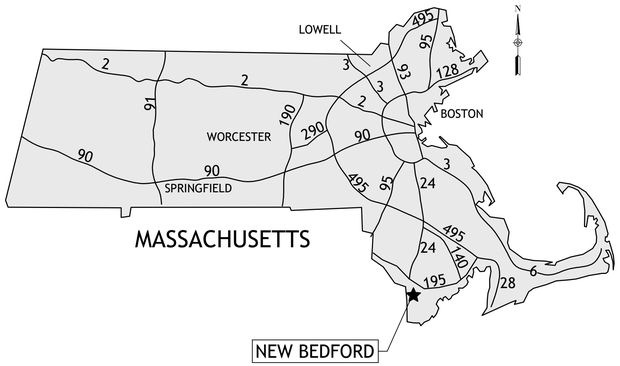
Soils Comparison		
HSG	Pre-dev Area (AC)	Post-dev Area (AC)
A	109.416	109.432
B	0.18	0.18
C	16.981	16.981
D	17.369	17.369
Total	143.946	143.962

Peak Discharge Comparison (cfs)						
	RETURN PERIOD					
	2-YR		10-YR		100 YR	
ANALYSIS POINT	PRE	POST	PRE	POST	PRE	POST
AP-1	0.1	0.0	0.3	0.3	2.2	2.2
AP-2	3.7	1.9	6.8	4.8	11.9	14.3
AP-3	3.2	3.1	5.1	5.0	8.1	8.1
AP-4	48.5	48.85	78.5	79.2	116.1	117.5
AP-5	9.23	11.5	14.7	16.7	23.3	25.1

APPENDIX A

NOI DRAWINGS

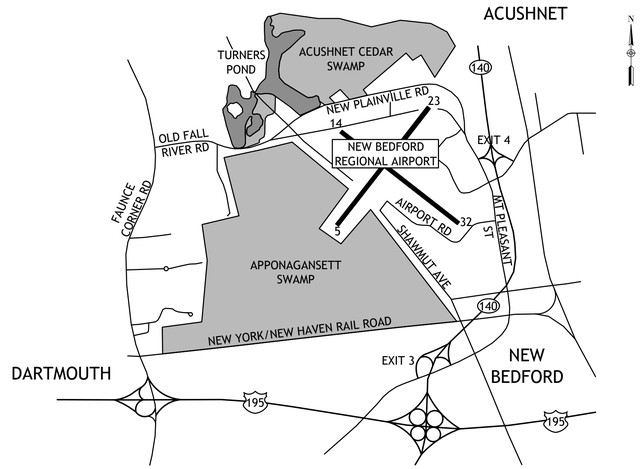
NOI PERMIT DRAWINGS



LOCATION MAP

newbedford
regional airport

NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MASSACHUSETTS 02746



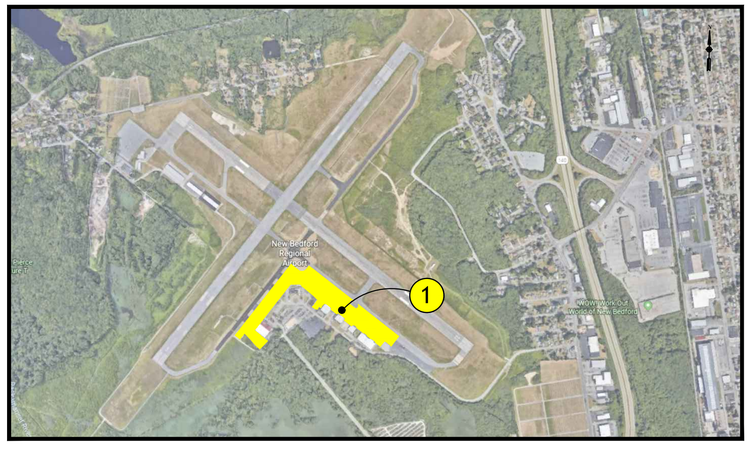
LOCUS MAP

RECONSTRUCT TERMINAL APRONS
PHASES 1, 2, AND 3
NOTICE OF INTENT (NOI) SUBMISSION

JANUARY 2020
AIP NO. 3-25-0034-XX-2020

GENERAL NOTES

1. THE INFORMATION INCLUDED IN THIS NOI PLAN SET IS CONSIDERED PRELIMINARY AND IS INTENDED FOR PERMITTING PURPOSES ONLY; IT IS NOT INTENDED FOR FINAL LAYOUT OR CONSTRUCTION. THE CONSTRUCTION BID SET WILL INCLUDE THE ORDER OF CONDITIONS ISSUED BY THE NEW BEDFORD CONSERVATION COMMISSION (NBCC). THE ORDER OF CONDITIONS WILL TAKE PRECEDENCE OVER ANY CONFLICTING INFORMATION INCLUDED IN THIS NOI PLAN SET OR CONSTRUCTION BID SET.
2. DE-WATERING WILL BE REQUIRED DURING CONSTRUCTION. DE-WATERING MEASURES LOCATED WITHIN A JURISDICTIONAL RESOURCE AREA SHALL CONFORM TO THE REQUIREMENTS NOTED IN THESE PLANS AND INCLUDED IN THE ORDER OF CONDITIONS ISSUED BY THE NBCC. DE-WATERING MEASURES LOCATED OUTSIDE OF A JURISDICTIONAL RESOURCE AREA (E.G. BEYOND 100' FROM BVW) SHALL EMPLOY APPROPRIATE MEASURES TO ASSURE THAT CONSTRUCTION ACTIVITY DOES NOT ADVERSELY IMPACT JURISDICTIONAL RESOURCE AREAS.
3. EROSION CONTROL MATTING SHALL BE USED FOR SLOPE STABILIZATION ON ALL PROPOSED GRADING EXCEEDING A SLOPE OF 4:1 (H:V).
4. ALL CATCH BASIN REQUIRE INLET PROTECTION FOR SEDIMENT REMOVAL AND WATER QUALITY PURPOSES, AT ALL TIMES THROUGHOUT CONSTRUCTION, PURSUANT TO THE DETAIL INCLUDED IN THIS NOI PLAN SET.



PROPOSED CONSTRUCTION

1 - RECONSTRUCT TERMINAL APRONS

PREPARED BY

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NOI PERMIT DRAWINGS
NOT FOR CONSTRUCTION

DRAWING NO.
NOI.1
1 OF 11

01/15/2020 NOI SUBMISSION FOR NBCC

1/15/2020 1:53:07 PM \\nas201\Companydata\ASG Data\Projects\nbd - new bedford\046 design only - terminal aprons phases 123\CAD\nbd submission\01-103-046_NO COVER SHEET.dwg (PEJ)

New Bedford Regional Airport
Reconstruct Terminal Aprons / NOI Submission

Summary Impacts to Land Under Water (sf)

Area On Map	Description of Impact	Total Impact
1	NA - No BVW or LUW Impacts	0
2	NA - No BVW or LUW Impacts	0
3	NA - No BVW or LUW Impacts	0
4	Temp cofferdam work (LUW)	150
5	Temp cofferdam work (LUW)	85
	Total Proposed Impact (sf):	**235**

Summary of Change (cfs): Post vs. Pre

Analysis Point	2-Year Storm	10-Year Storm	100-Year Storm
1	-0.04	-0.06	-0.03
2	-1.83	-1.96	2.40
3	-0.04	-0.05	-0.03
4	0.36	0.72	1.39
5	2.22	2.08	1.79

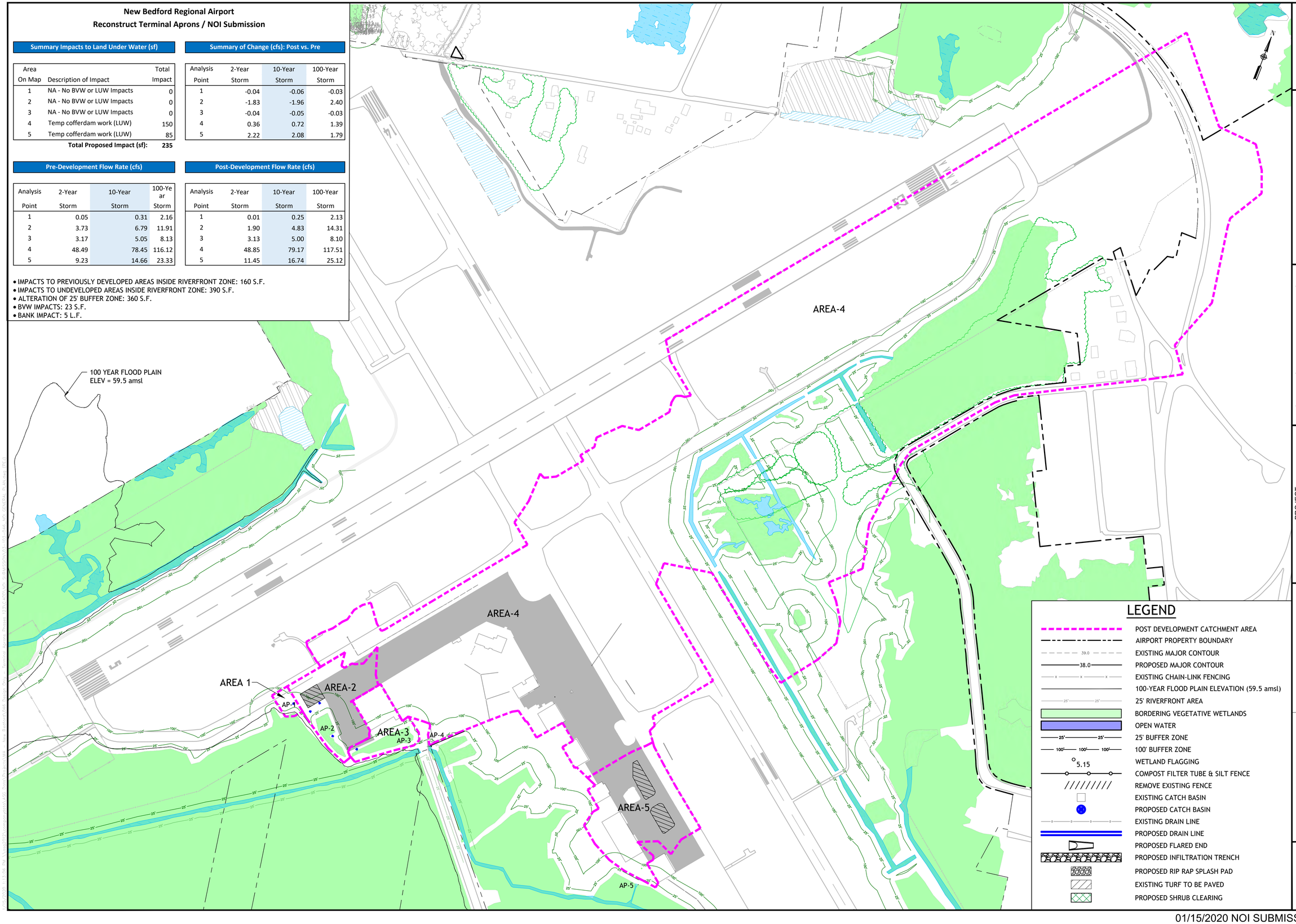
Pre-Development Flow Rate (cfs)

Analysis Point	2-Year Storm	10-Year Storm	100-Year Storm
1	0.05	0.31	2.16
2	3.73	6.79	11.91
3	3.17	5.05	8.13
4	48.49	78.45	116.12
5	9.23	14.66	23.33

Post-Development Flow Rate (cfs)

Analysis Point	2-Year Storm	10-Year Storm	100-Year Storm
1	0.01	0.25	2.13
2	1.90	4.83	14.31
3	3.13	5.00	8.10
4	48.85	79.17	117.51
5	11.45	16.74	25.12

- IMPACTS TO PREVIOUSLY DEVELOPED AREAS INSIDE RIVERFRONT ZONE: 160 S.F.
- IMPACTS TO UNDEVELOPED AREAS INSIDE RIVERFRONT ZONE: 390 S.F.
- ALTERATION OF 25' BUFFER ZONE: 360 S.F.
- BVW IMPACTS: 23 S.F.
- BANK IMPACT: 5 L.F.



COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PEDUSTER
CIVIL
No. 52939
REGISTERED
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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

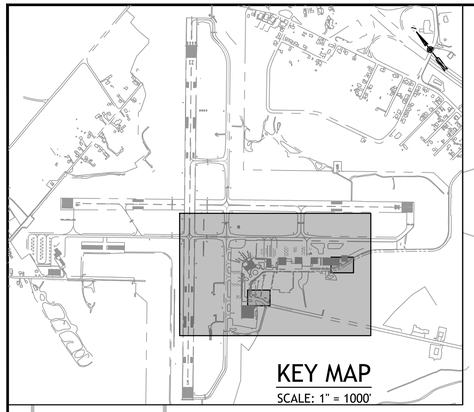
OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=200'

SHEET TITLE
CATCHMENT AREAS

GRAPHIC SCALE
0 100' 200' 400'

DRAWING NO.
NOI.2
2 OF 11



GRASS AREAS TO BE PAVED (TYP)

TAXIWAY B

TAXIWAY E

TAXIWAY A

T/W A1

T/W A2

T/W A3

RUNWAY 5-23

TERMINAL

MAINTENANCE BUILDING

SANDPIPER AIR

SANDPIPER AIR

HANGAR 8

NOR EAST HANGAR

CLAREMONT AVIATION

AP-5

SEE SHEET NOI.6

DOWNEY ST

PROPOSED WATER QUALITY STRUCTURE #4 SEE DETAIL SHEET NOI.8

SEE INSET THIS SHEET

AP-4

AP-3

COLONIAL HANGAR

SHAWMUT AVE

SEE SHEET NOI.5

100 YEAR FLOOD PLAIN ELEV 59.5 amsl

SEE SHEET NOI.4

AP-2

AP-1

AIRPORT GRAVEL ACCESS ROAD

AIRPORT PROPERTY LINE

PROPOSED VEGETATION REMOVAL

FENCE REMOVAL (TYP)

CONTRACTOR STAGING AREA

COMPOST FILTER TUBE & SILT FENCE SEE DETAIL NOI.11

25' BUFFER ZONE BRUSH CLEARING = 125 S.F.

IMPACTS TO PREVIOUSLY DEVELOPED AREAS INSIDE RIVERFRONT ZONE: 160 S.F.
IMPACTS TO UNDEVELOPED AREA INSIDE RIVERFRONT ZONE: 390 S.F.

SCALE: 1" = 20'

COMMONWEALTH OF MASSACHUSETTS
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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	SE
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=80'

SHEET TITLE
CATCHMENT AREA & ANALYSIS POINTS

GRAPHIC SCALE
0 40' 80' 160'

DRAWING NO.
NOI.3
3 OF 11

01/15/2020 NOI SUBMISSION FOR NBCC

PROPOSED HW-2
INV = 57.20 (IN)

PROPOSED HW-3
INV = 56.92 (OUT)

RIP RAP SPLASH PAD (TYP.)
USE MHD SPEC. M2.02.3 STONE
DIMENSIONS: 5'6" x 2'6"
SEE DETAIL SHEET NOI.9

PROPOSED 12" RCP

FLOW

INSTALL COMPOST FILTER TUBE
AT BOTH ENDS OF NEW CULVERT
OUTSIDE OF WETLAND LIMITS

REMOVE AND REPLACE EXIST.
COLLAPSED 12" CONC. CULVERT
WITH NEW 12" RCP CULVERT

SCALE: 1" = 10'

SILL=61.58

SILL=61.61

COLONIAL HANGAR

FUEL FILL

FUEL PUMPS

FUEL TANK

SEE INSET THIS SHEET

PROPOSED COMPOST
FILTER TUBE & SILT
FENCE (TYP)

AIRPORT GRAVEL ACCESS ROAD

PROPOSED WATER QUALITY STRUCTURE #2
SEE DETAIL SHEET NOI.7
RIM = 59.65
INV OUT = 57.32

PROPOSED DIVERSION MANHOLE WITH OUTLET CONTROL
SEE DETAIL SHEET NOI.10
RIM = 59.73
INV IN = 57.30
INV OUT (W) = 57.27
INV OUT (E) = 57.29

PROPOSED 12" RCP

12" FLARED END
INV = 57.23

TRIPLE FRAME CATCH BASIN
SEE DETAIL SHEET NOI.9
RIM = 60.06
INV OUT = 57.38

PROPOSED 15" RCP

15" FLARED END
INV = 57.25

PROPOSED WATER QUALITY STRUCTURE #1
SEE DETAIL SHEET NOI.7
RIM = 59.70
INV IN = 57.3
INV OUT = 57.3

BOTTOM OF BASIN
ELEV = 56.5' amsl

PROPOSED 18' x 2' RIP-RAP
EMERGENCY OVERFLOW
SPILLWAY
SEE DETAIL SHEET NOI.7

PROPOSED DETENTION BASIN #1

PROPOSED FLARED END WITH
STONE SPLASH PAD (TYP)
SEE DETAIL SHEET NOI.9

PROPOSED 12" FLARED END
INV = 57.00

OVER
FLOW

PROPOSED 15" RCP

PROPOSED 15" RCP

15" FLARED END
INV = 57.26

AIRPORT GRAVEL ACCESS ROAD

15" FLARED END
INV = 57.08

PROPOSED COMPOST FILTER
TUBE & SILT FENCE (TYP)

BOTTOM OF BASIN
ELEV = 56.5' amsl

100 YEAR FLOOD PLAIN
ELEV = 59.5 amsl

PROPOSED DETENTION BASIN #2

KEY MAP
SCALE: 1" = 1000'

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PRUISTER
CIVIL
No. 53595
REGISTERED
PROFESSIONAL ENGINEER

ASG
AIRPORT SOLUTIONS GROUP, LLC
AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
PHONE (781) 681-0065 FAX (781) 681-0050

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PROJECT
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PHASES 2, AND 3
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OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

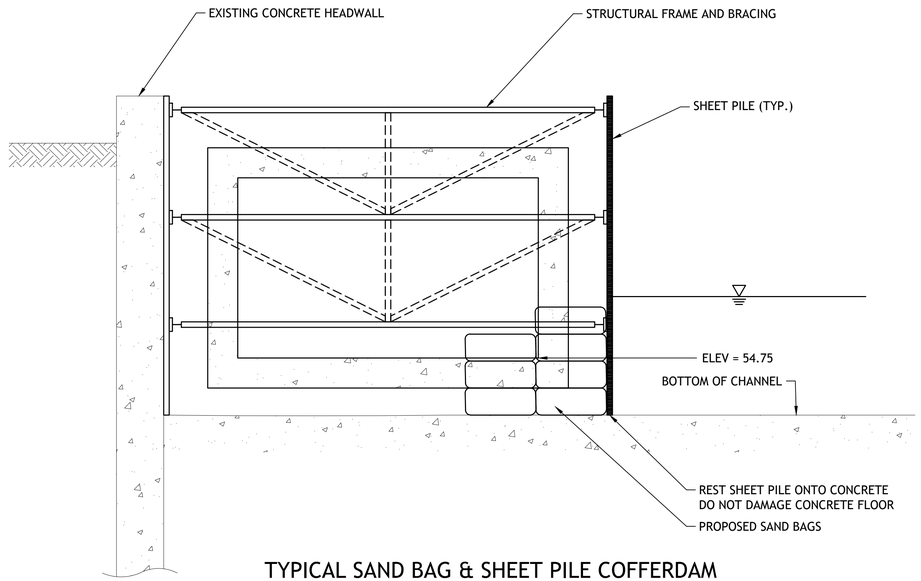
PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=20'

SHEET TITLE
CATCHMENT AREAS #1,2,3
ANALYSIS POINTS #1,2,3

GRAPHIC SCALE
0 10' 20' 40'

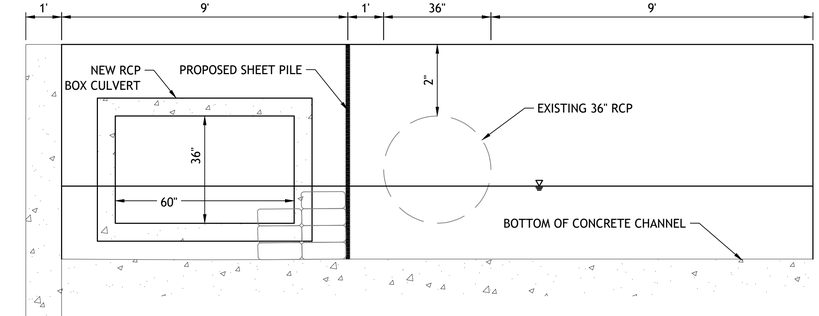
DRAWING NO.
NOI.4

01/15/2020 NOI SUBMISSION FOR NBCC



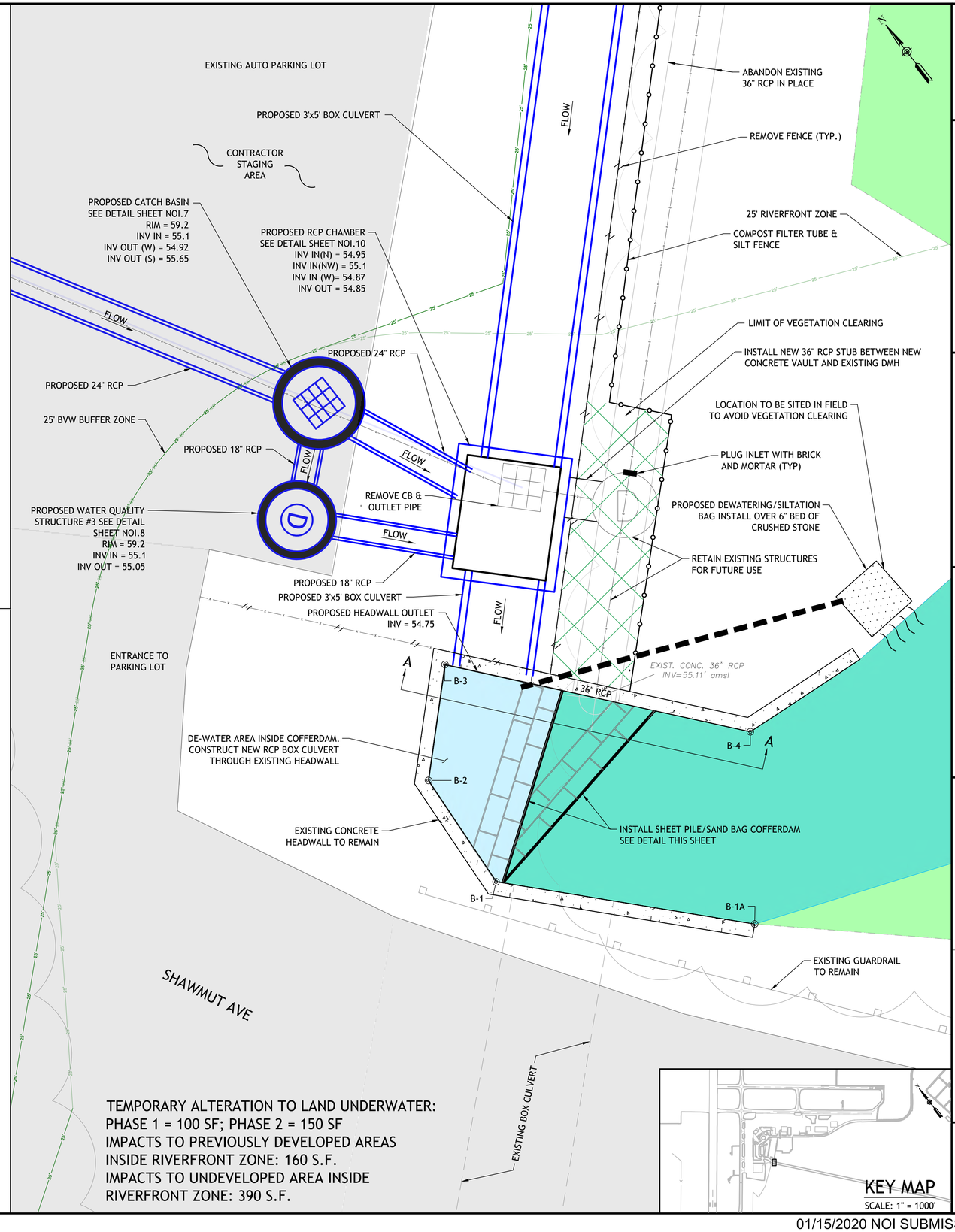
TYPICAL SAND BAG & SHEET PILE COFFERDAM

SCALE: N.T.S.



SECTION A-A

SCALE: N.T.S.



TEMPORARY ALTERATION TO LAND UNDERWATER:
PHASE 1 = 100 SF; PHASE 2 = 150 SF
IMPACTS TO PREVIOUSLY DEVELOPED AREAS
INSIDE RIVERFRONT ZONE: 160 S.F.
IMPACTS TO UNDEVELOPED AREA INSIDE
RIVERFRONT ZONE: 390 S.F.

SCALE: 1" = 1000'

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PRUSTER
CIVIL
No. 52939
REGISTERED
PROFESSIONAL ENGINEER

ASG
AIRPORT SOLUTIONS GROUP, LLC
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PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=4'

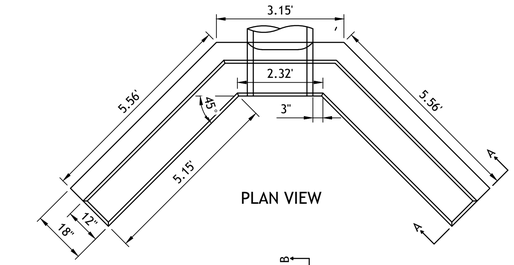
SHEET TITLE
CATCHMENT AREA #3
ANALYSIS POINT #3

GRAPHIC SCALE
0 2 4 8"

DRAWING NO.
NOI.5

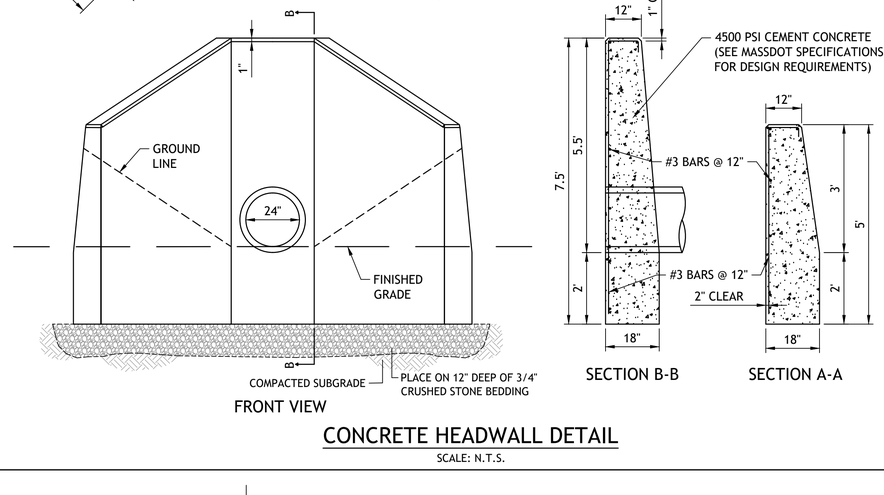
5 OF 11

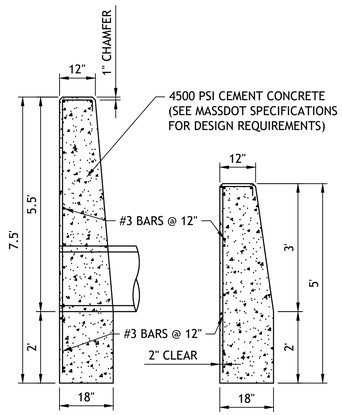
1/15/2020 1:41:41 PM \\oss2012\company\data\ASG Data\Projects\MA - New Bedford\046 Design Only - Terminal Aprons Phases 123\C-ADD\N0I SUBMISSION\03-103-046_N0I GENERAL PLAN.dwg (PEJ)



NOTES:

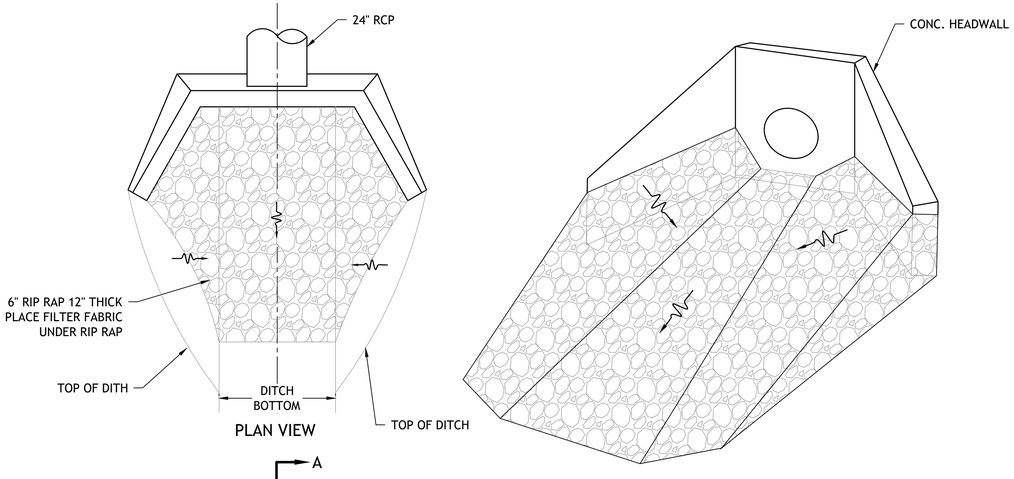
1. CONCRETE: 28 DAY COMPRESSIVE STRENGTH F'c = 4,500 PSI.
2. STEEL REINFORCEMENT: ASTM A 615, GRADE 60.
3. MINIMUM REINFORCING COVER - 2".
4. 3/4" CHAMFER ON ALL EXPOSED EDGES.
5. DIMENSIONS AS SHOWN MAY VARY DEPENDING ON MANUFACTURER.





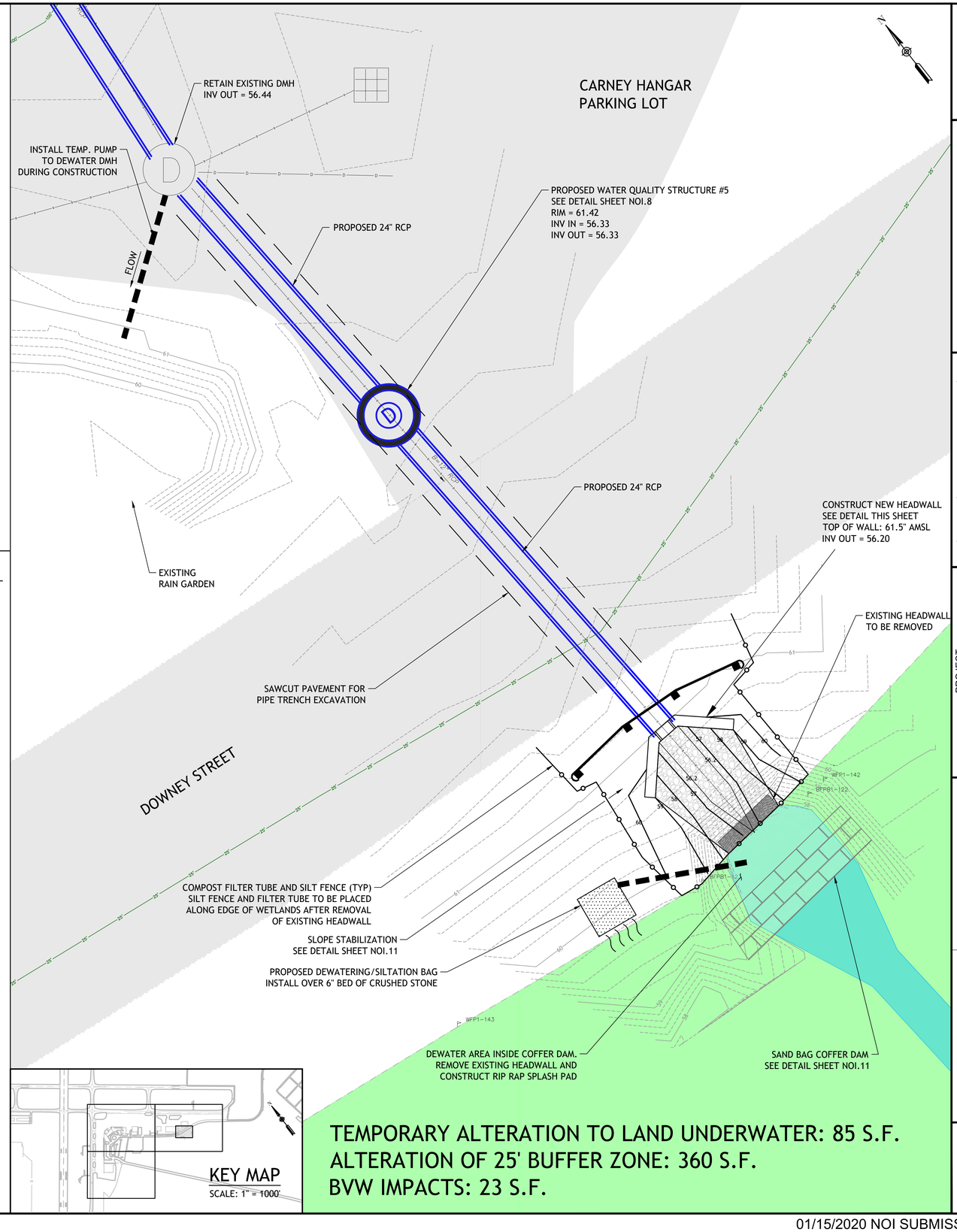
CONCRETE HEADWALL DETAIL

SCALE: N.T.S.



CONCRETE HEADWALL AND RIP RAP DETAIL

SCALE: N.T.S.



KEY MAP

SCALE: 1" = 1000'

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PROUSTER
CIVIL
No. 52939
REGISTERED
PROFESSIONAL ENGINEER

ASG
AIRPORT SOLUTIONS GROUP
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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

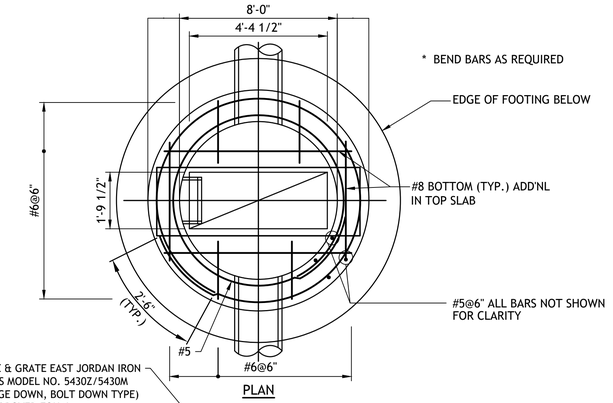
OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	1"=5'

SHEET TITLE
ANALYSIS POINT #5

GRAPHIC SCALE
0 2.5 5 10'

DRAWING NO.
NOI.6

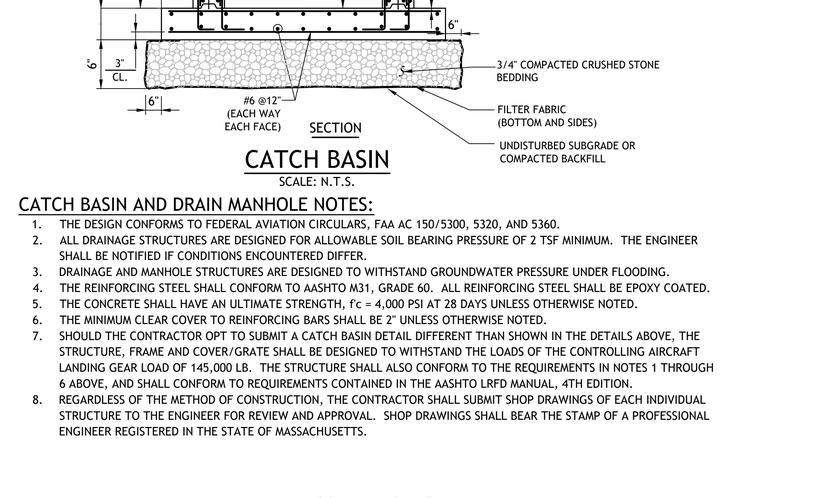


CATCH BASIN

SCALE: N.T.S.

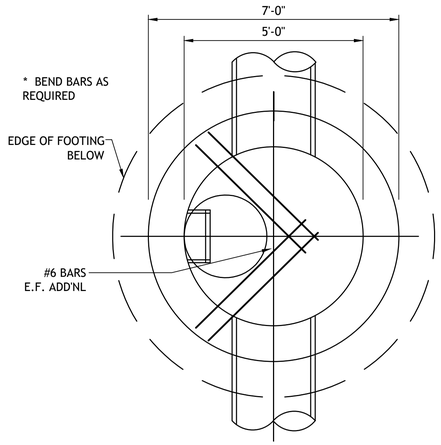
CATCH BASIN AND DRAIN MANHOLE NOTES:

1. THE DESIGN CONFORMS TO FEDERAL AVIATION CIRCULARS, FAA AC 150/5300, 5320, AND 5360.
2. ALL DRAINAGE STRUCTURES ARE DESIGNED FOR ALLOWABLE SOIL BEARING PRESSURE OF 2 TSF MINIMUM. THE ENGINEER SHALL BE NOTIFIED IF CONDITIONS ENCOUNTERED DIFFER.
3. DRAINAGE AND MANHOLE STRUCTURES ARE DESIGNED TO WITHSTAND GROUNDWATER PRESSURE UNDER FLOODING.
4. THE REINFORCING STEEL SHALL CONFORM TO AASHTO M31, GRADE 60. ALL REINFORCING STEEL SHALL BE EPOXY COATED.
5. THE CONCRETE SHALL HAVE AN ULTIMATE STRENGTH, f'c = 4,000 PSI AT 28 DAYS UNLESS OTHERWISE NOTED.
6. THE MINIMUM CLEAR COVER TO REINFORCING BARS SHALL BE 2" UNLESS OTHERWISE NOTED.
7. SHOULD THE CONTRACTOR OPT TO SUBMIT A CATCH BASIN DETAIL DIFFERENT THAN SHOWN IN THE DETAILS ABOVE, THE STRUCTURE, FRAME AND COVER/GRATE SHALL BE DESIGNED TO WITHSTAND THE LOADS OF THE CONTROLLING AIRCRAFT LANDING GEAR LOAD OF 145,000 LB. THE STRUCTURE SHALL ALSO CONFORM TO THE REQUIREMENTS IN NOTES 1 THROUGH 6 ABOVE, AND SHALL CONFORM TO REQUIREMENTS CONTAINED IN THE AASHTO LRFD MANUAL, 4TH EDITION.
8. REGARDLESS OF THE METHOD OF CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF EACH INDIVIDUAL STRUCTURE TO THE ENGINEER FOR REVIEW AND APPROVAL. SHOP DRAWINGS SHALL BEAR THE STAMP OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF MASSACHUSETTS.



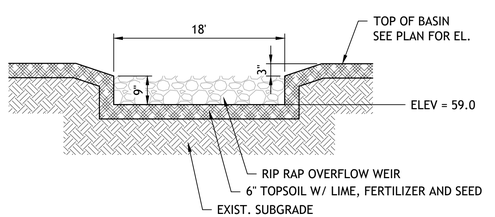
DETENTION BASIN DETAIL

SCALE: N.T.S.



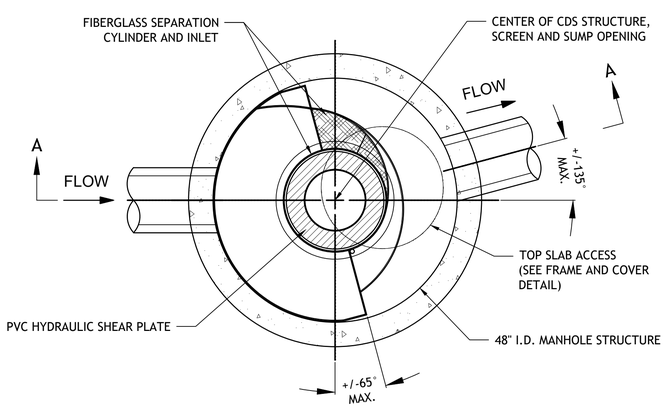
DRAIN MANHOLE

SCALE: N.T.S.

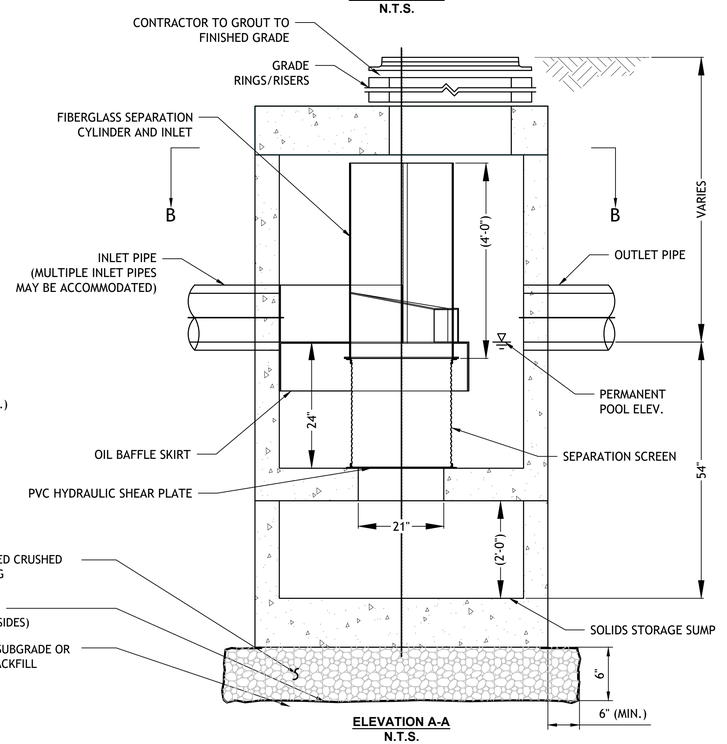


RIP RAP OVERFLOW DETAIL

SCALE: N.T.S.



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

WATER QUALITY STRUCTURE DETAIL (STRUCTURES 1 & 2)

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. POLLISTER
CIVIL
No. 52339
REGISTERED PROFESSIONAL ENGINEER

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PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

SHEET TITLE
DRAINAGE & EROSION CONTROL DETAILS (1 OF 5)

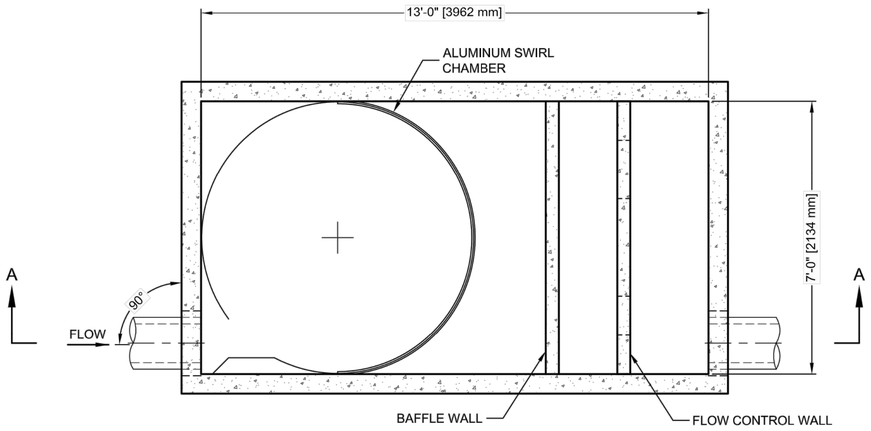
GRAPHIC SCALE
NOT TO SCALE

DRAWING NO.
NOI.7

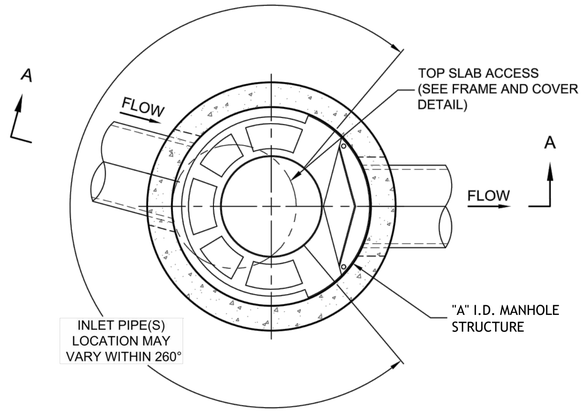
7 OF 11

01/15/2020 NOI SUBMISSION FOR NBCC

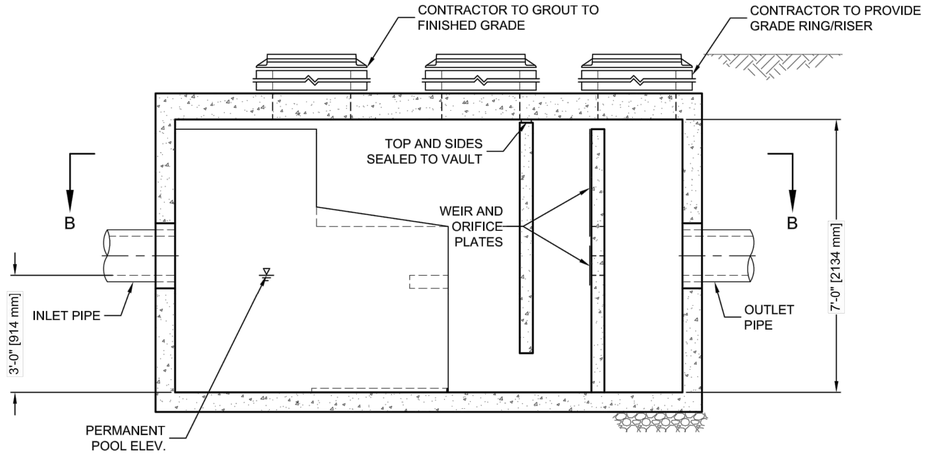
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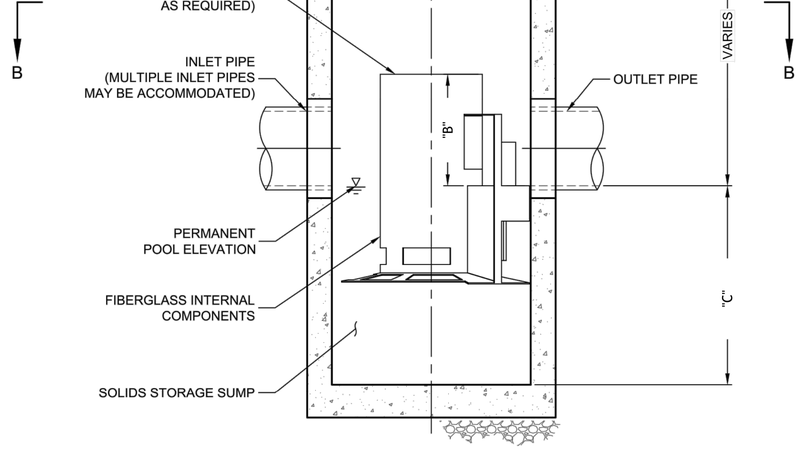
SECTION B-B



PLAN VIEW B-B
NOT TO SCALE



SECTION A-A



ELEVATION A-A
NOT TO SCALE

STRUCTURAL I.D.	DIAMETER "A"	"B"	"C"
OW-3	48"	2'-3"	4'-0"
OW-5	60"	2'-10"	4'-6"

WATER QUALITY STRUCTURE DETAIL
STRUCTURE 4
SCALE: N.T.S.

WATER QUALITY STRUCTURE DETAIL
(STRUCTURES 3 & 5)
SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PEDERSEN
CIVIL
No. 37339
REGISTERED PROFESSIONAL ENGINEER

ASG
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AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
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PROJECT
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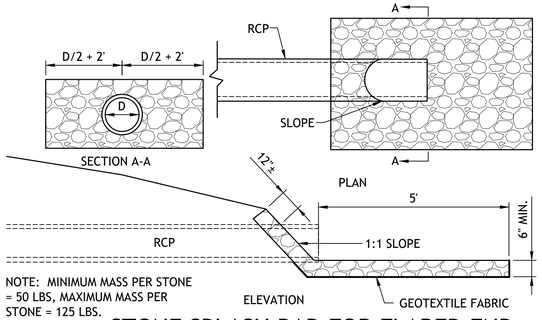
PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

SHEET TITLE
DRAINAGE & EROSION CONTROL DETAILS (2 OF 5)

GRAPHIC SCALE
NOT TO SCALE

DRAWING NO.
NOI.8

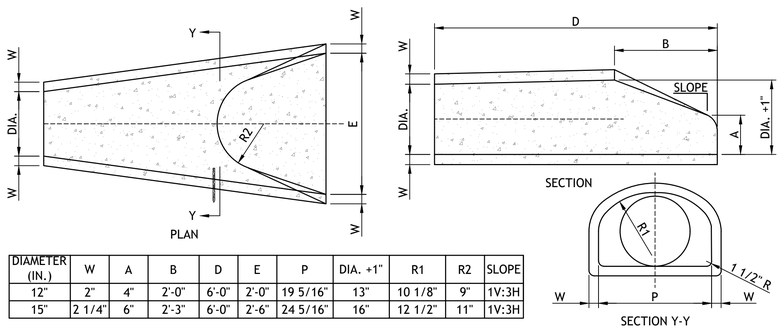
1/15/2020 1:28:33 PM \\asg2012\companydata\ASG Data\Projects\MA - New Bedford\046 Design Only - Terminal Aprons Phases 123\CADD\02 SUBMISSION\1-1-103-046_NOI DRAINAGE DETAILS.dwg (PEJ)



NOTE: MINIMUM MASS PER STONE = 50 LBS, MAXIMUM MASS PER STONE = 125 LBS.

STONE SPLASH PAD FOR FLARED END

SCALE: N.T.S.

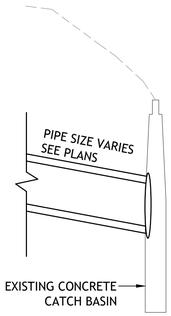


DIAMETER (IN.)	W	A	B	D	E	P	DIA. +1"	R1	R2	SLOPE
12"	2"	4"	2'-0"	6'-0"	2'-0"	19 5/16"	13"	10 1/8"	9"	1V:3H
15"	2 1/4"	6"	2'-3"	6'-0"	2'-6"	24 5/16"	16"	12 1/2"	11"	1V:3H

NOTES:
1. DIMENSIONS SHALL CONFORM TO MASSDOT CONSTRUCTION STANDARDS, DRAWING NO. E 206.8.0

REINFORCED CONCRETE PIPE FLARED END

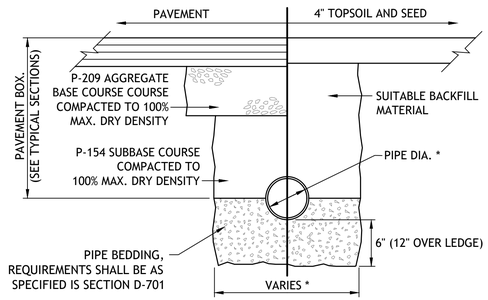
SCALE: N.T.S.



NOTES:
1. CORE HOLE MAX. OF 3" GREATER THAN O.D. OF PIPE.
2. INSERT PIPE SUCH THAT PIPE PENETRATES CATCH BASIN A MIN. OF 3".
3. FILL OPENING WITH NON-SHIRNK MORTAR.

CORE EXISTING CATCH BASIN / DMH

SCALE: N.T.S.

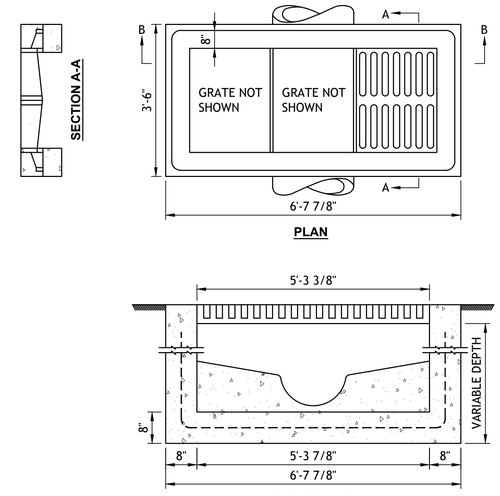


* PIPE DIA.	TRENCH WIDTH
UP TO 12"	36"
12" TO 24"	I.D. PLUS 24"
GREATER THAN 24"	2 x I.D.

NOTE: CONTRACTOR SHALL SHORE TRENCH SIDES WHEN REQUIRED.

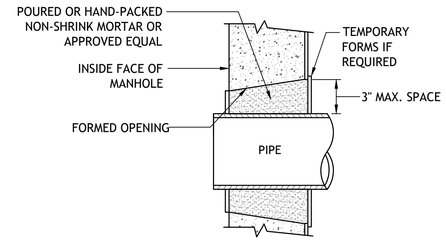
TYPICAL DRAINAGE PIPE TRENCH DETAIL

N.T.S.



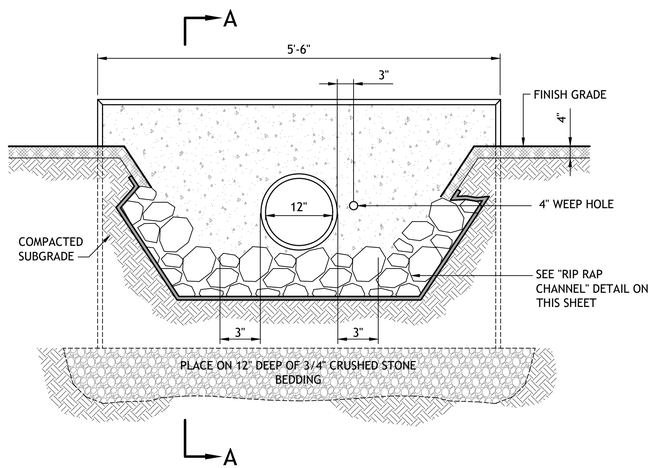
THREE-GRATE INLET STRUCTURE

SCALE: N.T.S.



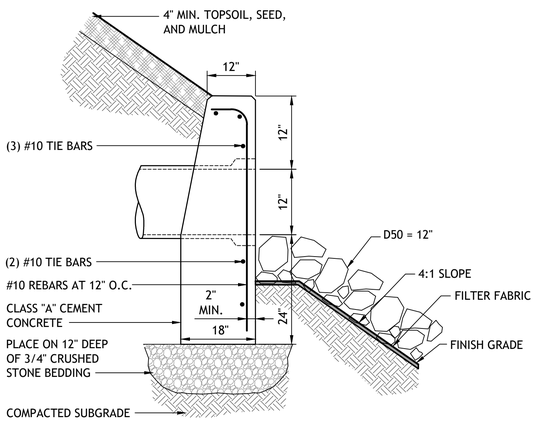
MORTAR PIPE CONNECTION AT STRUCTURES

SCALE: N.T.S.

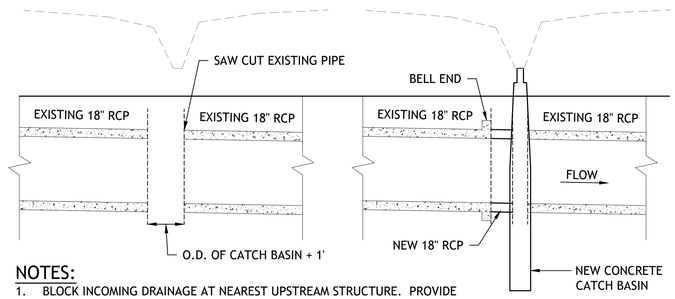


FRONT ELEVATION CONCRETE HEADWALL DETAIL

N.T.S.



SECTION A-A



NOTES:
1. BLOCK INCOMING DRAINAGE AT NEAREST UPSTREAM STRUCTURE. PROVIDE TEMPORARY PUMPING OR DEWATERING AS NECESSARY.
2. CUT EXISTING DRAINAGE PIPE 1' LARGER THAN O.D. OF CATCH BASIN.
3. INSERT CATCH BASIN, SLIDE TOWARD DOWNSTREAM.
4. INSERT SECTION OF PIPE ON UPSTREAM SIDE ALLOWING FOR MINIMUM 3" PENETRATION OF BOTH PIPE SECTIONS INTO STRUCTURE.
5. WORK REQUIRED TO INTERCEPT EXISTING PIPE SHALL BE CONSIDERED INCIDENTAL TO NEW CONCRETE CATCH BASIN.

INTERCEPT EXISTING PIPE

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PRUISTER
CIVIL
No. 37339
REGISTERED PROFESSIONAL ENGINEER

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AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

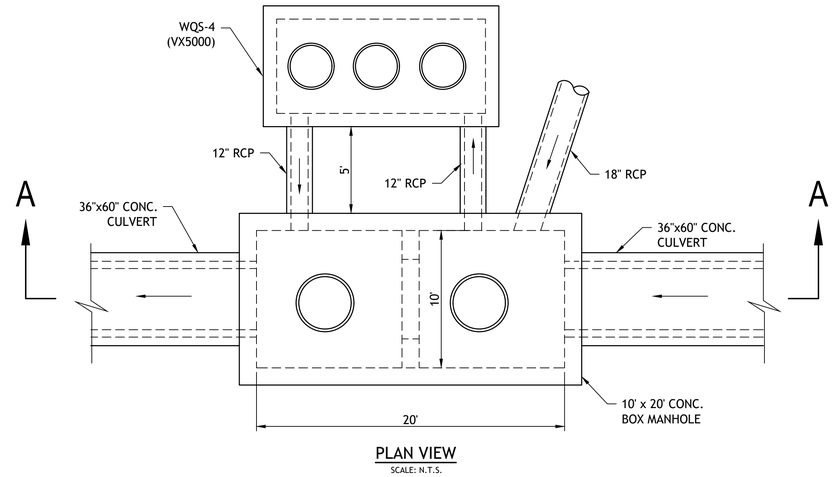
SHEET TITLE
DRAINAGE & EROSION CONTROL DETAILS (3 OF 5)

GRAPHIC SCALE
NOT TO SCALE

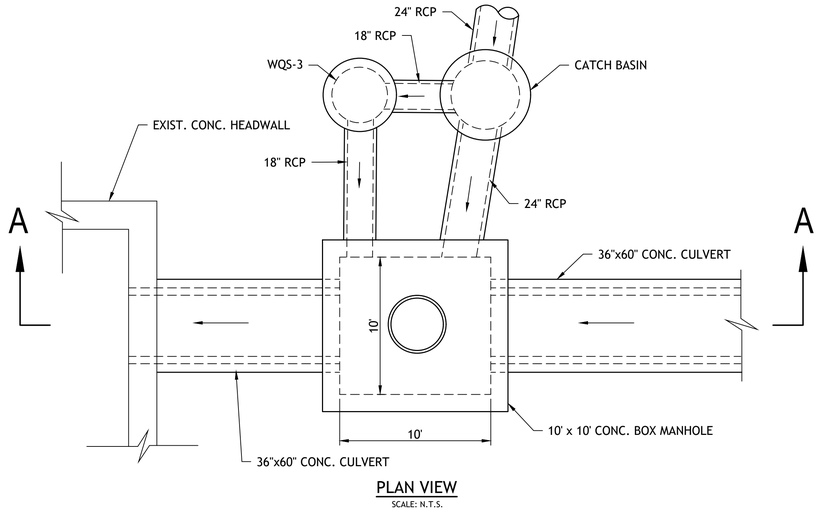
DRAWING NO.
NOI.9

01/15/2020 NOI SUBMISSION FOR NBCC

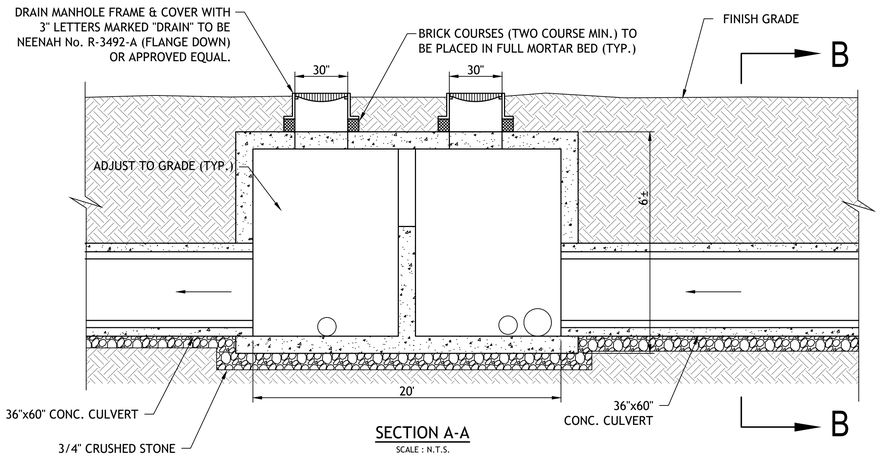
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PLAN VIEW
SCALE: N.T.S.

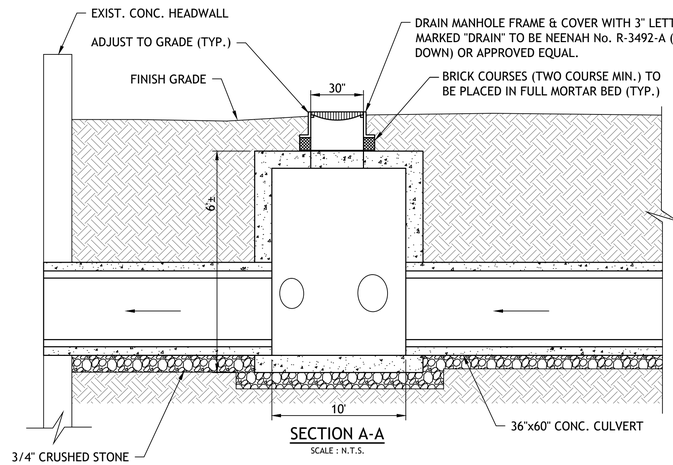


PLAN VIEW
SCALE: N.T.S.



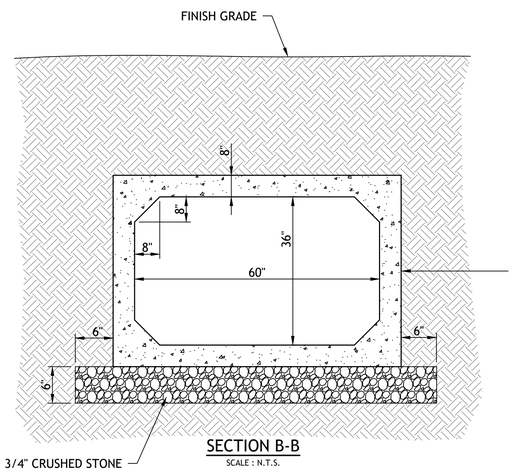
SECTION A-A
SCALE : N.T.S.

BYPASS MANHOLE WITH WEIR (OUTLET CONTROL) VAULT A
SCALE: N.T.S.

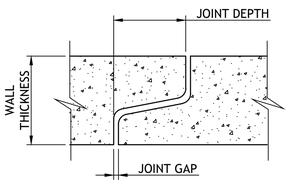


SECTION A-A
SCALE : N.T.S.

BOX MANHOLE VAULT B
SCALE: N.T.S.

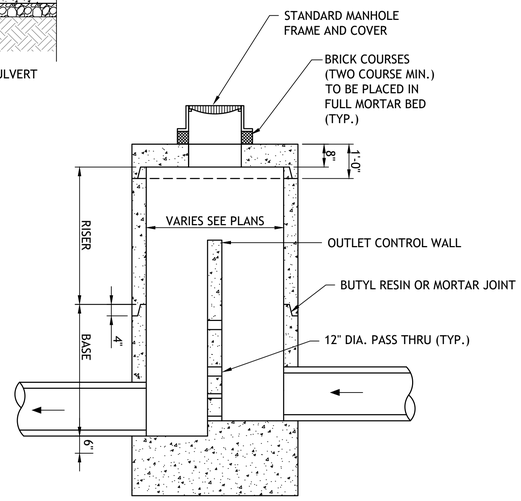


SECTION B-B
SCALE : N.T.S.



SECTION THROUGH BOX JOINT
SCALE : N.T.S.

SECTION THROUGH CULVERT



DIVERSION MANHOLE DETAIL
SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PICHUSTER
CIVIL
No. 37339
REGISTERED
PROFESSIONAL ENGINEER

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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

SHEET TITLE
DRAINAGE AND EROSION CONTROL DETAILS (4 OF 5)

GRAPHIC SCALE
NOT TO SCALE

DRAWING NO.
NOI.10

01/15/2020 NOI SUBMISSION FOR NBCC

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NEW ENGLAND WETLAND PLANTS, INC

820 WEST STREET, AMHERST, MA 01002
PHONE: 413-548-8000 FAX 413-549-4000
EMAIL: INFO@NEWP.COM WEB ADDRESS: WWW.NEWP.COM

New England Conservation/Wildlife Mix

Botanical Name	Common Name	Indicator
Elymus virginicus	Virginia Wild Rye	FACW-
Schizachyrium scoparium	Little Bluestem	FACU
Andropogon gerardii	Big Bluestem	FAC
Festuca rubra	Red Fescue	FACU
Sorghastrum nutans	Indian Grass	UPL
Panicum virgatum	Switch Grass	FAC
Chamaecrista fasciculata	Partridge Pea	FACU
Desmodium canadense	Showy Tick Trefoil	FAC
Asclepias tuberosa	Butterfly Milkweed	NI
Bidens frondosa	Beggar Ticks	FACW
Eupatorium purpureum (Eutrochium maculatum)	Purple Joe Pye Weed	FAC
Rudbeckia hirta	Black Eyed Susan	FACU-
Aster pilosus (Symphyotrichum pilosum)	Heath (or Hairy) Aster	UPL
Solidago juncea	Early Goldenrod	

PRICE PER LB. $39.50 MIN. QUANITY 2 LBS. **TOTAL:** $79.00 APPLY: 25 LBS/ACRE :1750 sq ft/lb

The New England Conservation/Wildlife Mix provides a permanent cover of grasses, wildflowers, and legumes
For both good erosion control and wildlife habitat value. The mix is designed to be a no maintenance seeding, and is appropriate for cut and fill slopes, detention basin side slopes, and disturbed areas adjacent to commercial and residential projects.

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.

NEW ENGLAND WETLAND PLANTS, INC

820 WEST STREET, AMHERST, MA 01002
PHONE: 413-548-8000 FAX 413-549-4000
EMAIL: INFO@NEWP.COM WEB ADDRESS: WWW.NEWP.COM

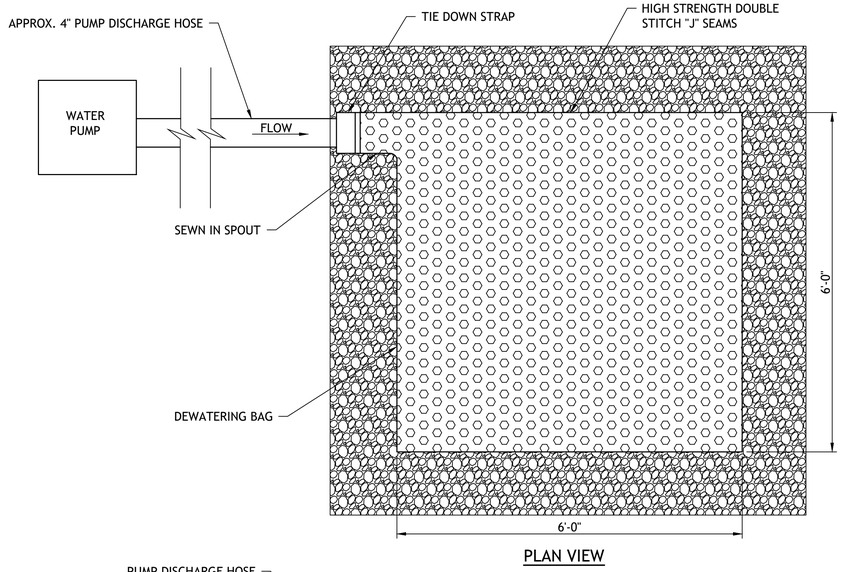
New England Erosion Control/Restoration Mix For Detention Basins and Moist Sites

Botanical Name	Common Name	Indicator
Elymus riparius	Riverbank Wild Rye	FACW
Schizachyrium scoparium	Little Bluestem	FACU
Festuca rubra	Red Fescue	FACU
Andropogon gerardii	Big Bluestem	FAC
Panicum virgatum	Switch Grass	FAC
Vernonia noveboracensis	New York Ironweed	FACW+
Agrostis perennans	Upland Bentgrass	FACU
Bidens frondosa	Beggar Ticks	FACW
Eupatorium maculatum (Eutrochium maculatum)	Spotted Joe Pye Weed	OBL
Eupatorium perfoliatum	Boneset	FACW
Aster novae-angliae (Symphyotrichum novae-anglia	New England Aster	FACW-
Scirpus cyperinus	Wool Grass	FACW
Juncus effusus	Soft Rush	FACW+

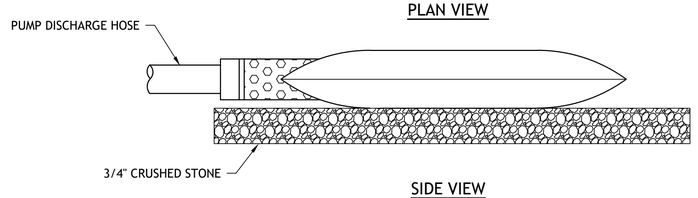
PRICE PER LB. $37.00 MIN. QUANITY 3 LBS. **TOTAL:** $111.00 APPLY: 35 LBS/ACRE :1250 sq ft/lb

The New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites contains a selection of native grasses and wildflowers designed to colonize generally moist, recently disturbed sites where quick growth of vegetation is desired to stabilize the soil surface. It is an appropriate seed mix for ecologically sensitive restorations that require stabilization as well as long-term establishment of native vegetation. This mix is particularly appropriate for detention basins that do not hold standing water. Many of the plants in this mix can tolerate infrequent inundation, but not constant flooding. The mix may be applied by hand, by mechanical spreader, or by hydro-seeder. After sowing, lightly rake, roll or cultipack to insure good seed-to-soil contact. Best results are obtained with a Spring or late Summer seeding. Late Fall and Winter dormant seeding requires an increase in the application rate. A light mulching of clean, weed-free straw is recommended

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.



PLAN VIEW

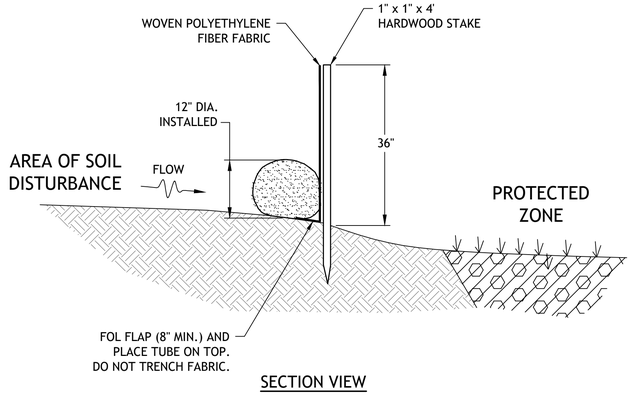


SIDE VIEW

NOTES:
1. SEAMS MUST BE HIGH STRENGTH DOUBLE STITCHED "J" SEAMS
2. SEAMS MUST BE TESTED UNDER ASTM D-4884, ACF TEST RESULTS AVAILABLE UPON REQUEST.

DEWATERING BAG FOR SEDIMENT CONTROL

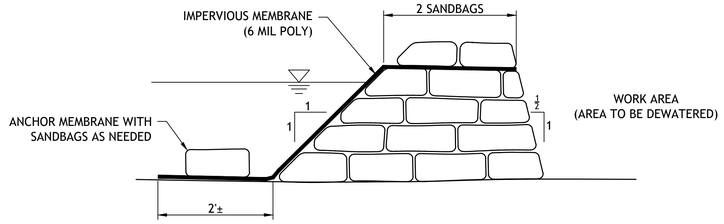
SCALE: N.T.S.



SECTION VIEW

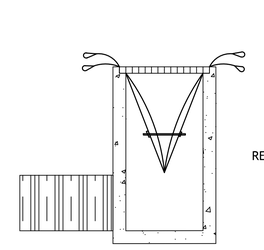
COMPOST FILTER TUBE AND SILT FENCE

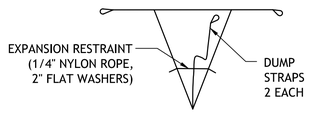
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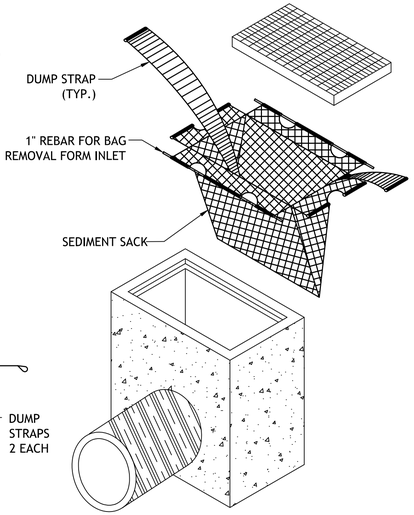


SECTION OF SANDBAG COFFERDAM USING SMALL SANDBAGS

SCALE: N.T.S.





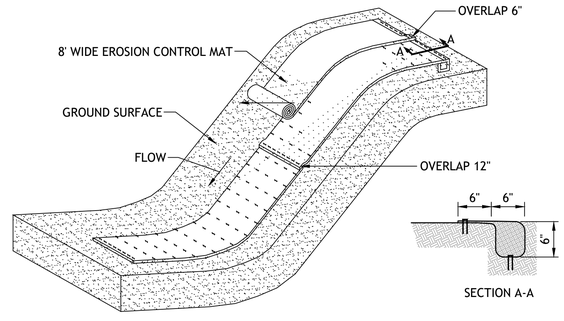


CATCH BASIN INLET NOTES:

1. CONTRACTOR SHALL REMOVE SEDIMENT AS NECESSARY TO MAINTAIN LEVEL BELOW OVERFLOW HOLES IN SEDIMENT SACK.
2. SEDIMENT SACK SHALL BE USED ON ALL CATCH BASINS WITHIN THE CONSTRUCTION ZONE, INCLUDING NEW STRUCTURES, OR AS DIRECTED BY THE ENGINEER.
3. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING SEDIMENTATION SACKS THROUGHOUT THE DURATION OF THE PROJECT.
4. CONTRACTOR SHALL REMOVE AND LEGALLY DISPOSE OF SEDIMENT AS REQUIRED.
5. CONTRACTOR SHALL REMOVE SEDIMENT SACKS AND LEGALLY DISPOSE OF THEM OFF-SITE, UPON COMPLETION OF THE PROJECT AND AS REQUIRED.
6. 1" REBAR FOR BAG REMOVAL SHALL BE REMOVED DURING WINTER MONTHS AT LOCATIONS WHERE THERE IS PLOW ACTIVITY. BARS SHALL BE REINSTALLED AFTER SNOW SEASON IS COMPLETE.

CATCH BASIN INLET PROTECTION

SCALE: N.T.S.



EROSION CONTROL MATTING NOTES:

1. PRIOR TO PLACING EROSION CONTROL MATTING, PREPARE THE SOIL BY RAKING AREA FREE OF CLODS AND LARGE STONES.
2. SEED, MULCH AND FERTILIZER SHALL BE DISTRIBUTED AS SPECIFIED OVER THE PREPARED SOIL PRIOR TO PLACING THE EROSION CONTROL MATTING.
3. ALL SEAMS SHALL BE OVERLAPPED A MINIMUM OF 6" AND SECURED WITH STAPLES 18" ON CENTER.
4. TO SECURE MAT TO GROUND, STAPLE RANDOMLY AT 24" INTERVALS THROUGHOUT
5. APPROXIMATELY 200 STAPLES PER ROLL
6. PLACE EROSION CONTROL MATTING AS DIRECTED BY THE ENGINEER AND ON SLOPES GREATER THAN 5:1.

EROSION CONTROL MATTING

SCALE: N.T.S.

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. PROUSTER
CIVIL
No. 52939
REGISTERED PROFESSIONAL ENGINEER

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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	RJM
DRAWN BY	PEJ
CHECKED BY	CAS
DATE	January 2020
DRAWING SCALE	NOT TO SCALE

SHEET TITLE
DRAINAGE AND EROSION CONTROL DETAILS (5 OF 5)

GRAPHIC SCALE
NOT TO SCALE

DRAWING NO.
NOI.11

11 OF 11

01/15/2020 NOI SUBMISSION FOR NBCC

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APPENDIX B

EXISTING HYDROCAD DRAINAGE CALCULATIONS

EX-TWA-E1
A = 1.194 AC
CN = 50
Tc = 21.4 MIN.

EX-RW5-E5
A = 2.132 AC
CN = 53
Tc = 46.6 MIN.

EX-RW23-E6
A= 3.464 AC
CN = 53
Tc =10.0 MIN.

EX-RW23-E4
A=10.361 AC
CN = 60
Tc = 28.6 MIN.

EX-TWA-W1
A= 4.726 AC
CN = 48
Tc = 17.6 MIN.

EX-RW23-E3
A = 9.450 AC
CN = 46
Tc = 70.0 MIN.

EX-RW23-E2
A = 22.469 AC
CN = 62
Tc = 18.8 MIN.

EX-RW32-NE-1
A= 7.120 AC
CN = 47
Tc = 10.0 MIN.

EX-RW23-E1
A= 51.158 AC
CN = 56
Tc = 67.6 MIN.

EX-RW32-NE-2
A= 2.900 AC
CN = 51
Tc = 10.0 MIN.

40S 47S 48S 49S 50S 51S 52S 53S 54S 74S

ANALYSIS POINT 1
ANALYSIS POINT 2
ANALYSIS POINT 3
ANALYSIS POINT 4
ANALYSIS POINT 5

TERMINAL APRON
SEE DETAIL IN
SHEET D1.2

LEGEND

- WATERSHED BOUNDARY
- WATERSHED TRAVEL PATH
- AIRPORT PROPERTY LINE
- OPEN WATER
- EXISTING WETLANDS

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. FISHUSTER
CIVIL
No. 53595
REGISTERED
PROFESSIONAL ENGINEER

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AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
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PROJECT
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PHASES 1, 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	FYA
DRAWN BY	FYA
CHECKED BY	SJR
DATE	January 2020
DRAWING SCALE	1" = 200'

SHEET TITLE
EXISTING DRAINAGE PLAN

GRAPHIC SCALE
0 100 200 400

DRAWING NO.
D1.1
OF

1/7/2020 2:26:41 PM J:\ASG Data\Projects\MA - New Bedford\04 Design Only - Terminal Aprons Phases 1\2\3\dwg\Drainage\103-046 Drainage Design.dwg (FYA)

EX-RW32-NE1
A = 7.12 AC.
CN = 47
Tc = 10.0 MIN.

EX-RW32-NE2
A = 2.900 AC.
CN = 51
Tc = 10.0 MIN.

TAXIWAY B

EX-CB-23
A = 0.500 AC.
CN = 98
Tc = 10.0 MIN.

EX-CB-20
A = 0.290 AC.
CN = 77
Tc = 10.0 MIN.

EX-CB-21
A = 0.650 AC.
CN = 63
Tc = 10.0 MIN.

EX-CB-22
A = 0.720 AC.
CN = 89
Tc = 10.0 MIN.

EX-CB-24
A = 0.605 AC.
CN = 98
Tc = 10.0 MIN.

EX-CB-27
A = 0.020 AC.
CN = 98
Tc = 10.0 MIN.

EX-CB-25
A = 3.345 AC.
CN = 97
Tc = 10.0 MIN.

EX-CB-28
A = 1.100 AC.
CN = 92
Tc = 10.0 MIN.

TAXIWAY B

EX-CB-30
A = 1.99 AC.
CN = 80
Tc = 10.0 MIN.

EX-CB-31
A = 1.500 AC.
CN = 89
Tc = 10.0 MIN.

EX-CB-15
A = 0.829 AC.
CN = 98
Tc = 10.0 MIN.

EX-CB-16
A = 0.459 AC.
CN = 97
Tc = 10.0 MIN.

EX-CB-17
A = 0.745 AC.
CN = 93
Tc = 10.0 MIN.

EX-CB-18
A = 0.044 AC.
CN = 98
Tc = 10.0 MIN.

EX-CB-38
A = 0.178 AC.
CN = 98
Tc = 10.0 MIN.

EX-CB-11
A = 0.179 AC.
CN = 67
Tc = 10.0 MIN.

EX-CB-19
A = 0.367 AC.
CN = 90
Tc = 10.0 MIN.

EX-CB-13
A = 0.066 AC.
CN = 39
Tc = 10.0 MIN.

EX-DMH-3
A = 1.062 AC.
CN = 77
Tc = 10.0 MIN.

EX-CB-10
A = 0.182 AC.
CN = 72
Tc = 10.0 MIN.

EX-CB-12
A = 0.812 AC.
CN = 96
Tc = 10.0 MIN.

EX-TERMINAL ROOF
A = 0.210 AC.
CN = 98
Tc = 10.0 MIN.

EX-ROOF
A = 0.210 AC.
CN = 98
Tc = 10.0 MIN.

EX-ROOF
A = 0.697 AC.
CN = 98
Tc = 10.0 MIN.

EX-PARKING
A = 0.213 AC.
CN = 98
Tc = 10.0 MIN.

AP-5
ANALYSIS
POINT #5

EX-CB-3
A = 0.892 AC.
CN = 83
Tc = 10.0 MIN.

EX-CB-5
A = 1.180 AC.
CN = 73
Tc = 10.0 MIN.

EX-CB-4
A = 1.014 AC.
CN = 94
Tc = 10.2 MIN.

EX-CB-6
A =0.392 AC.
CN = 79
Tc=10.0 MIN.

EX-CB-9
A = 1.080 AC.
CN = 96
Tc = 10.0 MIN.

EX-CB-8
A = 1.278 AC.
CN = 91
Tc = 10.0 MIN.

AP-4
ANALYSIS
POINT #3

TAXIWAY A

EX-CB-1
A = 0.751 AC.
CN = 97
Tc = 10.0 MIN.

EX-COLONIAL-3
A = 0.933 AC.
CN = 77
Tc = 10.0 MIN.

EX-TWA-E1
A = 1.194 AC.
CN = 50
Tc = 21.4 MIN.

EX-COLONIAL ROOF
A = 0.658 AC.
CN = 98
Tc = 10.0 MIN.

AP-3
ANALYSIS
POINT #3

EX-COLONIAL-2
A = 2.610 AC.
CN = 78
Tc = 10.0 MIN.

EX-CB-2
A = 0.520 AC.
CN = 88
Tc = 10.0 MIN.

AP-2
ANALYSIS
POINT #2

EX-COLONIAL-1
A = 0.282 AC.
CN = 56
Tc = 10.0 MIN.

AP-1
ANALYSIS
POINT #1

LEGEND

- WATERSHED BOUNDARY
- WATERSHED TRAVEL PATH
- AIRPORT PROPERTY LINE
- OPEN WATER
- EXISTING WETLANDS

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. FISHUSTER
CIVIL
No. 53599
REGISTERED
PROFESSIONAL ENGINEER

ASG
AIRPORT SOLUTIONS GROUP, LLC
AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 1, 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	FYA
DRAWN BY	FYA
CHECKED BY	SJR
DATE	January 2020
DRAWING SCALE	1" = 80'

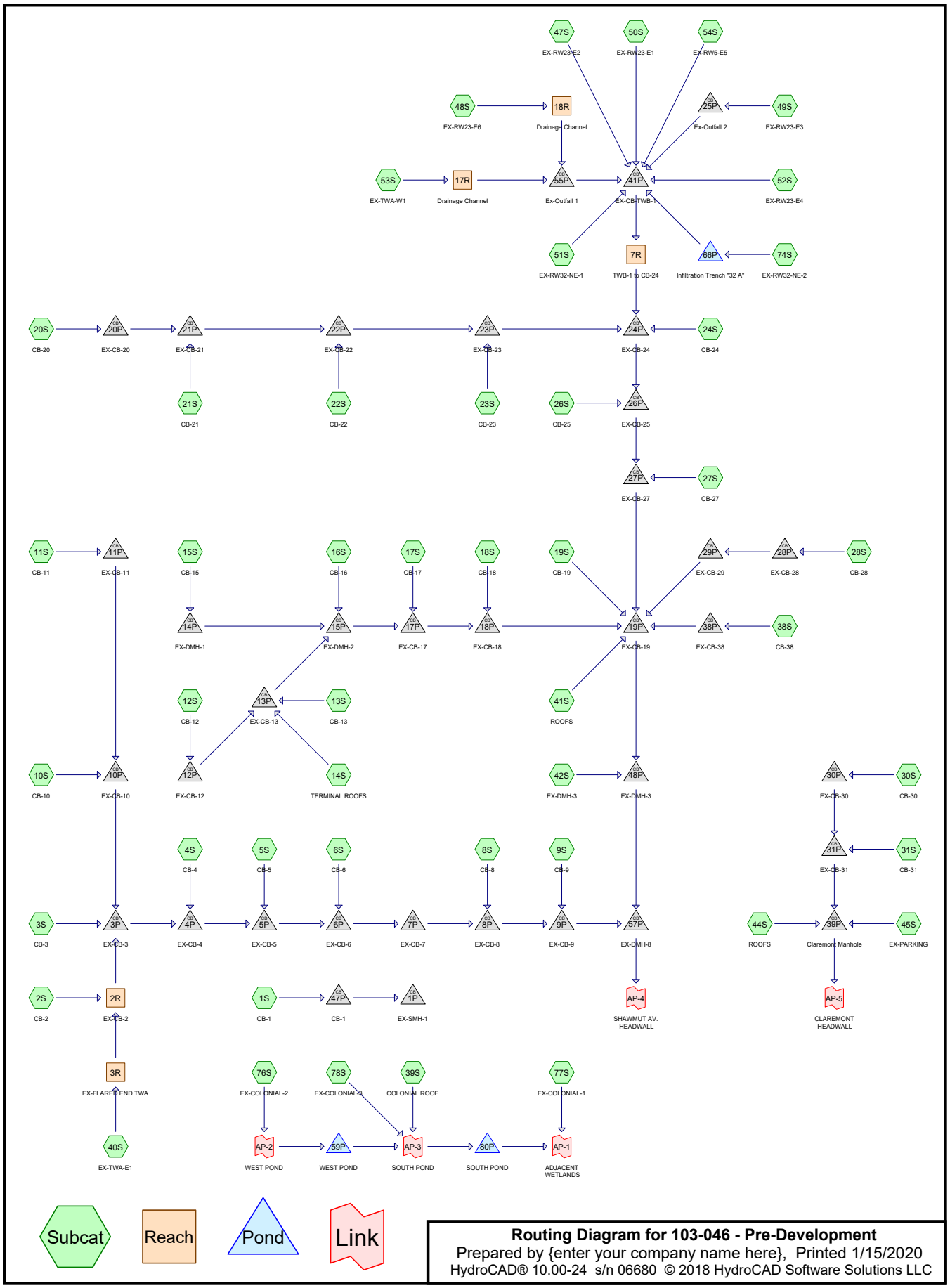
SHEET TITLE
EXISTING DRAINAGE PLAN
(TERMINAL APRON)

GRAPHIC SCALE
0 40 80 160

DRAWING NO.
D1.2

OF

1/14/2020 2:39:16 PM P:\ASG Data\Projects\MA — New Bedford\Civil\103-046 Design Only — Terminal Aprons Phases 123\Design\Drawings\103-046 Drawings Design v4.dwg (FYA)



Routing Diagram for 103-046 - Pre-Development

Prepared by {enter your company name here}, Printed 1/15/2020

HydroCAD® 10.00-24 s/n 06680 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: CB-1 Runoff Area=0.751 ac 98.54% Impervious Runoff Depth=3.06"
Tc=10.0 min CN=97 Runoff=2.15 cfs 0.191 af

Subcatchment2S: CB-2 Runoff Area=0.520 ac 82.31% Impervious Runoff Depth=2.18"
Tc=10.0 min CN=88 Runoff=1.16 cfs 0.094 af

Subcatchment3S: CB-3 Runoff Area=0.892 ac 75.22% Impervious Runoff Depth=1.77"
Flow Length=357' Tc=10.0 min CN=83 Runoff=1.62 cfs 0.132 af

Subcatchment4S: CB-4 Runoff Area=1.014 ac 93.29% Impervious Runoff Depth=2.74"
Flow Length=459' Tc=10.2 min CN=94 Runoff=2.71 cfs 0.231 af

Subcatchment5S: CB-5 Runoff Area=1.180 ac 56.78% Impervious Runoff Depth=1.11"
Tc=10.0 min CN=73 Runoff=1.27 cfs 0.109 af

Subcatchment6S: CB-6 Runoff Area=0.392 ac 67.86% Impervious Runoff Depth=1.49"
Tc=10.0 min CN=79 Runoff=0.59 cfs 0.049 af

Subcatchment8S: CB-8 Runoff Area=1.278 ac 87.95% Impervious Runoff Depth=2.45"
Tc=10.0 min CN=91 Runoff=3.15 cfs 0.261 af

Subcatchment9S: CB-9 Runoff Area=1.080 ac 95.65% Impervious Runoff Depth=2.95"
Tc=10.0 min CN=96 Runoff=3.03 cfs 0.265 af

Subcatchment10S: CB-10 Runoff Area=0.182 ac 56.59% Impervious Runoff Depth=1.06"
Tc=10.0 min CN=72 Runoff=0.18 cfs 0.016 af

Subcatchment11S: CB-11 Runoff Area=0.179 ac 48.04% Impervious Runoff Depth=0.79"
Flow Length=149' Tc=10.0 min CN=67 Runoff=0.12 cfs 0.012 af

Subcatchment12S: CB-12 Runoff Area=0.812 ac 97.41% Impervious Runoff Depth=2.95"
Tc=10.0 min CN=96 Runoff=2.28 cfs 0.199 af

Subcatchment13S: CB-13 Runoff Area=0.066 ac 0.00% Impervious Runoff Depth=0.00"
Tc=10.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment14S: TERMINAL ROOFS Runoff Area=0.210 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.61 cfs 0.055 af

Subcatchment15S: CB-15 Runoff Area=0.829 ac 99.52% Impervious Runoff Depth=3.17"
Flow Length=250' Slope=0.0118 '/' Tc=10.0 min CN=98 Runoff=2.40 cfs 0.219 af

Subcatchment16S: CB-16 Runoff Area=0.459 ac 98.47% Impervious Runoff Depth=3.06"
Tc=10.0 min CN=97 Runoff=1.31 cfs 0.117 af

Subcatchment17S: CB-17 Runoff Area=0.745 ac 91.28% Impervious Runoff Depth=2.64"
Tc=10.0 min CN=93 Runoff=1.95 cfs 0.164 af

Subcatchment18S: CB-18 Runoff Area=0.044 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.13 cfs 0.012 af

Subcatchment19S: CB-19 Runoff Area=0.367 ac 86.65% Impervious Runoff Depth=2.35"
Tc=10.0 min CN=90 Runoff=0.87 cfs 0.072 af

Subcatchment20S: CB-20 Runoff Area=0.290 ac 65.17% Impervious Runoff Depth=1.36"
Tc=10.0 min CN=77 Runoff=0.39 cfs 0.033 af

Subcatchment21S: CB-21 Runoff Area=0.650 ac 40.62% Impervious Runoff Depth=0.61"
Tc=10.0 min CN=63 Runoff=0.31 cfs 0.033 af

Subcatchment22S: CB-22 Runoff Area=0.720 ac 85.28% Impervious Runoff Depth=2.26"
Flow Length=247' Tc=10.0 min CN=89 Runoff=1.66 cfs 0.136 af

Subcatchment23S: CB-23 Runoff Area=0.500 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.45 cfs 0.132 af

Subcatchment24S: CB-24 Runoff Area=0.605 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.75 cfs 0.160 af

Subcatchment26S: CB-25 Runoff Area=3.345 ac 97.79% Impervious Runoff Depth=3.06"
Tc=10.0 min CN=97 Runoff=9.57 cfs 0.852 af

Subcatchment27S: CB-27 Runoff Area=0.020 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment28S: CB-28 Runoff Area=1.100 ac 89.82% Impervious Runoff Depth=2.54"
Tc=10.0 min CN=92 Runoff=2.79 cfs 0.233 af

Subcatchment30S: CB-30 Runoff Area=1.990 ac 69.85% Impervious Runoff Depth=1.56"
Flow Length=268' Tc=10.0 min CN=80 Runoff=3.15 cfs 0.258 af

Subcatchment31S: CB-31 Runoff Area=1.500 ac 85.13% Impervious Runoff Depth=2.26"
Flow Length=217' Tc=10.0 min CN=89 Runoff=3.45 cfs 0.283 af

Subcatchment38S: CB-38 Runoff Area=0.178 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.52 cfs 0.047 af

Subcatchment39S: COLONIAL ROOF Runoff Area=0.658 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.91 cfs 0.174 af

Subcatchment40S: EX-TWA-E1 Runoff Area=1.194 ac 18.93% Impervious Runoff Depth=0.17"
Flow Length=338' Tc=21.4 min CN=50 Runoff=0.04 cfs 0.017 af

Subcatchment41S: ROOFS Runoff Area=0.619 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.80 cfs 0.163 af

Subcatchment42S: EX-DMH-3 Runoff Area=1.062 ac 63.94% Impervious Runoff Depth=1.36"
Tc=10.0 min CN=77 Runoff=1.44 cfs 0.120 af

Subcatchment44S: ROOFS Runoff Area=0.697 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=2.02 cfs 0.184 af

Subcatchment45S: EX-PARKING Runoff Area=0.213 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.62 cfs 0.056 af

Subcatchment47S: EX-RW23-E2 Runoff Area=22.469 ac 9.29% Impervious Runoff Depth=0.57"
Flow Length=1,209' Tc=18.8 min CN=62 Runoff=7.59 cfs 1.066 af

Subcatchment48S: EX-RW23-E6 Runoff Area=3.464 ac 23.73% Impervious Runoff Depth=0.25"
Flow Length=353' Tc=10.0 min CN=53 Runoff=0.33 cfs 0.073 af

Subcatchment49S: EX-RW23-E3 Runoff Area=9.450 ac 11.30% Impervious Runoff Depth=0.09"
Flow Length=1,277' Tc=70.0 min CN=46 Runoff=0.11 cfs 0.068 af

Subcatchment50S: EX-RW23-E1 Runoff Area=51.158 ac 7.68% Impervious Runoff Depth=0.35"
Flow Length=2,965' Tc=67.6 min CN=56 Runoff=4.36 cfs 1.472 af

Subcatchment51S: EX-RW32-NE-1 Runoff Area=7.120 ac 13.03% Impervious Runoff Depth=0.11"
Tc=10.0 min CN=47 Runoff=0.10 cfs 0.063 af

Subcatchment52S: EX-RW23-E4 Runoff Area=10.361 ac 36.22% Impervious Runoff Depth=0.49"
Flow Length=336' Tc=28.6 min CN=60 Runoff=2.38 cfs 0.422 af

Subcatchment53S: EX-TWA-W1 Runoff Area=4.726 ac 14.47% Impervious Runoff Depth=0.13"
Flow Length=595' Tc=17.6 min CN=48 Runoff=0.08 cfs 0.050 af

Subcatchment54S: EX-RW5-E5 Runoff Area=2.132 ac 23.64% Impervious Runoff Depth=0.25"
Flow Length=1,056' Tc=46.6 min CN=53 Runoff=0.13 cfs 0.045 af

Subcatchment74S: EX-RW32-NE-2 Runoff Area=2.900 ac 19.66% Impervious Runoff Depth=0.20"
Flow Length=390' Tc=10.0 min CN=51 Runoff=0.17 cfs 0.048 af

Subcatchment76S: EX-COLONIAL-2 Runoff Area=2.610 ac 66.25% Impervious Runoff Depth=1.42"
Flow Length=328' Tc=10.0 min CN=78 Runoff=3.73 cfs 0.309 af

Subcatchment77S: EX-COLONIAL-1 Runoff Area=0.282 ac 17.73% Impervious Runoff Depth=0.35"
Flow Length=50' Slope=0.0593 '/' Tc=10.0 min CN=56 Runoff=0.05 cfs 0.008 af

Subcatchment78S: EX-COLONIAL-3 Runoff Area=0.933 ac 64.09% Impervious Runoff Depth=1.36"
Flow Length=28' Slope=0.0897 '/' Tc=10.0 min CN=77 Runoff=1.27 cfs 0.105 af

Reach 2R: EX-CB-2 Avg. Flow Depth=0.28' Max Vel=2.48 fps Inflow=1.16 cfs 0.111 af
n=0.012 L=160.0' S=0.0033 '/' Capacity=2.70 cfs Outflow=1.15 cfs 0.111 af

Reach 3R: EX-FLARED END TWA Avg. Flow Depth=0.03' Max Vel=0.83 fps Inflow=0.04 cfs 0.017 af
n=0.012 L=103.0' S=0.0049 '/' Capacity=3.29 cfs Outflow=0.04 cfs 0.017 af

Reach 7R: TWB-1 to CB-24 Avg. Flow Depth=1.26' Max Vel=6.51 fps Inflow=10.32 cfs 3.258 af
18.0" Round Pipe n=0.012 L=258.3' S=0.0079 '/' Capacity=10.09 cfs Outflow=10.31 cfs 3.258 af

Reach 17R: Drainage Channel Avg. Flow Depth=0.06' Max Vel=0.58 fps Inflow=0.08 cfs 0.050 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=0.08 cfs 0.050 af

Reach 18R: Drainage Channel Avg. Flow Depth=0.14' Max Vel=0.90 fps Inflow=0.33 cfs 0.073 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=0.32 cfs 0.073 af

Pond 1P: EX-SMH-1 Peak Elev=85.82' Inflow=2.15 cfs 0.191 af
6.0" Round Culvert n=0.012 L=236.0' S=0.0268 '/' Outflow=2.15 cfs 0.191 af

Pond 3P: EX-CB-3 Peak Elev=75.26' Inflow=3.07 cfs 0.271 af
15.0" Round Culvert n=0.013 L=165.0' S=0.0023 '/' Outflow=3.07 cfs 0.271 af

Pond 4P: EX-CB-4 Peak Elev=74.81' Inflow=5.77 cfs 0.503 af
15.0" Round Culvert n=0.012 L=68.0' S=0.0010 '/' Outflow=5.77 cfs 0.503 af

Pond 5P: EX-CB-5 Peak Elev=73.97' Inflow=7.04 cfs 0.612 af
15.0" Round Culvert n=0.012 L=136.0' S=0.0028 '/' Outflow=7.04 cfs 0.612 af

Pond 6P: EX-CB-6 Peak Elev=72.01' Inflow=7.63 cfs 0.661 af
15.0" Round Culvert n=0.012 L=70.0' S=0.0114 '/' Outflow=7.63 cfs 0.661 af

Pond 7P: EX-CB-7 Peak Elev=70.40' Inflow=7.63 cfs 0.661 af
15.0" Round Culvert n=0.010 L=39.4' S=0.0165 '/' Outflow=7.63 cfs 0.661 af

Pond 8P: EX-CB-8 Peak Elev=67.77' Inflow=10.77 cfs 0.921 af
15.0" Round Culvert n=0.012 L=106.0' S=0.0134 '/' Outflow=10.77 cfs 0.921 af

Pond 9P: EX-CB-9 Peak Elev=63.62' Inflow=13.80 cfs 1.186 af
15.0" Round Culvert n=0.013 L=16.0' S=0.0088 '/' Outflow=13.80 cfs 1.186 af

Pond 10P: EX-CB-10 Peak Elev=75.28' Inflow=0.31 cfs 0.028 af
12.0" Round Culvert n=0.012 L=344.0' S=0.0031 '/' Outflow=0.31 cfs 0.028 af

Pond 11P: EX-CB-11 Peak Elev=75.28' Inflow=0.12 cfs 0.012 af
12.0" Round Culvert n=0.012 L=177.0' S=0.0033 '/' Outflow=0.12 cfs 0.012 af

Pond 12P: EX-CB-12 Peak Elev=65.25' Inflow=2.28 cfs 0.199 af
18.0" Round Culvert n=0.012 L=150.0' S=0.0049 '/' Outflow=2.28 cfs 0.199 af

Pond 13P: EX-CB-13 Peak Elev=65.18' Inflow=2.89 cfs 0.255 af
18.0" Round Culvert n=0.012 L=158.0' S=0.0027 '/' Outflow=2.89 cfs 0.255 af

Pond 14P: EX-DMH-1 Peak Elev=65.83' Inflow=2.40 cfs 0.219 af
12.0" Round Culvert n=0.012 L=200.0' S=0.0052 '/' Outflow=2.40 cfs 0.219 af

Pond 15P: EX-DMH-2 Peak Elev=65.06' Inflow=6.61 cfs 0.590 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0030 '/' Outflow=6.61 cfs 0.590 af

Pond 17P: EX-CB-17 Peak Elev=64.92' Inflow=8.55 cfs 0.754 af
24.0" Round Culvert n=0.012 L=155.0' S=0.0028 '/' Outflow=8.55 cfs 0.754 af

Pond 18P: EX-CB-18 Peak Elev=64.61' Inflow=8.68 cfs 0.766 af
24.0" Round Culvert n=0.012 L=153.0' S=0.0028 '/' Outflow=8.68 cfs 0.766 af

Pond 19P: EX-CB-19 Peak Elev=64.28' Inflow=33.30 cfs 5.889 af
24.0" Round Culvert n=0.012 L=70.0' S=0.0040 '/' Outflow=33.30 cfs 5.889 af

Pond 20P: EX-CB-20 Peak Elev=68.10' Inflow=0.39 cfs 0.033 af
15.0" Round Culvert n=0.012 L=95.0' S=0.0046 '/' Outflow=0.39 cfs 0.033 af

Pond 21P: EX-CB-21 Peak Elev=68.10' Inflow=0.70 cfs 0.066 af
15.0" Round Culvert n=0.012 L=197.0' S=0.0031 '/' Outflow=0.70 cfs 0.066 af

Pond 22P: EX-CB-22 Peak Elev=68.08' Inflow=2.35 cfs 0.202 af
15.0" Round Culvert n=0.012 L=97.0' S=0.0081 '/' Outflow=2.35 cfs 0.202 af

Pond 23P: EX-CB-23 Peak Elev=67.93' Inflow=3.79 cfs 0.334 af
18.0" Round Culvert n=0.012 L=189.0' S=0.0011 '/' Outflow=3.79 cfs 0.334 af

Pond 24P: EX-CB-24 Peak Elev=67.69' Inflow=12.69 cfs 3.751 af
24.0" Round Culvert n=0.012 L=97.0' S=0.0107 '/' Outflow=12.69 cfs 3.751 af

Pond 25P: Ex-Outfall 2 Peak Elev=69.32' Inflow=0.11 cfs 0.068 af
10.0" Round Culvert n=0.012 L=211.0' S=0.0013 '/' Outflow=0.11 cfs 0.068 af

Pond 26P: EX-CB-25 Peak Elev=67.28' Inflow=18.99 cfs 4.603 af
24.0" Round Culvert n=0.012 L=138.0' S=-0.0075 '/' Outflow=18.99 cfs 4.603 af

Pond 27P: EX-CB-27 Peak Elev=65.66' Inflow=19.04 cfs 4.608 af
24.0" Round Culvert n=0.012 L=67.0' S=-0.0055 '/' Outflow=19.04 cfs 4.608 af

Pond 28P: EX-CB-28 Peak Elev=464.18' Inflow=2.79 cfs 0.233 af
4.0" Round Culvert n=0.013 L=175.0' S=0.0057 '/' Outflow=2.79 cfs 0.233 af

Pond 29P: EX-CB-29 Peak Elev=64.51' Inflow=2.79 cfs 0.233 af
18.0" Round Culvert n=0.012 L=320.0' S=0.0010 '/' Outflow=2.79 cfs 0.233 af

Pond 30P: EX-CB-30 Peak Elev=62.25' Inflow=3.15 cfs 0.258 af
15.0" Round Culvert n=0.012 L=262.0' S=0.0025 '/' Outflow=3.15 cfs 0.258 af

Pond 31P: EX-CB-31 Peak Elev=61.58' Inflow=6.60 cfs 0.541 af
15.0" Round Culvert n=0.012 L=237.0' S=0.0054 '/' Outflow=6.60 cfs 0.541 af

Pond 38P: EX-CB-38 Peak Elev=64.77' Inflow=0.52 cfs 0.047 af
6.0" Round Culvert n=0.012 L=56.0' S=0.0291 '/' Outflow=0.52 cfs 0.047 af

Pond 39P: Claremont Manhole Peak Elev=58.85' Inflow=9.23 cfs 0.782 af
18.0" Round Culvert n=0.012 L=79.0' S=0.0030 '/' Outflow=9.23 cfs 0.782 af

Pond 41P: EX-CB-TWB-1 Peak Elev=64.41' Inflow=10.32 cfs 3.258 af
18.0" Round Culvert n=0.012 L=251.0' S=0.0113 '/' Outflow=10.32 cfs 3.258 af

Pond 47P: CB-1 Peak Elev=108.83' Inflow=2.15 cfs 0.191 af
6.0" Round Culvert n=0.010 L=236.0' S=0.0243 '/' Outflow=2.15 cfs 0.191 af

Pond 48P: EX-DMH-3 Peak Elev=60.08' Inflow=34.74 cfs 6.009 af
36.0" Round Culvert n=0.012 L=305.0' S=0.0041 '/' Outflow=34.74 cfs 6.009 af

Pond 55P: Ex-Outfall 1 Peak Elev=66.07' Inflow=0.33 cfs 0.122 af
10.0" Round Culvert n=0.012 L=124.0' S=0.0141 '/' Outflow=0.33 cfs 0.122 af

Pond 57P: EX-DMH-8 Peak Elev=58.89' Inflow=48.49 cfs 7.196 af
36.0" Round Culvert n=0.012 L=15.0' S=0.0040 '/' Outflow=48.49 cfs 7.196 af

Pond 59P: WEST POND Peak Elev=57.42' Storage=0.309 af Inflow=3.73 cfs 0.309 af
Outflow=0.00 cfs 0.000 af

Pond 66P: Infiltration Trench "32 A" Peak Elev=62.50' Storage=173 cf Inflow=0.17 cfs 0.048 af
Discarded=0.09 cfs 0.048 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.048 af

Pond 80P: SOUTH POND Peak Elev=57.28' Storage=11,802 cf Inflow=3.17 cfs 0.279 af
12.0" Round Culvert n=0.012 L=28.0' S=0.0264 '/' Outflow=0.03 cfs 0.023 af

Link AP-1: ADJACENT WETLANDS Inflow=0.05 cfs 0.031 af
Primary=0.05 cfs 0.031 af

Link AP-2: WEST POND Inflow=3.73 cfs 0.309 af
Primary=3.73 cfs 0.309 af

Link AP-3: SOUTH POND Inflow=3.17 cfs 0.279 af
Primary=3.17 cfs 0.279 af

Link AP-4: SHAWMUT AV. HEADWALL Inflow=48.49 cfs 7.196 af
Primary=48.49 cfs 7.196 af

Link AP-5: CLAREMONT HEADWALL Inflow=9.23 cfs 0.782 af
Primary=9.23 cfs 0.782 af

Total Runoff Area = 143.946 ac Runoff Volume = 8.813 af Average Runoff Depth = 0.73"
73.25% Pervious = 105.447 ac 26.75% Impervious = 38.499 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: CB-1 Runoff Area=0.751 ac 98.54% Impervious Runoff Depth=4.45"
Tc=10.0 min CN=97 Runoff=3.07 cfs 0.278 af

Subcatchment2S: CB-2 Runoff Area=0.520 ac 82.31% Impervious Runoff Depth=3.48"
Tc=10.0 min CN=88 Runoff=1.82 cfs 0.151 af

Subcatchment3S: CB-3 Runoff Area=0.892 ac 75.22% Impervious Runoff Depth=2.99"
Flow Length=357' Tc=10.0 min CN=83 Runoff=2.73 cfs 0.223 af

Subcatchment4S: CB-4 Runoff Area=1.014 ac 93.29% Impervious Runoff Depth=4.11"
Flow Length=459' Tc=10.2 min CN=94 Runoff=3.97 cfs 0.347 af

Subcatchment5S: CB-5 Runoff Area=1.180 ac 56.78% Impervious Runoff Depth=2.12"
Tc=10.0 min CN=73 Runoff=2.54 cfs 0.209 af

Subcatchment6S: CB-6 Runoff Area=0.392 ac 67.86% Impervious Runoff Depth=2.63"
Tc=10.0 min CN=79 Runoff=1.06 cfs 0.086 af

Subcatchment8S: CB-8 Runoff Area=1.278 ac 87.95% Impervious Runoff Depth=3.79"
Tc=10.0 min CN=91 Runoff=4.77 cfs 0.403 af

Subcatchment9S: CB-9 Runoff Area=1.080 ac 95.65% Impervious Runoff Depth=4.33"
Tc=10.0 min CN=96 Runoff=4.37 cfs 0.390 af

Subcatchment10S: CB-10 Runoff Area=0.182 ac 56.59% Impervious Runoff Depth=2.05"
Tc=10.0 min CN=72 Runoff=0.38 cfs 0.031 af

Subcatchment11S: CB-11 Runoff Area=0.179 ac 48.04% Impervious Runoff Depth=1.67"
Flow Length=149' Tc=10.0 min CN=67 Runoff=0.29 cfs 0.025 af

Subcatchment12S: CB-12 Runoff Area=0.812 ac 97.41% Impervious Runoff Depth=4.33"
Tc=10.0 min CN=96 Runoff=3.29 cfs 0.293 af

Subcatchment13S: CB-13 Runoff Area=0.066 ac 0.00% Impervious Runoff Depth=0.16"
Tc=10.0 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment14S: TERMINAL ROOFS Runoff Area=0.210 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=0.86 cfs 0.080 af

Subcatchment15S: CB-15 Runoff Area=0.829 ac 99.52% Impervious Runoff Depth=4.56"
Flow Length=250' Slope=0.0118 '/' Tc=10.0 min CN=98 Runoff=3.41 cfs 0.315 af

Subcatchment16S: CB-16 Runoff Area=0.459 ac 98.47% Impervious Runoff Depth=4.45"
Tc=10.0 min CN=97 Runoff=1.88 cfs 0.170 af

Subcatchment17S: CB-17 Runoff Area=0.745 ac 91.28% Impervious Runoff Depth=4.00"
Tc=10.0 min CN=93 Runoff=2.89 cfs 0.248 af

Subcatchment18S: CB-18 Runoff Area=0.044 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=0.18 cfs 0.017 af

Subcatchment19S: CB-19 Runoff Area=0.367 ac 86.65% Impervious Runoff Depth=3.68"
Tc=10.0 min CN=90 Runoff=1.34 cfs 0.113 af

Subcatchment20S: CB-20 Runoff Area=0.290 ac 65.17% Impervious Runoff Depth=2.46"
Tc=10.0 min CN=77 Runoff=0.73 cfs 0.059 af

Subcatchment21S: CB-21 Runoff Area=0.650 ac 40.62% Impervious Runoff Depth=1.38"
Tc=10.0 min CN=63 Runoff=0.84 cfs 0.075 af

Subcatchment22S: CB-22 Runoff Area=0.720 ac 85.28% Impervious Runoff Depth=3.58"
Flow Length=247' Tc=10.0 min CN=89 Runoff=2.58 cfs 0.215 af

Subcatchment23S: CB-23 Runoff Area=0.500 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.06 cfs 0.190 af

Subcatchment24S: CB-24 Runoff Area=0.605 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.49 cfs 0.230 af

Subcatchment26S: CB-25 Runoff Area=3.345 ac 97.79% Impervious Runoff Depth=4.45"
Tc=10.0 min CN=97 Runoff=13.67 cfs 1.240 af

Subcatchment27S: CB-27 Runoff Area=0.020 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=0.08 cfs 0.008 af

Subcatchment28S: CB-28 Runoff Area=1.100 ac 89.82% Impervious Runoff Depth=3.89"
Tc=10.0 min CN=92 Runoff=4.19 cfs 0.357 af

Subcatchment30S: CB-30 Runoff Area=1.990 ac 69.85% Impervious Runoff Depth=2.72"
Flow Length=268' Tc=10.0 min CN=80 Runoff=5.54 cfs 0.451 af

Subcatchment31S: CB-31 Runoff Area=1.500 ac 85.13% Impervious Runoff Depth=3.58"
Flow Length=217' Tc=10.0 min CN=89 Runoff=5.37 cfs 0.448 af

Subcatchment38S: CB-38 Runoff Area=0.178 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=0.73 cfs 0.068 af

Subcatchment39S: COLONIAL ROOF Runoff Area=0.658 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.71 cfs 0.250 af

Subcatchment40S: EX-TWA-E1 Runoff Area=1.194 ac 18.93% Impervious Runoff Depth=0.61"
Flow Length=338' Tc=21.4 min CN=50 Runoff=0.35 cfs 0.061 af

Subcatchment41S: ROOFS Runoff Area=0.619 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.55 cfs 0.235 af

Subcatchment42S: EX-DMH-3 Runoff Area=1.062 ac 63.94% Impervious Runoff Depth=2.46"
Tc=10.0 min CN=77 Runoff=2.67 cfs 0.217 af

Subcatchment44S: ROOFS Runoff Area=0.697 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.87 cfs 0.265 af

Subcatchment45S: EX-PARKING Runoff Area=0.213 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=0.88 cfs 0.081 af

Subcatchment47S: EX-RW23-E2 Runoff Area=22.469 ac 9.29% Impervious Runoff Depth=1.32"
Flow Length=1,209' Tc=18.8 min CN=62 Runoff=21.62 cfs 2.465 af

Subcatchment48S: EX-RW23-E6 Runoff Area=3.464 ac 23.73% Impervious Runoff Depth=0.77"
Flow Length=353' Tc=10.0 min CN=53 Runoff=1.90 cfs 0.222 af

Subcatchment49S: EX-RW23-E3 Runoff Area=9.450 ac 11.30% Impervious Runoff Depth=0.42"
Flow Length=1,277' Tc=70.0 min CN=46 Runoff=0.89 cfs 0.334 af

Subcatchment50S: EX-RW23-E1 Runoff Area=51.158 ac 7.68% Impervious Runoff Depth=0.94"
Flow Length=2,965' Tc=67.6 min CN=56 Runoff=16.53 cfs 4.009 af

Subcatchment51S: EX-RW32-NE-1 Runoff Area=7.120 ac 13.03% Impervious Runoff Depth=0.47"
Tc=10.0 min CN=47 Runoff=1.55 cfs 0.278 af

Subcatchment52S: EX-RW23-E4 Runoff Area=10.361 ac 36.22% Impervious Runoff Depth=1.19"
Flow Length=336' Tc=28.6 min CN=60 Runoff=7.33 cfs 1.024 af

Subcatchment53S: EX-TWA-W1 Runoff Area=4.726 ac 14.47% Impervious Runoff Depth=0.51"
Flow Length=595' Tc=17.6 min CN=48 Runoff=1.10 cfs 0.203 af

Subcatchment54S: EX-RW5-E5 Runoff Area=2.132 ac 23.64% Impervious Runoff Depth=0.77"
Flow Length=1,056' Tc=46.6 min CN=53 Runoff=0.65 cfs 0.137 af

Subcatchment74S: EX-RW32-NE-2 Runoff Area=2.900 ac 19.66% Impervious Runoff Depth=0.66"
Flow Length=390' Tc=10.0 min CN=51 Runoff=1.21 cfs 0.160 af

Subcatchment76S: EX-COLONIAL-2 Runoff Area=2.610 ac 66.25% Impervious Runoff Depth=2.54"
Flow Length=328' Tc=10.0 min CN=78 Runoff=6.79 cfs 0.553 af

Subcatchment77S: EX-COLONIAL-1 Runoff Area=0.282 ac 17.73% Impervious Runoff Depth=0.94"
Flow Length=50' Slope=0.0593 '/' Tc=10.0 min CN=56 Runoff=0.21 cfs 0.022 af

Subcatchment78S: EX-COLONIAL-3 Runoff Area=0.933 ac 64.09% Impervious Runoff Depth=2.46"
Flow Length=28' Slope=0.0897 '/' Tc=10.0 min CN=77 Runoff=2.34 cfs 0.191 af

Reach 2R: EX-CB-2 Avg. Flow Depth=0.39' Max Vel=2.90 fps Inflow=1.87 cfs 0.212 af
n=0.012 L=160.0' S=0.0033 '/' Capacity=2.70 cfs Outflow=1.86 cfs 0.212 af

Reach 3R: EX-FLARED END TWA Avg. Flow Depth=0.11' Max Vel=1.86 fps Inflow=0.35 cfs 0.061 af
n=0.012 L=103.0' S=0.0049 '/' Capacity=3.29 cfs Outflow=0.35 cfs 0.061 af

Reach 7R: TWB-1 to CB-24 Avg. Flow Depth=1.50' Max Vel=6.51 fps Inflow=34.82 cfs 8.671 af
18.0" Round Pipe n=0.012 L=258.3' S=0.0079 '/' Capacity=10.09 cfs Outflow=10.65 cfs 8.671 af

Reach 17R: Drainage Channel Avg. Flow Depth=0.27' Max Vel=1.31 fps Inflow=1.10 cfs 0.203 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=1.09 cfs 0.203 af

Reach 18R: Drainage Channel Avg. Flow Depth=0.35' Max Vel=1.51 fps Inflow=1.90 cfs 0.222 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=1.79 cfs 0.222 af

Pond 1P: EX-SMH-1 Peak Elev=119.34' Inflow=3.07 cfs 0.278 af
6.0" Round Culvert n=0.012 L=236.0' S=0.0268 '/' Outflow=3.07 cfs 0.278 af

Pond 3P: EX-CB-3 Peak Elev=104.67' Inflow=5.24 cfs 0.490 af
15.0" Round Culvert n=0.013 L=165.0' S=0.0023 '/' Outflow=5.24 cfs 0.490 af

Pond 4P: EX-CB-4 Peak Elev=103.35' Inflow=9.21 cfs 0.837 af
15.0" Round Culvert n=0.012 L=68.0' S=0.0010 '/' Outflow=9.21 cfs 0.837 af

Pond 5P: EX-CB-5 Peak Elev=101.17' Inflow=11.75 cfs 1.046 af
15.0" Round Culvert n=0.012 L=136.0' S=0.0028 '/' Outflow=11.75 cfs 1.046 af

Pond 6P: EX-CB-6 Peak Elev=95.67' Inflow=12.80 cfs 1.132 af
15.0" Round Culvert n=0.012 L=70.0' S=0.0114 '/' Outflow=12.80 cfs 1.132 af

Pond 7P: EX-CB-7 Peak Elev=91.11' Inflow=12.80 cfs 1.132 af
15.0" Round Culvert n=0.010 L=39.4' S=0.0165 '/' Outflow=12.80 cfs 1.132 af

Pond 8P: EX-CB-8 Peak Elev=83.68' Inflow=17.57 cfs 1.536 af
15.0" Round Culvert n=0.012 L=106.0' S=0.0134 '/' Outflow=17.57 cfs 1.536 af

Pond 9P: EX-CB-9 Peak Elev=72.58' Inflow=21.94 cfs 1.926 af
15.0" Round Culvert n=0.013 L=16.0' S=0.0088 '/' Outflow=21.94 cfs 1.926 af

Pond 10P: EX-CB-10 Peak Elev=104.77' Inflow=0.67 cfs 0.056 af
12.0" Round Culvert n=0.012 L=344.0' S=0.0031 '/' Outflow=0.67 cfs 0.056 af

Pond 11P: EX-CB-11 Peak Elev=104.78' Inflow=0.29 cfs 0.025 af
12.0" Round Culvert n=0.012 L=177.0' S=0.0033 '/' Outflow=0.29 cfs 0.025 af

Pond 12P: EX-CB-12 Peak Elev=76.98' Inflow=3.29 cfs 0.293 af
18.0" Round Culvert n=0.012 L=150.0' S=0.0049 '/' Outflow=3.29 cfs 0.293 af

Pond 13P: EX-CB-13 Peak Elev=76.82' Inflow=4.15 cfs 0.374 af
18.0" Round Culvert n=0.012 L=158.0' S=0.0027 '/' Outflow=4.15 cfs 0.374 af

Pond 14P: EX-DMH-1 Peak Elev=78.24' Inflow=3.41 cfs 0.315 af
12.0" Round Culvert n=0.012 L=200.0' S=0.0052 '/' Outflow=3.41 cfs 0.315 af

Pond 15P: EX-DMH-2 Peak Elev=76.54' Inflow=9.44 cfs 0.859 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0030 '/' Outflow=9.44 cfs 0.859 af

Pond 17P: EX-CB-17 Peak Elev=76.23' Inflow=12.33 cfs 1.108 af
24.0" Round Culvert n=0.012 L=155.0' S=0.0028 '/' Outflow=12.33 cfs 1.108 af

Pond 18P: EX-CB-18 Peak Elev=75.54' Inflow=12.51 cfs 1.125 af
24.0" Round Culvert n=0.012 L=153.0' S=0.0028 '/' Outflow=12.51 cfs 1.125 af

Pond 19P: EX-CB-19 Peak Elev=74.81' Inflow=53.85 cfs 12.585 af
24.0" Round Culvert n=0.012 L=70.0' S=0.0040 '/' Outflow=53.85 cfs 12.585 af

Pond 20P: EX-CB-20 Peak Elev=86.11' Inflow=0.73 cfs 0.059 af
15.0" Round Culvert n=0.012 L=95.0' S=0.0046 '/' Outflow=0.73 cfs 0.059 af

Pond 21P: EX-CB-21 Peak Elev=86.09' Inflow=1.57 cfs 0.134 af
15.0" Round Culvert n=0.012 L=197.0' S=0.0031 '/' Outflow=1.57 cfs 0.134 af

Pond 22P: EX-CB-22 Peak Elev=85.98' Inflow=4.14 cfs 0.349 af
15.0" Round Culvert n=0.012 L=97.0' S=0.0081 '/' Outflow=4.14 cfs 0.349 af

Pond 23P: EX-CB-23 Peak Elev=85.47' Inflow=6.20 cfs 0.539 af
18.0" Round Culvert n=0.012 L=189.0' S=0.0011 '/' Outflow=6.20 cfs 0.539 af

Pond 24P: EX-CB-24 Peak Elev=84.71' Inflow=18.78 cfs 9.441 af
24.0" Round Culvert n=0.012 L=97.0' S=0.0107 '/' Outflow=18.78 cfs 9.441 af

Pond 25P: Ex-Outfall 2 Peak Elev=93.86' Inflow=0.89 cfs 0.334 af
10.0" Round Culvert n=0.012 L=211.0' S=0.0013 '/' Outflow=0.89 cfs 0.334 af

Pond 26P: EX-CB-25 Peak Elev=83.41' Inflow=32.45 cfs 10.680 af
24.0" Round Culvert n=0.012 L=138.0' S=-0.0075 '/' Outflow=32.45 cfs 10.680 af

Pond 27P: EX-CB-27 Peak Elev=78.79' Inflow=32.53 cfs 10.688 af
24.0" Round Culvert n=0.012 L=67.0' S=-0.0055 '/' Outflow=32.53 cfs 10.688 af

Pond 28P: EX-CB-28 Peak Elev=975.20' Inflow=4.19 cfs 0.357 af
4.0" Round Culvert n=0.013 L=175.0' S=0.0057 '/' Outflow=4.19 cfs 0.357 af

Pond 29P: EX-CB-29 Peak Elev=75.35' Inflow=4.19 cfs 0.357 af
18.0" Round Culvert n=0.012 L=320.0' S=0.0010 '/' Outflow=4.19 cfs 0.357 af

Pond 30P: EX-CB-30 Peak Elev=70.10' Inflow=5.54 cfs 0.451 af
15.0" Round Culvert n=0.012 L=262.0' S=0.0025 '/' Outflow=5.54 cfs 0.451 af

Pond 31P: EX-CB-31 Peak Elev=68.02' Inflow=10.91 cfs 0.899 af
15.0" Round Culvert n=0.012 L=237.0' S=0.0054 '/' Outflow=10.91 cfs 0.899 af

Pond 38P: EX-CB-38 Peak Elev=75.86' Inflow=0.73 cfs 0.068 af
6.0" Round Culvert n=0.012 L=56.0' S=0.0291 '/' Outflow=0.73 cfs 0.068 af

Pond 39P: Claremont Manhole Peak Elev=60.54' Inflow=14.66 cfs 1.245 af
18.0" Round Culvert n=0.012 L=79.0' S=0.0030 '/' Outflow=14.66 cfs 1.245 af

Pond 41P: EX-CB-TWB-1 Peak Elev=93.86' Inflow=34.82 cfs 8.671 af
18.0" Round Culvert n=0.012 L=251.0' S=0.0113 '/' Outflow=34.82 cfs 8.671 af

Pond 47P: CB-1 Peak Elev=166.35' Inflow=3.07 cfs 0.278 af
6.0" Round Culvert n=0.010 L=236.0' S=0.0243 '/' Outflow=3.07 cfs 0.278 af

Pond 48P: EX-DMH-3 Peak Elev=63.83' Inflow=56.52 cfs 12.803 af
36.0" Round Culvert n=0.012 L=305.0' S=0.0041 '/' Outflow=56.52 cfs 12.803 af

Pond 55P: Ex-Outfall 1 Peak Elev=95.63' Inflow=2.50 cfs 0.425 af
10.0" Round Culvert n=0.012 L=124.0' S=0.0141 '/' Outflow=2.50 cfs 0.425 af

Pond 57P: EX-DMH-8 Peak Elev=60.58' Inflow=78.45 cfs 14.729 af
36.0" Round Culvert n=0.012 L=15.0' S=0.0040 '/' Outflow=78.45 cfs 14.729 af

Pond 59P: WEST POND Peak Elev=58.26' Storage=0.551 af Inflow=6.79 cfs 0.553 af
Outflow=0.06 cfs 0.005 af

Pond 66P: Infiltration Trench "32 A" Peak Elev=62.79' Storage=1,396 cf Inflow=1.21 cfs 0.160 af
Discarded=0.39 cfs 0.160 af Primary=0.00 cfs 0.000 af Outflow=0.39 cfs 0.160 af

Pond 80P: SOUTH POND Peak Elev=57.43' Storage=13,589 cf Inflow=5.05 cfs 0.447 af
12.0" Round Culvert n=0.012 L=28.0' S=0.0264 '/' Outflow=0.29 cfs 0.190 af

Link AP-1: ADJACENTWETLANDS Inflow=0.31 cfs 0.212 af
Primary=0.31 cfs 0.212 af

Link AP-2: WEST POND Inflow=6.79 cfs 0.553 af
Primary=6.79 cfs 0.553 af

Link AP-3: SOUTH POND Inflow=5.05 cfs 0.447 af
Primary=5.05 cfs 0.447 af

Link AP-4: SHAWMUT AV. HEADWALL Inflow=78.45 cfs 14.729 af
Primary=78.45 cfs 14.729 af

Link AP-5: CLAREMONTHEADWALL Inflow=14.66 cfs 1.245 af
Primary=14.66 cfs 1.245 af

Total Runoff Area = 143.946 ac Runoff Volume = 17.428 af Average Runoff Depth = 1.45"
73.25% Pervious = 105.447 ac 26.75% Impervious = 38.499 ac

Summary for Subcatchment 1S: CB-1

Runoff = 3.07 cfs @ 12.13 hrs, Volume= 0.278 af, Depth= 4.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.011	39	>75% Grass cover, Good, HSG A	Open Space
0.740	98	Paved parking, HSG A	Pavement
0.751	97	Weighted Average	
0.011		1.46% Pervious Area	
0.740		98.54% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 2S: CB-2

Runoff = 1.82 cfs @ 12.14 hrs, Volume= 0.151 af, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.428	98	Paved parking, HSG A	Pavement
0.092	39	>75% Grass cover, Good, HSG A	Open Space
0.520	88	Weighted Average	
0.092		17.69% Pervious Area	
0.428		82.31% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 3S: CB-3

Runoff = 2.73 cfs @ 12.14 hrs, Volume= 0.223 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.671	98	Paved parking, HSG A	Pavement
0.221	39	>75% Grass cover, Good, HSG A	Open Space
0.892	83	Weighted Average	
0.221		24.78% Pervious Area	
0.671		75.22% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	127	0.0080	1.03		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
7.1	230	0.0060	0.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.2	357	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 4S: CB-4

Runoff = 3.97 cfs @ 12.14 hrs, Volume= 0.347 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.946	98	Paved parking, HSG A	Pavement
0.068	39	>75% Grass cover, Good, HSG A	Open Space
1.014	94	Weighted Average	
0.068		6.71% Pervious Area	
0.946		93.29% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	27	0.0038	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
3.7	432	0.0090	1.93		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.2	459	Total			

Summary for Subcatchment 5S: CB-5

Runoff = 2.54 cfs @ 12.14 hrs, Volume= 0.209 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.670	98	Paved parking, HSG A	Pavement
0.510	39	>75% Grass cover, Good, HSG A	Open Space
1.180	73	Weighted Average	
0.510		43.22% Pervious Area	
0.670		56.78% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 6S: CB-6

Runoff = 1.06 cfs @ 12.14 hrs, Volume= 0.086 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.126	39	>75% Grass cover, Good, HSG A	Open Space
0.266	98	Paved parking, HSG A	Pavement
0.392	79	Weighted Average	
0.126		32.14% Pervious Area	
0.266		67.86% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 8S: CB-8

Runoff = 4.77 cfs @ 12.14 hrs, Volume= 0.403 af, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.154	39	>75% Grass cover, Good, HSG A	Open Space
1.124	98	Paved parking, HSG A	Pavement
1.278	91	Weighted Average	
0.154		12.05% Pervious Area	
1.124		87.95% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 9S: CB-9

Runoff = 4.37 cfs @ 12.13 hrs, Volume= 0.390 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.869	98	Paved parking, HSG A	Pavement
0.031	39	>75% Grass cover, Good, HSG A	Open Space
0.016	61	>75% Grass cover, Good, HSG B	Open Space
0.164	98	Paved parking, HSG B	Pavement
1.080	96	Weighted Average	
0.047		4.35% Pervious Area	
1.033		95.65% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 10S: CB-10

Runoff = 0.38 cfs @ 12.14 hrs, Volume= 0.031 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.103	98	Paved parking, HSG A	Pavement
0.079	39	>75% Grass cover, Good, HSG A	Open Space
0.182	72	Weighted Average	
0.079		43.41% Pervious Area	
0.103		56.59% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 11S: CB-11

Runoff = 0.29 cfs @ 12.15 hrs, Volume= 0.025 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.086	98	Paved parking, HSG A	Pavement
0.093	39	>75% Grass cover, Good, HSG A	Open Space
0.179	67	Weighted Average	
0.093		51.96% Pervious Area	
0.086		48.04% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	56	0.0124	1.04		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
2.0	93	0.0125	0.78		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1					**Direct Entry,**
5.0	149	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 12S: CB-12

Runoff = 3.29 cfs @ 12.13 hrs, Volume= 0.293 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.021	39	>75% Grass cover, Good, HSG A	Open Space
0.791	98	Paved parking, HSG A	Pavement
0.812	96	Weighted Average	
0.021		2.59% Pervious Area	
0.791		97.41% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 13S: CB-13

Runoff = 0.00 cfs @ 13.72 hrs, Volume= 0.001 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.066	39	>75% Grass cover, Good, HSG A	Open Space
0.066		100.00% Pervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 14S: TERMINAL ROOFS

Runoff = 0.86 cfs @ 12.13 hrs, Volume= 0.080 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description	Land Use
*	0.195	98	Roofs, HSG A; TERMINAL	Roofs
*	0.015	98	Roofs, HSG A; UTILITY ROOM	Roofs
	0.210	98	Weighted Average	
	0.210		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 15S: CB-15

Runoff = 3.41 cfs @ 12.13 hrs, Volume= 0.315 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.825	98	Paved parking, HSG A	Pavement
0.004	39	>75% Grass cover, Good, HSG A	Open Space
0.829	98	Weighted Average	
0.004		0.48% Pervious Area	
0.825		99.52% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4					**Direct Entry,**
1.5	100	0.0118	1.15		**Sheet Flow,**
					Smooth surfaces n= 0.011 P2= 3.40"
1.1	150	0.0118	2.21		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
5.0	250	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 16S: CB-16

Runoff = 1.88 cfs @ 12.13 hrs, Volume= 0.170 af, Depth= 4.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.007	39	>75% Grass cover, Good, HSG A	Open Space
0.452	98	Paved parking, HSG A	Pavement
0.459	97	Weighted Average	
0.007		1.53% Pervious Area	
0.452		98.47% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 17S: CB-17

Runoff = 2.89 cfs @ 12.13 hrs, Volume= 0.248 af, Depth= 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.065	39	>75% Grass cover, Good, HSG A	Open Space
0.680	98	Paved parking, HSG A	Pavement
0.745	93	Weighted Average	
0.065		8.72% Pervious Area	
0.680		91.28% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 18S: CB-18

Runoff = 0.18 cfs @ 12.13 hrs, Volume= 0.017 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.044	98	Paved parking, HSG A	Pavement
0.044		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 19S: CB-19

Runoff = 1.34 cfs @ 12.14 hrs, Volume= 0.113 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.318	98	Paved parking, HSG A	Pavement
0.049	39	>75% Grass cover, Good, HSG A	Open Space
0.367	90	Weighted Average	
0.049		13.35% Pervious Area	
0.318		86.65% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 20S: CB-20

Runoff = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.101	39	>75% Grass cover, Good, HSG A	Open Space
0.189	98	Paved parking, HSG A	Pavement
0.290	77	Weighted Average	
0.101		34.83% Pervious Area	
0.189		65.17% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 21S: CB-21

Runoff = 0.84 cfs @ 12.15 hrs, Volume= 0.075 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.386	39	>75% Grass cover, Good, HSG A	Open Space
0.264	98	Paved parking, HSG A	Pavement
0.650	63	Weighted Average	
0.386		59.38% Pervious Area	
0.264		40.62% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 22S: CB-22

Runoff = 2.58 cfs @ 12.14 hrs, Volume= 0.215 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.106	39	>75% Grass cover, Good, HSG A	Open Space
0.614	98	Paved parking, HSG A	Pavement
0.720	89	Weighted Average	
0.106		14.72% Pervious Area	
0.614		85.28% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5					**Direct Entry,**
0.7	41	0.0110	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
1.6	87	0.0161	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	119	0.0062	1.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	247	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 23S: CB-23

Runoff = 2.06 cfs @ 12.13 hrs, Volume= 0.190 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.500	98	Paved parking, HSG A	Pavement
0.500		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 24S: CB-24

Runoff = 2.49 cfs @ 12.13 hrs, Volume= 0.230 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.605	98	Paved parking, HSG A	Pavement
0.605		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 26S: CB-25

Runoff = 13.67 cfs @ 12.13 hrs, Volume= 1.240 af, Depth= 4.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
3.271	98	Paved parking, HSG A	Pavement
0.074	39	>75% Grass cover, Good, HSG A	Open Space
3.345	97	Weighted Average	
0.074		2.21% Pervious Area	
3.271		97.79% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 27S: CB-27

Runoff = 0.08 cfs @ 12.13 hrs, Volume= 0.008 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.020	98	Paved parking, HSG A	Pavement
0.020		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 28S: CB-28

Runoff = 4.19 cfs @ 12.14 hrs, Volume= 0.357 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.988	98	Paved parking, HSG A	Pavement
0.112	39	>75% Grass cover, Good, HSG A	Open Space
1.100	92	Weighted Average	
0.112		10.18% Pervious Area	
0.988		89.82% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 30S: CB-30

Runoff = 5.54 cfs @ 12.14 hrs, Volume= 0.451 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.390	98	Paved parking, HSG A	Pavement
0.600	39	>75% Grass cover, Good, HSG A	Open Space
1.990	80	Weighted Average	
0.600		30.15% Pervious Area	
1.390		69.85% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	30	0.0067	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
1.7	203	0.0092	1.95		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	35	0.0235	1.07		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.8	268	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 31S: CB-31

Runoff = 5.37 cfs @ 12.14 hrs, Volume= 0.448 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.277	98	Paved parking, HSG A	Pavement
0.223	39	>75% Grass cover, Good, HSG A	Open Space
1.500	89	Weighted Average	
0.223		14.87% Pervious Area	
1.277		85.13% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9					**Direct Entry,**
2.5	170	0.0089	1.14		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
0.6	47	0.0303	1.22		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.0	217	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 38S: CB-38

Runoff = 0.73 cfs @ 12.13 hrs, Volume= 0.068 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.178	98	Paved parking, HSG D	Pavement
0.178		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 39S: COLONIAL ROOF

Runoff = 2.71 cfs @ 12.13 hrs, Volume= 0.250 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.658	98	Roofs, HSG A	Roofs
0.658		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 40S: EX-TWA-E1

Runoff = 0.35 cfs @ 12.44 hrs, Volume= 0.061 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.968	39	>75% Grass cover, Good, HSG A	Open Space
0.226	98	Paved parking, HSG A	Pavement
1.194	50	Weighted Average	
0.968		81.07% Pervious Area	
0.226		18.93% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	75	0.0069	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
3.8	163	0.0023	0.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.8	100	0.0022	2.08	1.56	**Pipe Channel,** 18.0" x 6.0" Box Area= 0.8 sf Perim= 4.0' r= 0.19' n= 0.011
21.4	338	Total			

Summary for Subcatchment 41S: ROOFS

Runoff = 2.55 cfs @ 12.13 hrs, Volume= 0.235 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description	Land Use
*	0.163	98	Roofs, HSG A, Maintenance Building,	Roofs
*	0.232	98	Roofs, HSG A, Sandpiper Hangar 1	Roofs
*	0.224	98	Roofs, HSG A, Sandpiper Hangar 2	Roofs
	0.619	98	Weighted Average	
	0.619		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 42S: EX-DMH-3

Runoff = 2.67 cfs @ 12.14 hrs, Volume= 0.217 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.383	39	>75% Grass cover, Good, HSG A	Open Space
0.679	98	Paved parking, HSG A	Pavement
1.062	77	Weighted Average	
0.383		36.06% Pervious Area	
0.679		63.94% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 44S: ROOFS

Runoff = 2.87 cfs @ 12.13 hrs, Volume= 0.265 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description	Land Use
*	0.537	98	Roofs, HSG A; NOR EAST	Roofs
*	0.160	98	Roofs, HSG A; HANGAR 8	Roofs
	0.697	98	Weighted Average	
	0.697		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 45S: EX-PARKING

Runoff = 0.88 cfs @ 12.13 hrs, Volume= 0.081 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.213	98	Paved parking, HSG A	Pavement
0.213		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 47S: EX-RW23-E2

Runoff = 21.62 cfs @ 12.29 hrs, Volume= 2.465 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
2.088	98	Paved parking, HSG A	Pavement
0.049	76	Gravel roads, HSG A	Roadway
8.257	39	>75% Grass cover, Good, HSG A	Open Space
5.292	65	Brush, Good, HSG C	Brush
3.510	74	>75% Grass cover, Good, HSG C	Open Space
0.194	70	Woods, Good, HSG C	Woods
1.637	80	>75% Grass cover, Good, HSG D	Open Space
1.442	77	Woods, Good, HSG D	Woods
22.469	62	Weighted Average	
20.381		90.71% Pervious Area	
2.088		9.29% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	300	0.0050	1.01		**Sheet Flow, Over Grass** Smooth surfaces n= 0.011 P2= 3.40"
13.7	811	0.0200	0.99		**Shallow Concentrated Flow, Shallow through grass** Short Grass Pasture Kv= 7.0 fps
0.2	98	0.0100	8.85	53.11	**Channel Flow, Through ditch** Area= 6.0 sf Perim= 4.0' r= 1.50' n= 0.022 Earth, clean & straight
18.8	1,209	Total			

Summary for Subcatchment 48S: EX-RW23-E6

Runoff = 1.90 cfs @ 12.18 hrs, Volume= 0.222 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.822	98	Paved parking, HSG A	Pavement
2.642	39	>75% Grass cover, Good, HSG A	Open Space
3.464	53	Weighted Average	
2.642		76.27% Pervious Area	
0.822		23.73% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0526	0.13		**Sheet Flow, Overland thru Grass** Grass: Dense n= 0.240 P2= 3.40"
2.1	210	0.0125	1.68		**Shallow Concentrated Flow, Shallow Concentrated Flow** Grassed Waterway Kv= 15.0 fps
1.5	124	0.0010	1.38	0.75	**Pipe Channel, Pipe Flow to Existing Outfall** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.012 Concrete pipe, finished
6.1	353	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 49S: EX-RW23-E3

Runoff = 0.89 cfs @ 13.30 hrs, Volume= 0.334 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.068	98	Paved parking, HSG A	Pasture
8.382	39	>75% Grass cover, Good, HSG A	Pasture
9.450	46	Weighted Average	
8.382		88.70% Pervious Area	
1.068		11.30% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	37	0.0100	0.88		**Sheet Flow, Over Taxiway** Smooth surfaces n= 0.011 P2= 3.40"
54.7	300	0.0058	0.09		**Sheet Flow, Over Land** Grass: Dense n= 0.240 P2= 3.40"
13.7	828	0.0045	1.01		**Shallow Concentrated Flow, Shallow Concentrated Flow** Grassed Waterway Kv= 15.0 fps
0.9	112	0.0025	2.18	1.19	**Pipe Channel, Pipe to Existing Outfall** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.012 Concrete pipe, finished

70.0 1,277 Total

Summary for Subcatchment 50S: EX-RW23-E1

Runoff = 16.53 cfs @ 13.07 hrs, Volume= 4.009 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.928	98	Paved parking, HSG A	Pavement
14.445	30	Brush, Good, HSG A	Brush
9.888	39	>75% Grass cover, Good, HSG A	Open Space
2.010	76	Gravel roads, HSG A	Roadway
0.790	30	Woods, Good, HSG A	Woods
5.006	83	1/4 acre lots, 38% imp, HSG C	Residential
0.807	74	>75% Grass cover, Good, HSG C	Open Space
2.172	70	Woods, Good, HSG C	Woods
0.262	87	1/4 acre lots, 38% imp, HSG D	Residential
7.250	73	Brush, Good, HSG D	Brush
0.969	80	>75% Grass cover, Good, HSG D	Open Space
5.631	77	Woods, Good, HSG D	Woods
51.158	56	Weighted Average	
47.228		92.32% Pervious Area	
3.930		7.68% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	100	0.0200	0.08		**Sheet Flow, Through Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
37.8	1,280	0.0065	0.56		**Shallow Concentrated Flow, Through Wetlands** Short Grass Pasture Kv= 7.0 fps
9.0	1,585	0.0036	2.92	122.82	**Channel Flow, Through Wetlands** Area= 42.0 sf Perim= 20.0' r= 2.10' n= 0.050 Scattered brush, heavy weeds
67.6	2,965	Total			

Summary for Subcatchment 51S: EX-RW32-NE-1

Runoff = 1.55 cfs @ 12.34 hrs, Volume= 0.278 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.928	98	Paved parking, HSG A	Pavement
6.192	39	>75% Grass cover, Good, HSG A	Open Space
7.120	47	Weighted Average	
6.192		86.97% Pervious Area	
0.928		13.03% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 52S: EX-RW23-E4

Runoff = 7.33 cfs @ 12.46 hrs, Volume= 1.024 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
3.753	98	Paved parking, HSG A	Pavement
6.608	39	>75% Grass cover, Good, HSG A	Open Space
10.361	60	Weighted Average	
6.608		63.78% Pervious Area	
3.753		36.22% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	126	0.0100	1.13		**Sheet Flow, Over Pavement**
					Smooth surfaces n= 0.011 P2= 3.40"
26.7	210	0.0171	0.13		**Sheet Flow, Over Grass**
					Grass: Dense n= 0.240 P2= 3.40"
28.6	336	Total			

Summary for Subcatchment 53S: EX-TWA-W1

Runoff = 1.10 cfs @ 12.44 hrs, Volume= 0.203 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.684	98	Paved parking, HSG A	Pavement
4.042	39	>75% Grass cover, Good, HSG A	Open Space
4.726	48	Weighted Average	
4.042		85.53% Pervious Area	
0.684		14.47% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	123	0.0390	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.40"
3.6	261	0.0066	1.22		**Shallow Concentrated Flow, Shallow Concentrated Flow** Grassed Waterway Kv= 15.0 fps
1.5	211	0.0022	2.31	1.81	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
17.6	595	Total			

Summary for Subcatchment 54S: EX-RW5-E5

Runoff = 0.65 cfs @ 12.79 hrs, Volume= 0.137 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.504	98	Paved parking, HSG A	Pavement
1.628	39	>75% Grass cover, Good, HSG A	Open Space
2.132	53	Weighted Average	
1.628		76.36% Pervious Area	
0.504		23.64% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	77	0.0129	1.13		**Sheet Flow, Over Pavement** Smooth surfaces n= 0.011 P2= 3.40"
35.9	179	0.0059	0.08		**Sheet Flow, Over Grass** Grass: Dense n= 0.240 P2= 3.40"
9.6	800	0.0020	1.38	0.27	**Pipe Channel, Pipe to Drainage System B** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.012 Concrete pipe, finished
46.6	1,056	Total			

Summary for Subcatchment 74S: EX-RW32-NE-2

Runoff = 1.21 cfs @ 12.19 hrs, Volume= 0.160 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.570	98	Paved parking, HSG A	Pavement
2.330	39	>75% Grass cover, Good, HSG A	Open Space
2.900	51	Weighted Average	
2.330		80.34% Pervious Area	
0.570		19.66% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0144	1.04		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
7.6	350	0.0119	0.76		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	390	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 76S: EX-COLONIAL-2

Runoff = 6.79 cfs @ 12.14 hrs, Volume= 0.553 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.066	96	Gravel surface, HSG A	Roadway
0.249	98	Water Surface, HSG A	Open Water
0.507	39	>75% Grass cover, Good, HSG A	Open Space
1.480	98	Paved parking, HSG A	Pavement
0.308	30	Brush, Good, HSG A	Brush
2.610	78	Weighted Average	
0.881		33.75% Pervious Area	
1.729		66.25% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0090	0.90		**Sheet Flow, Over Pavement** Smooth surfaces n= 0.011 P2= 3.40"
0.3	38	0.0147	2.46		**Shallow Concentrated Flow, Over Pavement** Paved Kv= 20.3 fps
6.9	198	0.0047	0.48		**Shallow Concentrated Flow, Through grass** Short Grass Pasture Kv= 7.0 fps
1.1	42	0.0158	0.63		**Shallow Concentrated Flow, Through brush** Woodland Kv= 5.0 fps
9.2	328	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 77S: EX-COLONIAL-1

Runoff = 0.21 cfs @ 12.17 hrs, Volume= 0.022 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.031	96	Gravel surface, HSG A	Roadway
0.201	39	>75% Grass cover, Good, HSG A	Open Space
0.050	98	Paved parking, HSG A	Pavement
0.282	56	Weighted Average	
0.232		82.27% Pervious Area	
0.050		17.73% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0593	0.11		**Sheet Flow, Through brush** Woods: Light underbrush n= 0.400 P2= 3.40"
7.7	50	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 78S: EX-COLONIAL-3

Runoff = 2.34 cfs @ 12.14 hrs, Volume= 0.191 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.242	98	Paved parking, HSG A	Pavement
0.293	30	Brush, Good, HSG A	Brush
0.356	98	Water Surface, HSG A	Open Water
0.042	96	Gravel surface, HSG A	Roadway
0.933	77	Weighted Average	
0.335		35.91% Pervious Area	
0.598		64.09% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	28	0.0897	0.11		**Sheet Flow, Through brush to open water** Woods: Light underbrush n= 0.400 P2= 3.40"
4.1	28	Total, Increased to minimum Tc = 10.0 min			

Summary for Reach 2R: EX-CB-2

Inflow Area = 1.714 ac, 38.16% Impervious, Inflow Depth = 1.48" for 10-Year event
Inflow = 1.87 cfs @ 12.14 hrs, Volume= 0.212 af
Outflow = 1.86 cfs @ 12.15 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.90 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 3.0 min

Peak Storage= 103 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 0.50' Flow Area= 0.8 sf, Capacity= 2.70 cfs

1.66' x 0.50' deep channel, n= 0.012 Concrete pipe, finished
Length= 160.0' Slope= 0.0033 '/'
Inlet Invert= 59.68', Outlet Invert= 59.16'



Summary for Reach 3R: EX-FLARED END TWA

Inflow Area = 1.194 ac, 18.93% Impervious, Inflow Depth = 0.61" for 10-Year event
Inflow = 0.35 cfs @ 12.44 hrs, Volume= 0.061 af
Outflow = 0.35 cfs @ 12.45 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.86 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 2.1 min

Peak Storage= 19 cf @ 12.45 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 0.8 sf, Capacity= 3.29 cfs

1.66' x 0.50' deep channel, n= 0.012 Concrete pipe, finished
Length= 103.0' Slope= 0.0049 '/'
Inlet Invert= 59.74', Outlet Invert= 59.24'



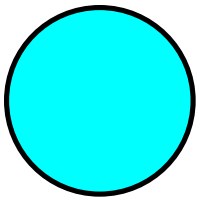
Summary for Reach 7R: TWB-1 to CB-24

Inflow Area = 113.780 ac, 12.61% Impervious, Inflow Depth = 0.91" for 10-Year event
Inflow = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af
Outflow = 10.65 cfs @ 12.08 hrs, Volume= 8.671 af, Atten= 69%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.51 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 4.54 fps, Avg. Travel Time= 0.9 min

Peak Storage= 456 cf @ 12.09 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.09 cfs

18.0" Round Pipe
n= 0.012
Length= 258.3' Slope= 0.0079 '/'
Inlet Invert= 60.34', Outlet Invert= 58.31'



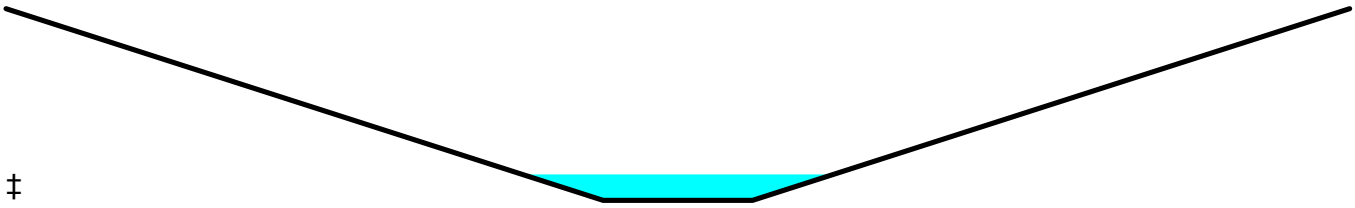
Summary for Reach 17R: Drainage Channel

Inflow Area = 4.726 ac, 14.47% Impervious, Inflow Depth = 0.51" for 10-Year event
Inflow = 1.10 cfs @ 12.44 hrs, Volume= 0.203 af
Outflow = 1.09 cfs @ 12.48 hrs, Volume= 0.203 af, Atten= 1%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.31 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 7.1 min

Peak Storage= 233 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 81.66 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 281.0' Slope= 0.0061 '/'
Inlet Invert= 68.00', Outlet Invert= 66.28'



‡

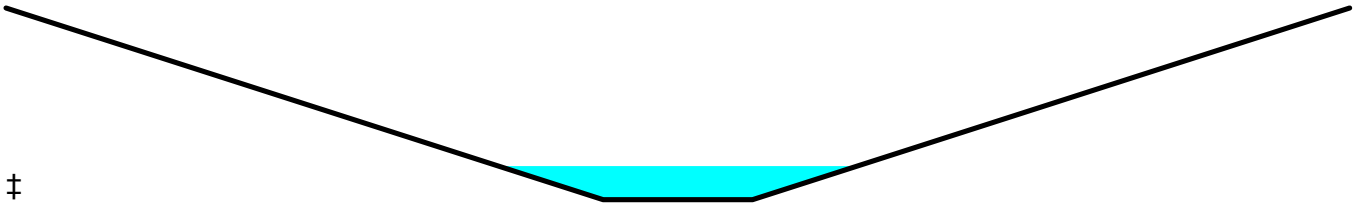
Summary for Reach 18R: Drainage Channel

Inflow Area = 3.464 ac, 23.73% Impervious, Inflow Depth = 0.77" for 10-Year event
Inflow = 1.90 cfs @ 12.18 hrs, Volume= 0.222 af
Outflow = 1.79 cfs @ 12.23 hrs, Volume= 0.222 af, Atten= 5%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.51 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 7.1 min

Peak Storage= 334 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 81.66 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 281.0' Slope= 0.0061 '/'
Inlet Invert= 68.00', Outlet Invert= 66.28'



‡

Summary for Pond 1P: EX-SMH-1

Inflow Area = 0.751 ac, 98.54% Impervious, Inflow Depth = 4.45" for 10-Year event
Inflow = 3.07 cfs @ 12.13 hrs, Volume= 0.278 af
Outflow = 3.07 cfs @ 12.13 hrs, Volume= 0.278 af, Atten= 0%, Lag= 0.0 min
Primary = 3.07 cfs @ 12.13 hrs, Volume= 0.278 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 119.34' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.49'	**6.0" Round Culvert** L= 236.0' Ke= 0.400 Inlet / Outlet Invert= 59.49' / 53.17' S= 0.0268 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Primary OutFlow Max=3.07 cfs @ 12.13 hrs HW=119.22' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 3.07 cfs @ 15.62 fps)

Summary for Pond 3P: EX-CB-3

Inflow Area = 2.967 ac, 51.03% Impervious, Inflow Depth = 1.98" for 10-Year event
Inflow = 5.24 cfs @ 12.14 hrs, Volume= 0.490 af
Outflow = 5.24 cfs @ 12.14 hrs, Volume= 0.490 af, Atten= 0%, Lag= 0.0 min
Primary = 5.24 cfs @ 12.14 hrs, Volume= 0.490 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 104.67' @ 12.18 hrs
Flood Elev= 62.01'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.11'	**15.0" Round CMP_Round 15"** L= 165.0' Ke= 0.400 Inlet / Outlet Invert= 59.11' / 58.73' S= 0.0023 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=98.62' TW=99.70' (Dynamic Tailwater)
↑—**1=CMP_Round 15"** (Controls 0.00 cfs)

Summary for Pond 4P: EX-CB-4

Inflow Area = 3.981 ac, 61.79% Impervious, Inflow Depth = 2.52" for 10-Year event
Inflow = 9.21 cfs @ 12.14 hrs, Volume= 0.837 af
Outflow = 9.21 cfs @ 12.14 hrs, Volume= 0.837 af, Atten= 0%, Lag= 0.0 min
Primary = 9.21 cfs @ 12.14 hrs, Volume= 0.837 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 103.35' @ 12.18 hrs
Flood Elev= 61.43'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.63'	**15.0" Round RCP_Round 15"** L= 68.0' Ke= 0.400 Inlet / Outlet Invert= 58.63' / 58.56' S= 0.0010 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=2.84 cfs @ 12.14 hrs HW=98.93' TW=98.70' (Dynamic Tailwater)
1=RCP_Round 15" (Outlet Controls 2.84 cfs @ 2.32 fps)

Summary for Pond 5P: EX-CB-5

Inflow Area = 5.161 ac, 60.65% Impervious, Inflow Depth = 2.43" for 10-Year event
Inflow = 11.75 cfs @ 12.14 hrs, Volume= 1.046 af
Outflow = 11.75 cfs @ 12.14 hrs, Volume= 1.046 af, Atten= 0%, Lag= 0.0 min
Primary = 11.75 cfs @ 12.14 hrs, Volume= 1.046 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 101.17' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**15.0" Round CMP_Round 15"** L= 136.0' Ke= 0.400 Inlet / Outlet Invert= 58.50' / 58.12' S= 0.0028 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=10.07 cfs @ 12.14 hrs HW=98.79' TW=94.50' (Dynamic Tailwater)
1=CMP_Round 15" (Outlet Controls 10.07 cfs @ 8.21 fps)

Summary for Pond 6P: EX-CB-6

Inflow Area = 5.553 ac, 61.16% Impervious, Inflow Depth = 2.45" for 10-Year event
Inflow = 12.80 cfs @ 12.14 hrs, Volume= 1.132 af
Outflow = 12.80 cfs @ 12.14 hrs, Volume= 1.132 af, Atten= 0%, Lag= 0.0 min
Primary = 12.80 cfs @ 12.14 hrs, Volume= 1.132 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 95.67' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	58.12'	**15.0" Round CMP_Round 15"** L= 70.0' Ke= 0.400 Inlet / Outlet Invert= 58.12' / 57.32' S= 0.0114 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=11.44 cfs @ 12.14 hrs HW=94.49' TW=90.73' (Dynamic Tailwater)
↑—**1=CMP_Round 15"** (Outlet Controls 11.44 cfs @ 9.32 fps)

Summary for Pond 7P: EX-CB-7

Inflow Area = 5.553 ac, 61.16% Impervious, Inflow Depth = 2.45" for 10-Year event
Inflow = 12.80 cfs @ 12.14 hrs, Volume= 1.132 af
Outflow = 12.80 cfs @ 12.14 hrs, Volume= 1.132 af, Atten= 0%, Lag= 0.0 min
Primary = 12.80 cfs @ 12.14 hrs, Volume= 1.132 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 91.11' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.32'	**15.0" Round Culvert** L= 39.4' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 57.32' / 56.67' S= 0.0165 '/' Cc= 0.900 n= 0.010, Flow Area= 1.23 sf

Primary OutFlow Max=12.44 cfs @ 12.14 hrs HW=90.73' TW=83.61' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 12.44 cfs @ 10.14 fps)

Summary for Pond 8P: EX-CB-8

Inflow Area = 6.831 ac, 66.17% Impervious, Inflow Depth = 2.70" for 10-Year event
Inflow = 17.57 cfs @ 12.14 hrs, Volume= 1.536 af
Outflow = 17.57 cfs @ 12.14 hrs, Volume= 1.536 af, Atten= 0%, Lag= 0.0 min
Primary = 17.57 cfs @ 12.14 hrs, Volume= 1.536 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 83.68' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	56.67'	**15.0" Round CMP_Round 15"** L= 106.0' Ke= 0.400 Inlet / Outlet Invert= 56.67' / 55.25' S= 0.0134 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=17.47 cfs @ 12.14 hrs HW=83.61' TW=72.58' (Dynamic Tailwater)
↑—**1=CMP_Round 15"** (Outlet Controls 17.47 cfs @ 14.23 fps)

Summary for Pond 9P: EX-CB-9

Inflow Area = 7.911 ac, 70.19% Impervious, Inflow Depth = 2.92" for 10-Year event
Inflow = 21.94 cfs @ 12.14 hrs, Volume= 1.926 af
Outflow = 21.94 cfs @ 12.14 hrs, Volume= 1.926 af, Atten= 0%, Lag= 0.0 min
Primary = 21.94 cfs @ 12.14 hrs, Volume= 1.926 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 72.58' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	55.25'	**15.0" Round CMP_Round 15"** L= 16.0' Ke= 0.400 Inlet / Outlet Invert= 55.25' / 55.11' S= 0.0088 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=21.92 cfs @ 12.14 hrs HW=72.56' TW=60.58' (Dynamic Tailwater)
↑—**1=CMP_Round 15"** (Inlet Controls 21.92 cfs @ 17.86 fps)

Summary for Pond 10P: EX-CB-10

Inflow Area = 0.361 ac, 52.35% Impervious, Inflow Depth = 1.86" for 10-Year event
Inflow = 0.67 cfs @ 12.15 hrs, Volume= 0.056 af
Outflow = 0.67 cfs @ 12.15 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.15 hrs, Volume= 0.056 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 104.77' @ 12.19 hrs
Flood Elev= 63.14'

Device	Routing	Invert	Outlet Devices
#1	Primary	60.89'	**12.0" Round RCP_Round 12"** L= 344.0' Ke= 0.400 Inlet / Outlet Invert= 60.89' / 59.81' S= 0.0031 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.15 hrs HW=96.10' TW=99.01' (Dynamic Tailwater)
↑—**1=RCP_Round 12"** (Controls 0.00 cfs)

Summary for Pond 11P: EX-CB-11

Inflow Area = 0.179 ac, 48.04% Impervious, Inflow Depth = 1.67" for 10-Year event
Inflow = 0.29 cfs @ 12.15 hrs, Volume= 0.025 af
Outflow = 0.29 cfs @ 12.15 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.15 hrs, Volume= 0.025 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 104.78' @ 12.20 hrs
Flood Elev= 64.77'

Device	Routing	Invert	Outlet Devices
#1	Primary	61.52'	**12.0" Round RCP_Round 12"** L= 177.0' Ke= 0.400 Inlet / Outlet Invert= 61.52' / 60.94' S= 0.0033 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.15 hrs HW=93.51' TW=96.82' (Dynamic Tailwater)
↑—**1=RCP_Round 12"** (Controls 0.00 cfs)

Summary for Pond 12P: EX-CB-12

Inflow Area = 0.812 ac, 97.41% Impervious, Inflow Depth = 4.33" for 10-Year event
Inflow = 3.29 cfs @ 12.13 hrs, Volume= 0.293 af
Outflow = 3.29 cfs @ 12.13 hrs, Volume= 0.293 af, Atten= 0%, Lag= 0.0 min
Primary = 3.29 cfs @ 12.13 hrs, Volume= 0.293 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 76.98' @ 12.19 hrs
Flood Elev= 63.19'

Device	Routing	Invert	Outlet Devices
#1	Primary	60.64'	**18.0" Round RCP_Round 18"** L= 150.0' Ke= 0.400 Inlet / Outlet Invert= 60.64' / 59.91' S= 0.0049 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.13 hrs HW=73.50' TW=74.37' (Dynamic Tailwater)
1=RCP_Round 18" (Controls 0.00 cfs)

Summary for Pond 13P: EX-CB-13

Inflow Area = 1.088 ac, 92.00% Impervious, Inflow Depth = 4.13" for 10-Year event
Inflow = 4.15 cfs @ 12.13 hrs, Volume= 0.374 af
Outflow = 4.15 cfs @ 12.13 hrs, Volume= 0.374 af, Atten= 0%, Lag= 0.0 min
Primary = 4.15 cfs @ 12.13 hrs, Volume= 0.374 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 76.82' @ 12.18 hrs
Flood Elev= 64.31'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.61'	**18.0" Round CMP_Round 18"** L= 158.0' Ke= 0.400 Inlet / Outlet Invert= 59.61' / 59.18' S= 0.0027 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.13 hrs HW=74.36' TW=74.99' (Dynamic Tailwater)
1=CMP_Round 18" (Controls 0.00 cfs)

Summary for Pond 14P: EX-DMH-1

Inflow Area = 0.829 ac, 99.52% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 3.41 cfs @ 12.13 hrs, Volume= 0.315 af
Outflow = 3.41 cfs @ 12.13 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.0 min
Primary = 3.41 cfs @ 12.13 hrs, Volume= 0.315 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 78.24' @ 12.17 hrs
Flood Elev= 64.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	60.47'	**12.0" Round RCP_Round 12"** L= 200.0' Ke= 0.400

Inlet / Outlet Invert= 60.47' / 59.43' S= 0.0052 '/' Cc= 0.900
n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.44 cfs @ 12.13 hrs HW=75.97' TW=74.96' (Dynamic Tailwater)
1=RCP_Round 12" (Outlet Controls 2.44 cfs @ 3.10 fps)

Summary for Pond 15P: EX-DMH-2

Inflow Area = 2.376 ac, 95.88% Impervious, Inflow Depth = 4.34" for 10-Year event
Inflow = 9.44 cfs @ 12.13 hrs, Volume= 0.859 af
Outflow = 9.44 cfs @ 12.13 hrs, Volume= 0.859 af, Atten= 0%, Lag= 0.0 min
Primary = 9.44 cfs @ 12.13 hrs, Volume= 0.859 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 76.54' @ 12.17 hrs
Flood Elev= 62.93'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.08'	**24.0" Round CMP_Round 24"** L= 100.0' Ke= 0.400 Inlet / Outlet Invert= 59.08' / 58.78' S= 0.0030 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=0.00 cfs @ 12.13 hrs HW=74.98' TW=75.38' (Dynamic Tailwater)
1=CMP_Round 24" (Controls 0.00 cfs)

Summary for Pond 17P: EX-CB-17

Inflow Area = 3.121 ac, 94.78% Impervious, Inflow Depth = 4.26" for 10-Year event
Inflow = 12.33 cfs @ 12.13 hrs, Volume= 1.108 af
Outflow = 12.33 cfs @ 12.13 hrs, Volume= 1.108 af, Atten= 0%, Lag= 0.0 min
Primary = 12.33 cfs @ 12.13 hrs, Volume= 1.108 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 76.23' @ 12.16 hrs
Flood Elev= 62.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.48'	**24.0" Round CMP_Round 24"** L= 155.0' Ke= 0.400 Inlet / Outlet Invert= 58.48' / 58.05' S= 0.0028 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=6.41 cfs @ 12.13 hrs HW=75.40' TW=75.21' (Dynamic Tailwater)
1=CMP_Round 24" (Outlet Controls 6.41 cfs @ 2.04 fps)

Summary for Pond 18P: EX-CB-18

Inflow Area = 3.165 ac, 94.85% Impervious, Inflow Depth = 4.26" for 10-Year event
Inflow = 12.51 cfs @ 12.13 hrs, Volume= 1.125 af
Outflow = 12.51 cfs @ 12.13 hrs, Volume= 1.125 af, Atten= 0%, Lag= 0.0 min
Primary = 12.51 cfs @ 12.13 hrs, Volume= 1.125 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 75.54' @ 12.15 hrs
Flood Elev= 62.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.48'	**24.0" Round CMP_Round 24"** L= 153.0' Ke= 0.400 Inlet / Outlet Invert= 58.48' / 58.05' S= 0.0028 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=9.99 cfs @ 12.13 hrs HW=75.21' TW=74.73' (Dynamic Tailwater)
↑—**1=CMP_Round 24"** (Outlet Controls 9.99 cfs @ 3.18 fps)

Summary for Pond 19P: EX-CB-19

Inflow Area = 125.339 ac, 19.88% Impervious, Inflow Depth = 1.20" for 10-Year event
Inflow = 53.85 cfs @ 12.13 hrs, Volume= 12.585 af
Outflow = 53.85 cfs @ 12.13 hrs, Volume= 12.585 af, Atten= 0%, Lag= 0.0 min
Primary = 53.85 cfs @ 12.13 hrs, Volume= 12.585 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 74.81' @ 12.14 hrs
Flood Elev= 62.67'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.05'	**24.0" Round CMP_Round 24"** L= 70.0' Ke= 0.400 Inlet / Outlet Invert= 58.05' / 57.77' S= 0.0040 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=53.59 cfs @ 12.13 hrs HW=74.74' TW=63.81' (Dynamic Tailwater)
↑—**1=CMP_Round 24"** (Inlet Controls 53.59 cfs @ 17.06 fps)

Summary for Pond 20P: EX-CB-20

Inflow Area = 0.290 ac, 65.17% Impervious, Inflow Depth = 2.46" for 10-Year event
Inflow = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af
Outflow = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 86.11' @ 12.20 hrs
Flood Elev= 64.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	60.72'	**15.0" Round CMP_Round 15"** L= 95.0' Ke= 0.400 Inlet / Outlet Invert= 60.72' / 60.28' S= 0.0046 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=80.11' TW=81.92' (Dynamic Tailwater)
↑—**1=CMP_Round 15"** (Controls 0.00 cfs)

Summary for Pond 21P: EX-CB-21

Inflow Area = 0.940 ac, 48.19% Impervious, Inflow Depth = 1.71" for 10-Year event
Inflow = 1.57 cfs @ 12.15 hrs, Volume= 0.134 af
Outflow = 1.57 cfs @ 12.15 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min
Primary = 1.57 cfs @ 12.15 hrs, Volume= 0.134 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 86.09' @ 12.19 hrs
Flood Elev= 63.88'

Device	Routing	Invert	Outlet Devices
#1	Primary	60.23'	**15.0" Round CMP_Round 15"** L= 197.0' Ke= 0.400 Inlet / Outlet Invert= 60.23' / 59.61' S= 0.0031 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 12.15 hrs HW=82.71' TW=83.88' (Dynamic Tailwater)
1=CMP_Round 15" (Controls 0.00 cfs)

Summary for Pond 22P: EX-CB-22

Inflow Area = 1.660 ac, 64.28% Impervious, Inflow Depth = 2.52" for 10-Year event
Inflow = 4.14 cfs @ 12.14 hrs, Volume= 0.349 af
Outflow = 4.14 cfs @ 12.14 hrs, Volume= 0.349 af, Atten= 0%, Lag= 0.0 min
Primary = 4.14 cfs @ 12.14 hrs, Volume= 0.349 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 85.98' @ 12.18 hrs
Flood Elev= 63.36'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.61'	**15.0" Round CMP_Round 15"** L= 97.0' Ke= 0.400 Inlet / Outlet Invert= 59.61' / 58.82' S= 0.0081 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=83.03' TW=83.69' (Dynamic Tailwater)
1=CMP_Round 15" (Controls 0.00 cfs)

Summary for Pond 23P: EX-CB-23

Inflow Area = 2.160 ac, 72.55% Impervious, Inflow Depth = 3.00" for 10-Year event
Inflow = 6.20 cfs @ 12.14 hrs, Volume= 0.539 af
Outflow = 6.20 cfs @ 12.14 hrs, Volume= 0.539 af, Atten= 0%, Lag= 0.0 min
Primary = 6.20 cfs @ 12.14 hrs, Volume= 0.539 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 85.47' @ 12.17 hrs
Flood Elev= 62.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.62'	**18.0" Round CMP_Round 18"** L= 189.0' Ke= 0.400

Inlet / Outlet Invert= 58.62' / 58.41' S= 0.0011 '/' Cc= 0.900
n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=83.43' TW=83.60' (Dynamic Tailwater)
1=CMP_Round 18" (Controls 0.00 cfs)

Summary for Pond 24P: EX-CB-24

Inflow Area = 116.545 ac, 14.17% Impervious, Inflow Depth = 0.97" for 10-Year event
Inflow = 18.78 cfs @ 12.14 hrs, Volume= 9.441 af
Outflow = 18.78 cfs @ 12.14 hrs, Volume= 9.441 af, Atten= 0%, Lag= 0.0 min
Primary = 18.78 cfs @ 12.14 hrs, Volume= 9.441 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 84.71' @ 12.16 hrs
Flood Elev= 62.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.31'	**24.0" Round CMP_Round 24"** L= 97.0' Ke= 0.400 Inlet / Outlet Invert= 58.31' / 57.27' S= 0.0107 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=12.44 cfs @ 12.14 hrs HW=83.47' TW=82.88' (Dynamic Tailwater)
1=CMP_Round 24" (Outlet Controls 12.44 cfs @ 3.96 fps)

Summary for Pond 25P: Ex-Outfall 2

Inflow Area = 9.450 ac, 11.30% Impervious, Inflow Depth = 0.42" for 10-Year event
Inflow = 0.89 cfs @ 13.30 hrs, Volume= 0.334 af
Outflow = 0.89 cfs @ 13.30 hrs, Volume= 0.334 af, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 13.30 hrs, Volume= 0.334 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 93.86' @ 12.38 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	69.06'	**10.0" Round Culvert** L= 211.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 69.06' / 68.78' S= 0.0013 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.55 sf

Primary OutFlow Max=1.11 cfs @ 13.30 hrs HW=77.09' TW=76.55' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.11 cfs @ 2.04 fps)

Summary for Pond 26P: EX-CB-25

Inflow Area = 119.890 ac, 16.51% Impervious, Inflow Depth = 1.07" for 10-Year event
Inflow = 32.45 cfs @ 12.14 hrs, Volume= 10.680 af
Outflow = 32.45 cfs @ 12.14 hrs, Volume= 10.680 af, Atten= 0%, Lag= 0.0 min
Primary = 32.45 cfs @ 12.14 hrs, Volume= 10.680 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 83.41' @ 12.15 hrs
Flood Elev= 61.77'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.20'	**24.0" Round CMP_Round 24"** L= 138.0' Ke= 0.400 Inlet / Outlet Invert= 57.17' / 58.20' S= -0.0075 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=30.61 cfs @ 12.14 hrs HW=82.75' TW=78.53' (Dynamic Tailwater)
1=CMP_Round 24" (Outlet Controls 30.61 cfs @ 9.74 fps)

Summary for Pond 27P: EX-CB-27

Inflow Area = 119.910 ac, 16.52% Impervious, Inflow Depth = 1.07" for 10-Year event
Inflow = 32.53 cfs @ 12.14 hrs, Volume= 10.688 af
Outflow = 32.53 cfs @ 12.14 hrs, Volume= 10.688 af, Atten= 0%, Lag= 0.0 min
Primary = 32.53 cfs @ 12.14 hrs, Volume= 10.688 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 78.79' @ 12.15 hrs
Flood Elev= 63.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.72'	**24.0" Round CMP_Round 24"** L= 67.0' Ke= 0.400 Inlet / Outlet Invert= 57.35' / 57.72' S= -0.0055 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=31.52 cfs @ 12.14 hrs HW=78.53' TW=74.75' (Dynamic Tailwater)
1=CMP_Round 24" (Inlet Controls 31.52 cfs @ 10.03 fps)

Summary for Pond 28P: EX-CB-28

Inflow Area = 1.100 ac, 89.82% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.19 cfs @ 12.14 hrs, Volume= 0.357 af
Outflow = 4.19 cfs @ 12.14 hrs, Volume= 0.357 af, Atten= 0%, Lag= 0.0 min
Primary = 4.19 cfs @ 12.14 hrs, Volume= 0.357 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 975.20' @ 12.14 hrs
Flood Elev= 61.99'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.32'	**4.0" Round Culvert** L= 175.0' Ke= 0.400 Inlet / Outlet Invert= 59.32' / 58.33' S= 0.0057 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf

Primary OutFlow Max=4.18 cfs @ 12.14 hrs HW=972.98' TW=75.07' (Dynamic Tailwater)
1=Culvert (Outlet Controls 4.18 cfs @ 47.94 fps)

Summary for Pond 29P: EX-CB-29

Inflow Area = 1.100 ac, 89.82% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 4.19 cfs @ 12.14 hrs, Volume= 0.357 af
Outflow = 4.19 cfs @ 12.13 hrs, Volume= 0.357 af, Atten= 0%, Lag= 0.0 min
Primary = 4.19 cfs @ 12.13 hrs, Volume= 0.357 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 75.35' @ 12.15 hrs
Flood Elev= 63.13'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.93'	**18.0" Round CMP_Round 18"** L= 320.0' Ke= 0.400 Inlet / Outlet Invert= 57.93' / 57.62' S= 0.0010 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.08 cfs @ 12.13 hrs HW=75.04' TW=74.74' (Dynamic Tailwater)
1=CMP_Round 18" (Outlet Controls 3.08 cfs @ 1.74 fps)

Summary for Pond 30P: EX-CB-30

Inflow Area = 1.990 ac, 69.85% Impervious, Inflow Depth = 2.72" for 10-Year event
Inflow = 5.54 cfs @ 12.14 hrs, Volume= 0.451 af
Outflow = 5.54 cfs @ 12.14 hrs, Volume= 0.451 af, Atten= 0%, Lag= 0.0 min
Primary = 5.54 cfs @ 12.14 hrs, Volume= 0.451 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 70.10' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	58.74'	**15.0" Round RCP_Round 15"** L= 262.0' Ke= 0.400 Inlet / Outlet Invert= 58.74' / 58.09' S= 0.0025 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=5.41 cfs @ 12.14 hrs HW=70.01' TW=68.02' (Dynamic Tailwater)
1=RCP_Round 15" (Outlet Controls 5.41 cfs @ 4.40 fps)

Summary for Pond 31P: EX-CB-31

Inflow Area = 3.490 ac, 76.42% Impervious, Inflow Depth = 3.09" for 10-Year event
Inflow = 10.91 cfs @ 12.14 hrs, Volume= 0.899 af
Outflow = 10.91 cfs @ 12.14 hrs, Volume= 0.899 af, Atten= 0%, Lag= 0.0 min
Primary = 10.91 cfs @ 12.14 hrs, Volume= 0.899 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 68.02' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	58.04'	**15.0" Round RCP_Round 15"** L= 237.0' Ke= 0.400 Inlet / Outlet Invert= 58.04' / 56.77' S= 0.0054 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=10.89 cfs @ 12.14 hrs HW=68.01' TW=60.54' (Dynamic Tailwater)
↑—**1=RCP_Round 15"** (Outlet Controls 10.89 cfs @ 8.87 fps)

Summary for Pond 38P: EX-CB-38

Inflow Area = 0.178 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 0.73 cfs @ 12.13 hrs, Volume= 0.068 af
Outflow = 0.73 cfs @ 12.13 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.13 hrs, Volume= 0.068 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 75.86' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.20'	**6.0" Round Culvert** L= 56.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.20' / 57.57' S= 0.0291 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Primary OutFlow Max=0.63 cfs @ 12.13 hrs HW=75.52' TW=74.72' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.63 cfs @ 3.21 fps)

Summary for Pond 39P: Claremont Manhole

Inflow Area = 4.400 ac, 81.30% Impervious, Inflow Depth = 3.39" for 10-Year event
Inflow = 14.66 cfs @ 12.14 hrs, Volume= 1.245 af
Outflow = 14.66 cfs @ 12.14 hrs, Volume= 1.245 af, Atten= 0%, Lag= 0.0 min
Primary = 14.66 cfs @ 12.14 hrs, Volume= 1.245 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 60.54' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	56.47'	**18.0" Round RCP_Round 18"** L= 79.0' Ke= 0.400 Inlet / Outlet Invert= 56.47' / 56.23' S= 0.0030 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=14.64 cfs @ 12.14 hrs HW=60.53' TW=0.00' (Dynamic Tailwater)
↑—**1=RCP_Round 18"** (Barrel Controls 14.64 cfs @ 8.29 fps)

Summary for Pond 41P: EX-CB-TWB-1

Inflow Area = 113.780 ac, 12.61% Impervious, Inflow Depth = 0.91" for 10-Year event
Inflow = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af
Outflow = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af, Atten= 0%, Lag= 0.0 min
Primary = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 93.86' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	61.14'	**18.0" Round CMP_Round 18"** L= 251.0' Ke= 0.400 Inlet / Outlet Invert= 61.14' / 58.31' S= 0.0113 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=34.82 cfs @ 12.37 hrs HW=93.86' TW=61.84' (Dynamic Tailwater)
↑**1=CMP_Round 18"** (Outlet Controls 34.82 cfs @ 19.70 fps)

Summary for Pond 47P: CB-1

Inflow Area = 0.751 ac, 98.54% Impervious, Inflow Depth = 4.45" for 10-Year event
Inflow = 3.07 cfs @ 12.13 hrs, Volume= 0.278 af
Outflow = 3.07 cfs @ 12.13 hrs, Volume= 0.278 af, Atten= 0%, Lag= 0.0 min
Primary = 3.07 cfs @ 12.13 hrs, Volume= 0.278 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 166.35' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.49'	**6.0" Round Culvert** L= 236.0' Ke= 0.400 Inlet / Outlet Invert= 59.49' / 53.76' S= 0.0243 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=3.05 cfs @ 12.13 hrs HW=165.84' TW=119.22' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 3.05 cfs @ 15.53 fps)

Summary for Pond 48P: EX-DMH-3

Inflow Area = 126.401 ac, 20.25% Impervious, Inflow Depth = 1.22" for 10-Year event
Inflow = 56.52 cfs @ 12.14 hrs, Volume= 12.803 af
Outflow = 56.52 cfs @ 12.14 hrs, Volume= 12.803 af, Atten= 0%, Lag= 0.0 min
Primary = 56.52 cfs @ 12.14 hrs, Volume= 12.803 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 63.83' @ 12.14 hrs
Flood Elev= 60.86'

Device	Routing	Invert	Outlet Devices
#1	Primary	56.42'	**36.0" Round RCP_Round 36"** L= 305.0' Ke= 0.400 Inlet / Outlet Invert= 56.42' / 55.17' S= 0.0041 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf

Primary OutFlow Max=56.27 cfs @ 12.14 hrs HW=63.81' TW=60.58' (Dynamic Tailwater)
↑**1=RCP_Round 36"** (Outlet Controls 56.27 cfs @ 7.96 fps)

Summary for Pond 55P: Ex-Outfall 1

Inflow Area = 8.190 ac, 18.39% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 2.50 cfs @ 12.37 hrs, Volume= 0.425 af
Outflow = 2.50 cfs @ 12.37 hrs, Volume= 0.425 af, Atten= 0%, Lag= 0.0 min
Primary = 2.50 cfs @ 12.37 hrs, Volume= 0.425 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 95.63' @ 12.38 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	65.80'	**10.0" Round Culvert** L= 124.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 65.80' / 64.05' S= 0.0141 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.55 sf

Primary OutFlow Max=2.49 cfs @ 12.37 hrs HW=95.62' TW=93.86' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 2.49 cfs @ 4.57 fps)

Summary for Pond 57P: EX-DMH-8

Inflow Area = 134.312 ac, 23.19% Impervious, Inflow Depth = 1.32" for 10-Year event
Inflow = 78.45 cfs @ 12.14 hrs, Volume= 14.729 af
Outflow = 78.45 cfs @ 12.14 hrs, Volume= 14.729 af, Atten= 0%, Lag= 0.0 min
Primary = 78.45 cfs @ 12.14 hrs, Volume= 14.729 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 60.58' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	55.17'	**36.0" Round RCP_Round 36"** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 55.17' / 55.11' S= 0.0040 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf

Primary OutFlow Max=78.37 cfs @ 12.14 hrs HW=60.58' TW=0.00' (Dynamic Tailwater)
↑—**1=RCP_Round 36"** (Barrel Controls 78.37 cfs @ 11.09 fps)

Summary for Pond 59P: WEST POND

Inflow Area = 2.610 ac, 66.25% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 6.79 cfs @ 12.14 hrs, Volume= 0.553 af
Outflow = 0.06 cfs @ 24.11 hrs, Volume= 0.005 af, Atten= 99%, Lag= 718.1 min
Primary = 0.06 cfs @ 24.11 hrs, Volume= 0.005 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 58.26' @ 24.11 hrs Surf.Area= 0.313 ac Storage= 0.551 af

Plug-Flow detention time= 919.9 min calculated for 0.005 af (1% of inflow)
Center-of-Mass det. time= 650.0 min (1,482.6 - 832.7)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	0.563 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
56.00	0.166	0.000	0.000
57.00	0.240	0.203	0.203
58.00	0.297	0.269	0.472
58.30	0.316	0.092	0.563

Device	Routing	Invert	Outlet Devices
#1	Primary	58.25'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.06 cfs @ 24.11 hrs HW=58.26' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.06 cfs @ 0.33 fps)

Summary for Pond 66P: Infiltration Trench "32 A"

Inflow Area = 2.900 ac, 19.66% Impervious, Inflow Depth = 0.66" for 10-Year event
Inflow = 1.21 cfs @ 12.19 hrs, Volume= 0.160 af
Outflow = 0.39 cfs @ 12.79 hrs, Volume= 0.160 af, Atten= 68%, Lag= 36.0 min
Discarded = 0.39 cfs @ 12.79 hrs, Volume= 0.160 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.79' @ 12.79 hrs Surf.Area= 6,969 sf Storage= 1,396 cf

Plug-Flow detention time= 42.8 min calculated for 0.160 af (100% of inflow)
Center-of-Mass det. time= 42.8 min (961.5 - 918.7)

Volume	Invert	Avail.Storage	Storage Description
#1	62.32'	3,139 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	61.00'	43 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 107 cf Overall x 40.0% Voids
		3,181 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.32	0	0	0
62.50	1,485	134	134
63.00	10,535	3,005	3,139

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	0	0	0
62.32	162	107	107

Device	Routing	Invert	Outlet Devices
#1	Discarded	61.00'	**2.410 in/hr Exfiltration over Surface area above 61.00'** Excluded Surface area = 0 sf
#2	Primary	63.00'	**1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.39 cfs @ 12.79 hrs HW=62.79' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=61.00' TW=61.14' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 80P: SOUTH POND

Inflow Area = 4.201 ac, 71.05% Impervious, Inflow Depth = 1.28" for 10-Year event
Inflow = 5.05 cfs @ 12.14 hrs, Volume= 0.447 af
Outflow = 0.29 cfs @ 14.71 hrs, Volume= 0.190 af, Atten= 94%, Lag= 154.1 min
Primary = 0.29 cfs @ 14.71 hrs, Volume= 0.190 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 57.43' @ 14.71 hrs Surf.Area= 11,518 sf Storage= 13,589 cf
Flood Elev= 58.80' Surf.Area= 13,689 sf Storage= 31,167 cf

Plug-Flow detention time= 502.7 min calculated for 0.190 af (42% of inflow)
Center-of-Mass det. time= 358.0 min (1,154.6 - 796.6)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	33,924 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
56.00	7,233	0	0
57.00	10,433	8,833	8,833
58.00	12,936	11,685	20,518
59.00	13,877	13,407	33,924

Device	Routing	Invert	Outlet Devices
#1	Primary	57.20'	**12.0" Round RCP_Round 12"** L= 28.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 57.20' / 56.46' S= 0.0264 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.29 cfs @ 14.71 hrs HW=57.43' TW=0.00' (Dynamic Tailwater)
1=RCP_Round 12" (Inlet Controls 0.29 cfs @ 2.06 fps)

Summary for Link AP-1: ADJACENT WETLANDS

Inflow Area = 4.483 ac, 67.70% Impervious, Inflow Depth > 0.57" for 10-Year event
Inflow = 0.31 cfs @ 14.61 hrs, Volume= 0.212 af
Primary = 0.31 cfs @ 14.61 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link AP-2: WEST POND

Inflow Area = 2.610 ac, 66.25% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 6.79 cfs @ 12.14 hrs, Volume= 0.553 af
Primary = 6.79 cfs @ 12.14 hrs, Volume= 0.553 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link AP-3: SOUTH POND

Inflow Area = 4.201 ac, 71.05% Impervious, Inflow Depth = 1.28" for 10-Year event
Inflow = 5.05 cfs @ 12.14 hrs, Volume= 0.447 af
Primary = 5.05 cfs @ 12.14 hrs, Volume= 0.447 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link AP-4: SHAWMUT AV. HEADWALL

Inflow Area = 134.312 ac, 23.19% Impervious, Inflow Depth = 1.32" for 10-Year event
Inflow = 78.45 cfs @ 12.14 hrs, Volume= 14.729 af
Primary = 78.45 cfs @ 12.14 hrs, Volume= 14.729 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link AP-5: CLAREMONT HEADWALL

Inflow Area = 4.400 ac, 81.30% Impervious, Inflow Depth = 3.39" for 10-Year event
Inflow = 14.66 cfs @ 12.14 hrs, Volume= 1.245 af
Primary = 14.66 cfs @ 12.14 hrs, Volume= 1.245 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: CB-1 Runoff Area=0.751 ac 98.54% Impervious Runoff Depth=6.64"
Tc=10.0 min CN=97 Runoff=4.51 cfs 0.416 af

Subcatchment2S: CB-2 Runoff Area=0.520 ac 82.31% Impervious Runoff Depth=5.59"
Tc=10.0 min CN=88 Runoff=2.86 cfs 0.242 af

Subcatchment3S: CB-3 Runoff Area=0.892 ac 75.22% Impervious Runoff Depth=5.03"
Flow Length=357' Tc=10.0 min CN=83 Runoff=4.51 cfs 0.374 af

Subcatchment4S: CB-4 Runoff Area=1.014 ac 93.29% Impervious Runoff Depth=6.29"
Flow Length=459' Tc=10.2 min CN=94 Runoff=5.94 cfs 0.531 af

Subcatchment5S: CB-5 Runoff Area=1.180 ac 56.78% Impervious Runoff Depth=3.94"
Tc=10.0 min CN=73 Runoff=4.76 cfs 0.387 af

Subcatchment6S: CB-6 Runoff Area=0.392 ac 67.86% Impervious Runoff Depth=4.58"
Tc=10.0 min CN=79 Runoff=1.83 cfs 0.150 af

Subcatchment8S: CB-8 Runoff Area=1.278 ac 87.95% Impervious Runoff Depth=5.94"
Tc=10.0 min CN=91 Runoff=7.30 cfs 0.632 af

Subcatchment9S: CB-9 Runoff Area=1.080 ac 95.65% Impervious Runoff Depth=6.52"
Tc=10.0 min CN=96 Runoff=6.45 cfs 0.587 af

Subcatchment10S: CB-10 Runoff Area=0.182 ac 56.59% Impervious Runoff Depth=3.83"
Tc=10.0 min CN=72 Runoff=0.71 cfs 0.058 af

Subcatchment11S: CB-11 Runoff Area=0.179 ac 48.04% Impervious Runoff Depth=3.31"
Flow Length=149' Tc=10.0 min CN=67 Runoff=0.60 cfs 0.049 af

Subcatchment12S: CB-12 Runoff Area=0.812 ac 97.41% Impervious Runoff Depth=6.52"
Tc=10.0 min CN=96 Runoff=4.85 cfs 0.441 af

Subcatchment13S: CB-13 Runoff Area=0.066 ac 0.00% Impervious Runoff Depth=0.77"
Tc=10.0 min CN=39 Runoff=0.03 cfs 0.004 af

Subcatchment14S: TERMINAL ROOFS Runoff Area=0.210 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=1.27 cfs 0.118 af

Subcatchment15S: CB-15 Runoff Area=0.829 ac 99.52% Impervious Runoff Depth=6.76"
Flow Length=250' Slope=0.0118 '/' Tc=10.0 min CN=98 Runoff=5.00 cfs 0.467 af

Subcatchment16S: CB-16 Runoff Area=0.459 ac 98.47% Impervious Runoff Depth=6.64"
Tc=10.0 min CN=97 Runoff=2.76 cfs 0.254 af

Subcatchment17S: CB-17 Runoff Area=0.745 ac 91.28% Impervious Runoff Depth=6.17"
Tc=10.0 min CN=93 Runoff=4.35 cfs 0.383 af

Subcatchment18S: CB-18 Runoff Area=0.044 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=0.27 cfs 0.025 af

Subcatchment19S: CB-19 Runoff Area=0.367 ac 86.65% Impervious Runoff Depth=5.82"
Tc=10.0 min CN=90 Runoff=2.07 cfs 0.178 af

Subcatchment20S: CB-20 Runoff Area=0.290 ac 65.17% Impervious Runoff Depth=4.37"
Tc=10.0 min CN=77 Runoff=1.29 cfs 0.106 af

Subcatchment21S: CB-21 Runoff Area=0.650 ac 40.62% Impervious Runoff Depth=2.90"
Tc=10.0 min CN=63 Runoff=1.90 cfs 0.157 af

Subcatchment22S: CB-22 Runoff Area=0.720 ac 85.28% Impervious Runoff Depth=5.71"
Flow Length=247' Tc=10.0 min CN=89 Runoff=4.01 cfs 0.342 af

Subcatchment23S: CB-23 Runoff Area=0.500 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.01 cfs 0.282 af

Subcatchment24S: CB-24 Runoff Area=0.605 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.65 cfs 0.341 af

Subcatchment26S: CB-25 Runoff Area=3.345 ac 97.79% Impervious Runoff Depth=6.64"
Tc=10.0 min CN=97 Runoff=20.08 cfs 1.851 af

Subcatchment27S: CB-27 Runoff Area=0.020 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=0.12 cfs 0.011 af

Subcatchment28S: CB-28 Runoff Area=1.100 ac 89.82% Impervious Runoff Depth=6.05"
Tc=10.0 min CN=92 Runoff=6.35 cfs 0.555 af

Subcatchment30S: CB-30 Runoff Area=1.990 ac 69.85% Impervious Runoff Depth=4.69"
Flow Length=268' Tc=10.0 min CN=80 Runoff=9.49 cfs 0.778 af

Subcatchment31S: CB-31 Runoff Area=1.500 ac 85.13% Impervious Runoff Depth=5.71"
Flow Length=217' Tc=10.0 min CN=89 Runoff=8.36 cfs 0.714 af

Subcatchment38S: CB-38 Runoff Area=0.178 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=1.07 cfs 0.100 af

Subcatchment39S: COLONIAL ROOF Runoff Area=0.658 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.97 cfs 0.371 af

Subcatchment40S: EX-TWA-E1 Runoff Area=1.194 ac 18.93% Impervious Runoff Depth=1.67"
Flow Length=338' Tc=21.4 min CN=50 Runoff=1.32 cfs 0.166 af

Subcatchment41S: ROOFS Runoff Area=0.619 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.73 cfs 0.349 af

Subcatchment42S: EX-DMH-3 Runoff Area=1.062 ac 63.94% Impervious Runoff Depth=4.37"
Tc=10.0 min CN=77 Runoff=4.74 cfs 0.386 af

Subcatchment44S: ROOFS Runoff Area=0.697 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=4.20 cfs 0.393 af

Subcatchment45S: EX-PARKING Runoff Area=0.213 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=1.28 cfs 0.120 af

Subcatchment47S: EX-RW23-E2 Runoff Area=22.469 ac 9.29% Impervious Runoff Depth=2.80"
Flow Length=1,209' Tc=18.8 min CN=62 Runoff=49.76 cfs 5.245 af

Subcatchment48S: EX-RW23-E6 Runoff Area=3.464 ac 23.73% Impervious Runoff Depth=1.94"
Flow Length=353' Tc=10.0 min CN=53 Runoff=6.23 cfs 0.559 af

Subcatchment49S: EX-RW23-E3 Runoff Area=9.450 ac 11.30% Impervious Runoff Depth=1.32"
Flow Length=1,277' Tc=70.0 min CN=46 Runoff=4.14 cfs 1.040 af

Subcatchment50S: EX-RW23-E1 Runoff Area=51.158 ac 7.68% Impervious Runoff Depth=2.22"
Flow Length=2,965' Tc=67.6 min CN=56 Runoff=45.38 cfs 9.456 af

Subcatchment51S: EX-RW32-NE-1 Runoff Area=7.120 ac 13.03% Impervious Runoff Depth=1.41"
Tc=10.0 min CN=47 Runoff=8.19 cfs 0.834 af

Subcatchment52S: EX-RW23-E4 Runoff Area=10.361 ac 36.22% Impervious Runoff Depth=2.60"
Flow Length=336' Tc=28.6 min CN=60 Runoff=17.68 cfs 2.248 af

Subcatchment53S: EX-TWA-W1 Runoff Area=4.726 ac 14.47% Impervious Runoff Depth=1.49"
Flow Length=595' Tc=17.6 min CN=48 Runoff=4.83 cfs 0.587 af

Subcatchment54S: EX-RW5-E5 Runoff Area=2.132 ac 23.64% Impervious Runoff Depth=1.94"
Flow Length=1,056' Tc=46.6 min CN=53 Runoff=2.00 cfs 0.344 af

Subcatchment74S: EX-RW32-NE-2 Runoff Area=2.900 ac 19.66% Impervious Runoff Depth=1.76"
Flow Length=390' Tc=10.0 min CN=51 Runoff=4.58 cfs 0.424 af

Subcatchment76S: EX-COLONIAL-2 Runoff Area=2.610 ac 66.25% Impervious Runoff Depth=4.47"
Flow Length=328' Tc=10.0 min CN=78 Runoff=11.91 cfs 0.973 af

Subcatchment77S: EX-COLONIAL-1 Runoff Area=0.282 ac 17.73% Impervious Runoff Depth=2.22"
Flow Length=50' Slope=0.0593 '/' Tc=10.0 min CN=56 Runoff=0.60 cfs 0.052 af

Subcatchment78S: EX-COLONIAL-3 Runoff Area=0.933 ac 64.09% Impervious Runoff Depth=4.37"
Flow Length=28' Slope=0.0897 '/' Tc=10.0 min CN=77 Runoff=4.16 cfs 0.339 af

Reach 2R: EX-CB-2 Avg. Flow Depth=0.61' Max Vel=3.48 fps Inflow=3.52 cfs 0.408 af
n=0.012 L=160.0' S=0.0033 '/' Capacity=2.70 cfs Outflow=3.51 cfs 0.408 af

Reach 3R: EX-FLARED END TWA Avg. Flow Depth=0.27' Max Vel=2.97 fps Inflow=1.32 cfs 0.166 af
n=0.012 L=103.0' S=0.0049 '/' Capacity=3.29 cfs Outflow=1.32 cfs 0.166 af

Reach 7R: TWB-1 to CB-24 Avg. Flow Depth=1.50' Max Vel=6.51 fps Inflow=96.64 cfs 20.392 af
18.0" Round Pipe n=0.012 L=258.3' S=0.0079 '/' Capacity=10.09 cfs Outflow=10.86 cfs 20.392 af

Reach 17R: Drainage Channel Avg. Flow Depth=0.57' Max Vel=1.97 fps Inflow=4.83 cfs 0.587 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=4.76 cfs 0.587 af

Reach 18R: Drainage Channel Avg. Flow Depth=0.63' Max Vel=2.10 fps Inflow=6.23 cfs 0.559 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=6.02 cfs 0.559 af

Pond 1P: EX-SMH-1 Peak Elev=195.36' Inflow=4.51 cfs 0.416 af
6.0" Round Culvert n=0.012 L=236.0' S=0.0268 '/' Outflow=4.51 cfs 0.416 af

Pond 3P: EX-CB-3 Peak Elev=186.88' Inflow=9.28 cfs 0.889 af
15.0" Round Culvert n=0.013 L=165.0' S=0.0023 '/' Outflow=9.28 cfs 0.889 af

Pond 4P: EX-CB-4 Peak Elev=182.67' Inflow=15.20 cfs 1.421 af
15.0" Round Culvert n=0.012 L=68.0' S=0.0010 '/' Outflow=15.20 cfs 1.421 af

Pond 5P: EX-CB-5 Peak Elev=176.64' Inflow=19.96 cfs 1.808 af
15.0" Round Culvert n=0.012 L=136.0' S=0.0028 '/' Outflow=19.96 cfs 1.808 af

Pond 6P: EX-CB-6 Peak Elev=160.71' Inflow=21.79 cfs 1.957 af
15.0" Round Culvert n=0.012 L=70.0' S=0.0114 '/' Outflow=21.79 cfs 1.957 af

Pond 7P: EX-CB-7 Peak Elev=147.48' Inflow=21.79 cfs 1.957 af
15.0" Round Culvert n=0.010 L=39.4' S=0.0165 '/' Outflow=21.79 cfs 1.957 af

Pond 8P: EX-CB-8 Peak Elev=125.96' Inflow=29.08 cfs 2.590 af
15.0" Round Culvert n=0.012 L=106.0' S=0.0134 '/' Outflow=29.08 cfs 2.590 af

Pond 9P: EX-CB-9 Peak Elev=95.57' Inflow=35.52 cfs 3.177 af
15.0" Round Culvert n=0.013 L=16.0' S=0.0088 '/' Outflow=35.52 cfs 3.177 af

Pond 10P: EX-CB-10 Peak Elev=187.26' Inflow=1.32 cfs 0.107 af
12.0" Round Culvert n=0.012 L=344.0' S=0.0031 '/' Outflow=1.32 cfs 0.107 af

Pond 11P: EX-CB-11 Peak Elev=187.30' Inflow=0.60 cfs 0.049 af
12.0" Round Culvert n=0.012 L=177.0' S=0.0033 '/' Outflow=0.60 cfs 0.049 af

Pond 12P: EX-CB-12 Peak Elev=97.18' Inflow=4.85 cfs 0.441 af
18.0" Round Culvert n=0.012 L=150.0' S=0.0049 '/' Outflow=4.85 cfs 0.441 af

Pond 13P: EX-CB-13 Peak Elev=96.83' Inflow=6.13 cfs 0.564 af
18.0" Round Culvert n=0.012 L=158.0' S=0.0027 '/' Outflow=6.13 cfs 0.564 af

Pond 14P: EX-DMH-1 Peak Elev=99.84' Inflow=5.00 cfs 0.467 af
12.0" Round Culvert n=0.012 L=200.0' S=0.0052 '/' Outflow=5.00 cfs 0.467 af

Pond 15P: EX-DMH-2 Peak Elev=96.22' Inflow=13.88 cfs 1.285 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0030 '/' Outflow=13.88 cfs 1.285 af

Pond 17P: EX-CB-17 Peak Elev=95.55' Inflow=18.23 cfs 1.668 af
24.0" Round Culvert n=0.012 L=155.0' S=0.0028 '/' Outflow=18.23 cfs 1.668 af

Pond 18P: EX-CB-18 Peak Elev=94.05' Inflow=18.50 cfs 1.693 af
24.0" Round Culvert n=0.012 L=153.0' S=0.0028 '/' Outflow=18.50 cfs 1.693 af

Pond 19P: EX-CB-19 Peak Elev=92.46' Inflow=75.86 cfs 26.358 af
24.0" Round Culvert n=0.012 L=70.0' S=0.0040 '/' Outflow=75.86 cfs 26.358 af

Pond 20P: EX-CB-20 Peak Elev=114.33' Inflow=1.29 cfs 0.106 af
15.0" Round Culvert n=0.012 L=95.0' S=0.0046 '/' Outflow=1.29 cfs 0.106 af

Pond 21P: EX-CB-21 Peak Elev=114.29' Inflow=3.19 cfs 0.263 af
15.0" Round Culvert n=0.012 L=197.0' S=0.0031 '/' Outflow=3.19 cfs 0.263 af

Pond 22P: EX-CB-22 Peak Elev=113.83' Inflow=7.20 cfs 0.605 af
15.0" Round Culvert n=0.012 L=97.0' S=0.0081 '/' Outflow=7.20 cfs 0.605 af

Pond 23P: EX-CB-23 Peak Elev=112.31' Inflow=10.21 cfs 0.887 af
18.0" Round Culvert n=0.012 L=189.0' S=0.0011 '/' Outflow=10.21 cfs 0.887 af

Pond 24P: EX-CB-24 Peak Elev=110.30' Inflow=23.94 cfs 21.620 af
24.0" Round Culvert n=0.012 L=97.0' S=0.0107 '/' Outflow=23.94 cfs 21.620 af

Pond 25P: Ex-Outfall 2 Peak Elev=308.67' Inflow=4.14 cfs 1.040 af
10.0" Round Culvert n=0.012 L=211.0' S=0.0013 '/' Outflow=4.14 cfs 1.040 af

Pond 26P: EX-CB-25 Peak Elev=108.20' Inflow=44.02 cfs 23.471 af
24.0" Round Culvert n=0.012 L=138.0' S=-0.0075 '/' Outflow=44.02 cfs 23.471 af

Pond 27P: EX-CB-27 Peak Elev=99.76' Inflow=44.14 cfs 23.482 af
24.0" Round Culvert n=0.012 L=67.0' S=-0.0055 '/' Outflow=44.14 cfs 23.482 af

Pond 28P: EX-CB-28 Peak Elev=2,163.52' Inflow=6.35 cfs 0.555 af
4.0" Round Culvert n=0.013 L=175.0' S=0.0057 '/' Outflow=6.35 cfs 0.555 af

Pond 29P: EX-CB-29 Peak Elev=93.71' Inflow=6.35 cfs 0.555 af
18.0" Round Culvert n=0.012 L=320.0' S=0.0010 '/' Outflow=6.35 cfs 0.555 af

Pond 30P: EX-CB-30 Peak Elev=90.95' Inflow=9.49 cfs 0.778 af
15.0" Round Culvert n=0.012 L=262.0' S=0.0025 '/' Outflow=9.49 cfs 0.778 af

Pond 31P: EX-CB-31 Peak Elev=84.88' Inflow=17.85 cfs 1.492 af
15.0" Round Culvert n=0.012 L=237.0' S=0.0054 '/' Outflow=17.85 cfs 1.492 af

Pond 38P: EX-CB-38 Peak Elev=94.71' Inflow=1.07 cfs 0.100 af
6.0" Round Culvert n=0.012 L=56.0' S=0.0291 '/' Outflow=1.07 cfs 0.100 af

Pond 39P: Claremont Manhole Peak Elev=64.85' Inflow=23.33 cfs 2.005 af
18.0" Round Culvert n=0.012 L=79.0' S=0.0030 '/' Outflow=23.33 cfs 2.005 af

Pond 41P: EX-CB-TWB-1 Peak Elev=308.50' Inflow=96.64 cfs 20.392 af
18.0" Round Culvert n=0.012 L=251.0' S=0.0113 '/' Outflow=96.64 cfs 20.392 af

Pond 47P: CB-1 Peak Elev=296.80' Inflow=4.51 cfs 0.416 af
6.0" Round Culvert n=0.010 L=236.0' S=0.0243 '/' Outflow=4.51 cfs 0.416 af

Pond 48P: EX-DMH-3 Peak Elev=70.72' Inflow=80.59 cfs 26.744 af
36.0" Round Culvert n=0.012 L=305.0' S=0.0041 '/' Outflow=80.59 cfs 26.744 af

Pond 55P: Ex-Outfall 1 Peak Elev=332.42' Inflow=9.76 cfs 1.147 af
10.0" Round Culvert n=0.012 L=124.0' S=0.0141 '/' Outflow=9.76 cfs 1.147 af

Pond 57P: EX-DMH-8 Peak Elev=64.12' Inflow=116.12 cfs 29.921 af
36.0" Round Culvert n=0.012 L=15.0' S=0.0040 '/' Outflow=116.12 cfs 29.921 af

Pond 59P: WEST POND Peak Elev=58.39' Storage=0.563 af Inflow=11.91 cfs 0.973 af
Outflow=3.54 cfs 0.426 af

Pond 66P: Infiltration Trench "32 A" Peak Elev=308.13' Storage=3,181 cf Inflow=4.58 cfs 0.424 af
Discarded=0.60 cfs 0.346 af Primary=3.74 cfs 0.078 af Outflow=4.34 cfs 0.424 af

Pond 80P: SOUTH POND Peak Elev=57.90' Storage=19,183 cf Inflow=8.13 cfs 1.136 af
12.0" Round Culvert n=0.012 L=28.0' S=0.0264 '/' Outflow=2.07 cfs 0.879 af

Link AP-1: ADJACENTWETLANDS Inflow=2.16 cfs 0.931 af
Primary=2.16 cfs 0.931 af

Link AP-2: WEST POND Inflow=11.91 cfs 0.973 af
Primary=11.91 cfs 0.973 af

Link AP-3: SOUTH POND Inflow=8.13 cfs 1.136 af
Primary=8.13 cfs 1.136 af

Link AP-4: SHAWMUT AV. HEADWALL Inflow=116.12 cfs 29.921 af
Primary=116.12 cfs 29.921 af

Link AP-5: CLAREMONTHEADWALL Inflow=23.33 cfs 2.005 af
Primary=23.33 cfs 2.005 af

Total Runoff Area = 143.946 ac Runoff Volume = 34.423 af Average Runoff Depth = 2.87"
73.25% Pervious = 105.447 ac 26.75% Impervious = 38.499 ac

APPENDIX C

PROPOSED HYDROCAD DRAINAGE CALCULATIONS

PROP-TWA-E1
A = 1.194 AC.
CN = 50
Tc = 21.4 MIN.

PROP-RW5-E5
A = 2.132 AC.
CN = 53
Tc = 46.6 MIN.

PROP-RW23-E6
A = 3.464 AC.
CN = 53
Tc = 10.0 MIN.

PROP-RW23-E4
A = 10.361 AC.
CN = 60
Tc = 28.6 MIN.

PROP-TWA-W1
A = 4.726 AC.
CN = 48
Tc = 17.6 MIN.

PROP-RW23-E3
A = 9.450 AC.
CN = 46
Tc = 70.0 MIN.

PROP-RW23-E2
A = 22.469 AC.
CN = 62
Tc = 18.8 MIN.

PROP-RW32-NE1
A = 7.12 AC.
CN = 47
Tc = 10.0 MIN.

PROP-RW23-E1
A = 51.158 AC.
CN = 56
Tc = 67.6 MIN.

PROP-RW32-NE2
A = 2.900 AC.
CN = 51
Tc = 10.0 MIN.

40S 54S 48S 52S 53S 49S 47S 51S 50S 74S

ANALYSIS POINT 1
ANALYSIS POINT 2
ANALYSIS POINT 3
ANALYSIS POINT 4
ANALYSIS POINT 5

TERMINAL APRON
SEE DETAIL IN
SHEET D2.2

32

LEGEND

- WATERSHED BOUNDARY
- WATERSHED TRAVEL PATH
- AIRPORT PROPERTY LINE
- OPEN WATER
- EXISTING WETLANDS

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. FISHUSTER
CIVIL
No. 53595
REGISTERED
PROFESSIONAL ENGINEER

ASG
AIRPORT SOLUTIONS GROUP, LLC
AIRPORT CONSULTANT • BURLINGTON, MASSACHUSETTS
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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 1, 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	FYA
DRAWN BY	FYA
CHECKED BY	SJR
DATE	January 2020
DRAWING SCALE	1" = 500'

SHEET TITLE
PROPOSED DRAINAGE PLAN

GRAPHIC SCALE
0 250 500 1000

DRAWING NO.
D2.1

OF

7/1/2020, 2:59:16 PM, P:\ASG Data\Projects\MA – New Bedford\046 Design Only – Terminal Aprons Phases 123\Design\Drainage\103-046 Drainage Design v4.dwg, (FYA)

PR-RW32-NE-1
A = 7.120 AC.
CN = 47
Tc = 10.0 MIN.

PR-RW32-NE-2
A = 2.900 AC.
CN = 51
Tc = 10.0 MIN.

PR-CB-23
A = 0.610 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-24
A = 0.614 AC.
CN = 98
Tc = 10.0 MIN.

TAXIWAY B

PR-CB-20
A = 0.290 AC.
CN = 77
Tc = 10.0 MIN.

PR-CB-21
A = 0.650 AC.
CN = 63
Tc = 10.0 MIN.

PR-CB-22
A = 0.740 AC.
CN = 90
Tc = 10.0 MIN.

PR-CB-25
A = 0.952 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-26
A = 0.574 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-27
A = 0.958 AC.
CN = 94
Tc = 10.0 MIN.

PR-CB-28
A = 0.825 AC.
CN = 89
Tc = 10.0 MIN.

TAXIWAY B

PR-CB-32C
A = 1.129 AC.
CN = 94
Tc = 10.0 MIN.

PR-CB-34
A = 1.180 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-32A
A = 0.448 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-11
A = 0.170 AC.
CN = 66
Tc = 10.0 MIN.

PR-CB-15
A = 0.720 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-16
A = 0.460 AC.
CN = 96
Tc = 10.0 MIN.

PR-CB-17
A = 0.900 AC.
CN = 94
Tc = 10.0 MIN.

EX-TERMINAL ROOF
A = 0.210 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-30
A = 0.390 AC.
CN = 95
Tc = 10.0 MIN.

PR-CB-33
A = 0.343 AC.
CN = 92
Tc = 10.0 MIN.

PR-CB-13
A = 0.110 AC.
CN = 48
Tc = 10.0 MIN.

PR-CB-19
A = 0.450 AC.
CN = 90
Tc = 10.0 MIN.

PR-CB-29
A = 0.290 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-30A
A = 0.226 AC.
CN = 82
Tc = 10.0 MIN.

PR-CB-32B
A = 0.414 AC.
CN = 64
Tc = 10.0 MIN.

PR-PARKING
A = 0.205 AC.
CN = 98
Tc = 10.0 MIN.

PR-CB-10
A = 0.265 AC.
CN = 80
Tc = 10.0 MIN.

PR-CB-12
A = 0.930 AC.
CN = 98
Tc = 10.0 MIN.

PR-WQS-4
A = 1.062 AC.
CN = 77
Tc = 10.0 MIN.

PR-ROOF
A = 0.210 AC.
CN = 98
Tc = 10.0 MIN.

PR-ROOF
A = 0.697 AC.
CN = 98
Tc = 10.0 MIN.

AP-5
ANALYSIS
POINT #5

PR-CB-3
A = 1.030 AC.
CN = 85
Tc = 10.0 MIN.

PR-CB-5
A = 1.180 AC.
CN = 73
Tc = 10.0 MIN.

PR-CB-6
A =0.392 AC.
CN = 79
Tc=10.0 MIN.

PR-CB-9
A = 1.080 AC.
CN = 96
Tc = 10.0 MIN.

PR-CB-1
A = 1.146 AC.
CN = 94
Tc = 10.0 MIN.

PR-CB-8
A = 1.278 AC.
CN = 91
Tc = 10.0 MIN.

AP-4
ANALYSIS
POINT #4

PR-CB-2
A = 0.344 AC.
CN = 82
Tc = 10.0 MIN.

PR-COLONIAL ROOF
A = 0.658 AC.
CN = 98
Tc = 10.0 MIN.

PR-COLONIAL-6
A = 0.867 AC.
CN = 75
Tc = 10.0 MIN.

PR-TWA-E1
A = 1.194 AC.
CN = 50
Tc = 21.4 MIN.

PR-WQS-1A
A = 1.309 AC.
CN = 96
Tc = 10.0 MIN.

AP-3
ANALYSIS
POINT #3

PR-WQS-2
A = 0.584 AC.
CN = 98
Tc = 10.0 MIN.

PR-WQS-1
A = 0.539 AC.
CN = 77
Tc = 10.0 MIN.

TAXIWAY A

PR-DIRECT TO DP#1
A = 0.123 AC.
CN = 43
Tc = 10.0 MIN.

AP-2
ANALYSIS
POINT #2

PR-DIRECT TO DP#2
A = 0.178 AC.
CN = 64
Tc = 10.0 MIN.

PR-COLONIAL-1
A = 0.103 AC.
CN = 42
Tc = 10.0 MIN.

PR-COLONIAL-4
A = 0.568 AC.
CN = 67
Tc = 10.0 MIN.

AP-1
ANALYSIS
POINT #1

LEGEND

- WATERSHED BOUNDARY
- WATERSHED TRAVEL PATH
- AIRPORT PROPERTY LINE
- OPEN WATER
- EXISTING WETLANDS

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. FISHUSTER
CIVIL
No. 53595
REGISTERED
PROFESSIONAL ENGINEER

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NO.	DATE	DESCRIPTION	BY

PROJECT
RECONSTRUCT TERMINAL APRONS
PHASES 1, 2, AND 3
DESIGN ONLY

OWNER
NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	FYA
DRAWN BY	FYA
CHECKED BY	SJR
DATE	January 2020
DRAWING SCALE	1" = 500'

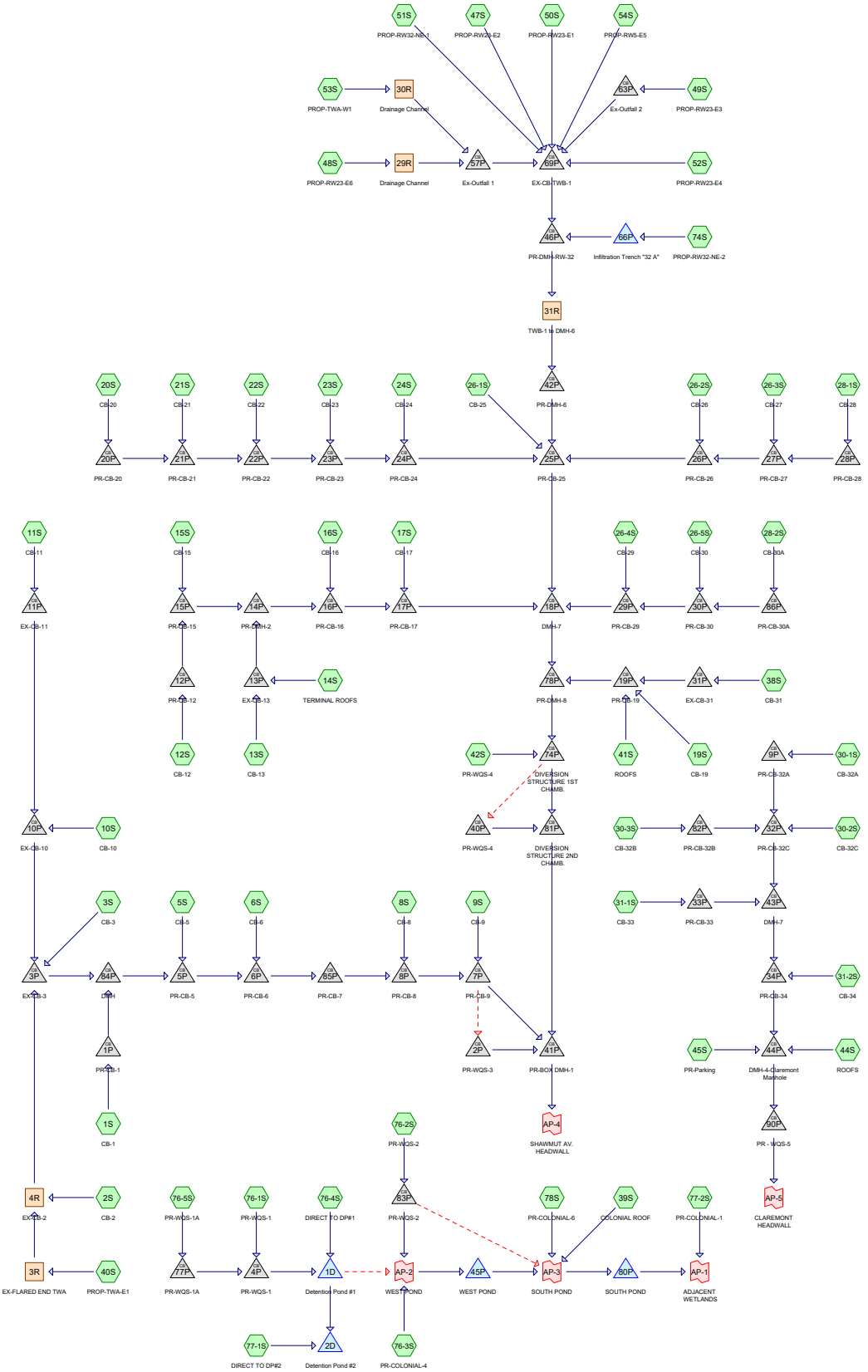
SHEET TITLE
PROPOSED DRAINAGE PLAN
(TERMINAL APRON)

GRAPHIC SCALE
0 40 80 160

DRAWING NO.
D2.2

OF

1/14/2020 3:02:28 PM P:\ASG Data\Projects\MA — New Bedford\CAD\Design Only — Terminal Aprons Phases 1,2,3\Design\Drainage\103-046 Drainage Design v4.dwg (FYA)



Subcat Reach Pond Link

Routing Diagram for 103-046 - Post Development

Prepared by {enter your company name here}, Printed 1/15/2020

HydroCAD® 10.00-24 s/n 06680 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: CB-1 Runoff Area=1.146 ac 93.80% Impervious Runoff Depth=2.74"
Flow Length=476' Slope=0.0063 '/' Tc=10.0 min CN=94 Runoff=3.08 cfs 0.262 af

Subcatchment2S: CB-2 Runoff Area=0.344 ac 73.26% Impervious Runoff Depth=1.70"
Tc=10.0 min CN=82 Runoff=0.60 cfs 0.049 af

Subcatchment3S: CB-3 Runoff Area=1.030 ac 78.45% Impervious Runoff Depth=1.93"
Flow Length=357' Tc=10.0 min CN=85 Runoff=2.04 cfs 0.166 af

Subcatchment5S: CB-5 Runoff Area=1.180 ac 56.78% Impervious Runoff Depth=1.11"
Tc=10.0 min CN=73 Runoff=1.27 cfs 0.109 af

Subcatchment6S: CB-6 Runoff Area=0.392 ac 67.86% Impervious Runoff Depth=1.49"
Tc=10.0 min CN=79 Runoff=0.59 cfs 0.049 af

Subcatchment8S: CB-8 Runoff Area=1.278 ac 87.95% Impervious Runoff Depth=2.45"
Tc=10.0 min CN=91 Runoff=3.15 cfs 0.261 af

Subcatchment9S: CB-9 Runoff Area=1.080 ac 95.65% Impervious Runoff Depth=2.95"
Tc=10.0 min CN=96 Runoff=3.03 cfs 0.265 af

Subcatchment10S: CB-10 Runoff Area=0.265 ac 70.19% Impervious Runoff Depth=1.56"
Tc=10.0 min CN=80 Runoff=0.42 cfs 0.034 af

Subcatchment11S: CB-11 Runoff Area=0.170 ac 45.88% Impervious Runoff Depth=0.75"
Flow Length=149' Tc=10.0 min CN=66 Runoff=0.11 cfs 0.011 af

Subcatchment12S: CB-12 Runoff Area=0.930 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=2.70 cfs 0.245 af

Subcatchment13S: CB-13 Runoff Area=0.110 ac 15.45% Impervious Runoff Depth=0.13"
Tc=10.0 min CN=48 Runoff=0.00 cfs 0.001 af

Subcatchment14S: TERMINAL ROOFS Runoff Area=0.210 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.61 cfs 0.055 af

Subcatchment15S: CB-15 Runoff Area=0.720 ac 100.00% Impervious Runoff Depth=3.17"
Flow Length=250' Slope=0.0118 '/' Tc=10.0 min CN=98 Runoff=2.09 cfs 0.190 af

Subcatchment16S: CB-16 Runoff Area=0.460 ac 97.17% Impervious Runoff Depth=2.95"
Tc=10.0 min CN=96 Runoff=1.29 cfs 0.113 af

Subcatchment17S: CB-17 Runoff Area=0.900 ac 93.33% Impervious Runoff Depth=2.74"
Tc=10.0 min CN=94 Runoff=2.42 cfs 0.205 af

Subcatchment19S: CB-19 Runoff Area=0.450 ac 86.67% Impervious Runoff Depth=2.35"
Tc=10.0 min CN=90 Runoff=1.07 cfs 0.088 af

Subcatchment20S: CB-20 Runoff Area=0.290 ac 65.17% Impervious Runoff Depth=1.36"
Tc=10.0 min CN=77 Runoff=0.39 cfs 0.033 af

Subcatchment21S: CB-21 Runoff Area=0.650 ac 40.46% Impervious Runoff Depth=0.61"
Tc=10.0 min CN=63 Runoff=0.31 cfs 0.033 af

Subcatchment22S: CB-22 Runoff Area=0.740 ac 85.68% Impervious Runoff Depth=2.35"
Flow Length=247' Tc=10.0 min CN=90 Runoff=1.76 cfs 0.145 af

Subcatchment23S: CB-23 Runoff Area=0.610 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.77 cfs 0.161 af

Subcatchment24S: CB-24 Runoff Area=0.614 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.78 cfs 0.162 af

Subcatchment26-1S: CB-25 Runoff Area=0.952 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=2.76 cfs 0.251 af

Subcatchment26-2S: CB-26 Runoff Area=0.574 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.66 cfs 0.151 af

Subcatchment26-3S: CB-27 Runoff Area=0.958 ac 93.32% Impervious Runoff Depth=2.74"
Tc=10.0 min CN=94 Runoff=2.57 cfs 0.219 af

Subcatchment26-4S: CB-29 Runoff Area=0.290 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.84 cfs 0.077 af

Subcatchment26-5S: CB-30 Runoff Area=0.390 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.13 cfs 0.103 af

Subcatchment28-1S: CB-28 Runoff Area=0.825 ac 84.85% Impervious Runoff Depth=2.26"
Tc=10.0 min CN=89 Runoff=1.90 cfs 0.156 af

Subcatchment28-2S: CB-30A Runoff Area=0.226 ac 72.12% Impervious Runoff Depth=1.70"
Tc=10.0 min CN=82 Runoff=0.39 cfs 0.032 af

Subcatchment30-1S: CB-32A Runoff Area=0.448 ac 100.00% Impervious Runoff Depth=3.17"
Flow Length=268' Tc=10.0 min CN=98 Runoff=1.30 cfs 0.118 af

Subcatchment30-2S: CB-32C Runoff Area=1.129 ac 92.56% Impervious Runoff Depth=2.74"
Flow Length=268' Tc=10.0 min CN=94 Runoff=3.03 cfs 0.258 af

Subcatchment30-3S: CB-32B Runoff Area=0.414 ac 42.27% Impervious Runoff Depth=0.66"
Flow Length=268' Tc=10.0 min CN=64 Runoff=0.22 cfs 0.023 af

Subcatchment31-1S: CB-33 Runoff Area=0.343 ac 89.80% Impervious Runoff Depth=2.54"
Tc=10.0 min CN=92 Runoff=0.87 cfs 0.073 af

Subcatchment31-2S: CB-34 Runoff Area=1.180 ac 100.00% Impervious Runoff Depth=3.17"
Flow Length=170' Slope=0.0089 '/' Tc=10.0 min CN=98 Runoff=3.42 cfs 0.311 af

Subcatchment38S: CB-31 Runoff Area=0.178 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.52 cfs 0.047 af

Subcatchment39S: COLONIAL ROOF Runoff Area=0.658 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.91 cfs 0.174 af

Subcatchment40S: PROP-TWA-E1 Runoff Area=1.194 ac 18.93% Impervious Runoff Depth=0.17"
Flow Length=338' Tc=21.4 min CN=50 Runoff=0.04 cfs 0.017 af

Subcatchment41S: ROOFS Runoff Area=0.619 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=1.80 cfs 0.163 af

Subcatchment42S: PR-WQS-4 Runoff Area=1.062 ac 63.94% Impervious Runoff Depth=1.36"
Tc=10.0 min CN=77 Runoff=1.44 cfs 0.120 af

Subcatchment44S: ROOFS Runoff Area=0.697 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=2.02 cfs 0.184 af

Subcatchment45S: PR-Parking Runoff Area=0.205 ac 100.00% Impervious Runoff Depth=3.17"
Tc=10.0 min CN=98 Runoff=0.59 cfs 0.054 af

Subcatchment47S: PROP-RW23-E2 Runoff Area=22.469 ac 9.29% Impervious Runoff Depth=0.57"
Flow Length=1,209' Tc=18.8 min CN=62 Runoff=7.59 cfs 1.066 af

Subcatchment48S: PROP-RW23-E6 Runoff Area=3.464 ac 23.73% Impervious Runoff Depth=0.25"
Flow Length=353' Tc=10.0 min CN=53 Runoff=0.33 cfs 0.073 af

Subcatchment49S: PROP-RW23-E3 Runoff Area=9.450 ac 11.30% Impervious Runoff Depth=0.09"
Flow Length=1,277' Tc=70.0 min CN=46 Runoff=0.11 cfs 0.068 af

Subcatchment50S: PROP-RW23-E1 Runoff Area=51.158 ac 7.68% Impervious Runoff Depth=0.35"
Flow Length=2,965' Tc=67.6 min CN=56 Runoff=4.36 cfs 1.472 af

Subcatchment51S: PROP-RW32-NE-1 Runoff Area=7.120 ac 13.03% Impervious Runoff Depth=0.11"
Tc=10.0 min CN=47 Runoff=0.10 cfs 0.063 af

Subcatchment52S: PROP-RW23-E4 Runoff Area=10.361 ac 36.22% Impervious Runoff Depth=0.49"
Flow Length=336' Tc=28.6 min CN=60 Runoff=2.38 cfs 0.422 af

Subcatchment53S: PROP-TWA-W1 Runoff Area=4.726 ac 14.47% Impervious Runoff Depth=0.13"
Flow Length=595' Tc=17.6 min CN=48 Runoff=0.08 cfs 0.050 af

Subcatchment54S: PROP-RW5-E5 Runoff Area=2.132 ac 23.64% Impervious Runoff Depth=0.25"
Flow Length=1,056' Tc=46.6 min CN=53 Runoff=0.13 cfs 0.045 af

Subcatchment74S: PROP-RW32-NE-2 Runoff Area=2.900 ac 19.66% Impervious Runoff Depth=0.20"
Flow Length=390' Tc=10.0 min CN=51 Runoff=0.17 cfs 0.048 af

Subcatchment76-1S: PR-WQS-1 Runoff Area=0.539 ac 58.26% Impervious Runoff Depth=1.36"
Flow Length=492' Tc=10.0 min CN=77 Runoff=0.73 cfs 0.061 af

Subcatchment76-2S: PR-WQS-2 Runoff Area=0.584 ac 100.00% Impervious Runoff Depth=3.17"
Flow Length=270' Tc=10.0 min CN=98 Runoff=1.69 cfs 0.154 af

Subcatchment76-3S: PR-COLONIAL-4 Runoff Area=0.568 ac 43.84% Impervious Runoff Depth=0.79"
Flow Length=42' Tc=10.0 min CN=67 Runoff=0.40 cfs 0.038 af

Subcatchment76-4S: DIRECT TO DP#1 Runoff Area=0.123 ac 0.00% Impervious Runoff Depth=0.04"
Tc=0.0 min CN=43 Runoff=0.00 cfs 0.000 af

Subcatchment76-5S: PR-WQS-1A Runoff Area=1.309 ac 96.49% Impervious Runoff Depth=2.95"
Flow Length=466' Tc=10.0 min CN=96 Runoff=3.68 cfs 0.321 af

Subcatchment77-1S: DIRECT TO DP#2 Runoff Area=0.178 ac 24.72% Impervious Runoff Depth=0.66"
Tc=0.0 min CN=64 Runoff=0.13 cfs 0.010 af

Subcatchment77-2S: PR-COLONIAL-1 Runoff Area=0.103 ac 4.85% Impervious Runoff Depth=0.03"
Flow Length=50' Slope=0.0593 '/' Tc=10.0 min CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment78S: PR-COLONIAL-6 Runoff Area=0.867 ac 61.36% Impervious Runoff Depth=1.23"
Flow Length=28' Slope=0.0897 '/' Tc=10.0 min CN=75 Runoff=1.05 cfs 0.089 af

Reach 3R: EX-FLARED END TWA Avg. Flow Depth=0.03' Max Vel=0.83 fps Inflow=0.04 cfs 0.017 af
n=0.012 L=103.0' S=0.0049 '/' Capacity=3.29 cfs Outflow=0.04 cfs 0.017 af

Reach 4R: EX-CB-2 Avg. Flow Depth=0.18' Max Vel=1.98 fps Inflow=0.60 cfs 0.066 af
n=0.012 L=160.0' S=0.0033 '/' Capacity=2.70 cfs Outflow=0.59 cfs 0.066 af

Reach 29R: Drainage Channel Avg. Flow Depth=0.14' Max Vel=0.90 fps Inflow=0.33 cfs 0.073 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=0.32 cfs 0.073 af

Reach 30R: Drainage Channel Avg. Flow Depth=0.06' Max Vel=0.58 fps Inflow=0.08 cfs 0.050 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=0.08 cfs 0.050 af

Reach 31R: TWB-1 to DMH-6 Avg. Flow Depth=1.26' Max Vel=6.51 fps Inflow=10.32 cfs 3.258 af
18.0" Round Pipe n=0.012 L=258.3' S=0.0079 '/' Capacity=10.09 cfs Outflow=10.31 cfs 3.258 af

Pond 1D: Detention Pond #1 Peak Elev=58.93' Storage=5,593 cf Inflow=4.41 cfs 0.383 af
Discarded=0.18 cfs 0.260 af Primary=2.69 cfs 0.123 af Secondary=0.00 cfs 0.000 af Outflow=2.84 cfs 0.383 af

Pond 1P: PR-CB-1 Peak Elev=58.98' Inflow=3.08 cfs 0.262 af
18.0" Round Culvert n=0.012 L=82.9' S=0.0036 '/' Outflow=3.08 cfs 0.262 af

Pond 2D: Detention Pond #2 Peak Elev=58.93' Storage=0.078 af Inflow=2.76 cfs 0.132 af
Outflow=0.11 cfs 0.132 af

Pond 2P: PR-WQS-3 Peak Elev=57.26' Inflow=5.01 cfs 0.924 af
18.0" Round Culvert n=0.012 L=11.9' S=0.0025 '/' Outflow=5.01 cfs 0.924 af

Pond 3P: EX-CB-3 Peak Elev=59.99' Inflow=3.15 cfs 0.276 af
18.0" Round Culvert n=0.012 L=173.5' S=0.0060 '/' Outflow=3.15 cfs 0.276 af

Pond 4P: PR-WQS-1 Peak Elev=58.93' Inflow=4.41 cfs 0.382 af
15.0" Round Culvert n=0.012 L=18.8' S=0.0027 '/' Outflow=4.41 cfs 0.382 af

Pond 5P: PR-CB-5 Peak Elev=58.69' Inflow=7.48 cfs 0.647 af
24.0" Round Culvert n=0.012 L=139.9' S=0.0025 '/' Outflow=7.48 cfs 0.647 af

Pond 6P: PR-CB-6 Peak Elev=58.39' Inflow=8.07 cfs 0.696 af
24.0" Round Culvert n=0.012 L=71.7' S=0.0035 '/' Outflow=8.07 cfs 0.696 af

Pond 7P: PR-CB-9 Peak Elev=57.44' Inflow=14.25 cfs 1.222 af
Primary=9.57 cfs 0.298 af Secondary=5.01 cfs 0.924 af Outflow=14.25 cfs 1.222 af

Pond 8P: PR-CB-8 Peak Elev=57.95' Inflow=11.22 cfs 0.957 af
24.0" Round Culvert n=0.012 L=93.2' S=0.0075 '/' Outflow=11.22 cfs 0.957 af

Pond 9P: PR-CB-32A Peak Elev=60.38' Inflow=1.30 cfs 0.118 af
12.0" Round Culvert n=0.012 L=41.2' S=0.0036 '/' Outflow=1.30 cfs 0.118 af

Pond 10P: EX-CB-10 Peak Elev=61.34' Inflow=0.53 cfs 0.045 af
12.0" Round Culvert n=0.012 L=344.0' S=0.0031 '/' Outflow=0.53 cfs 0.045 af

Pond 11P: EX-CB-11 Peak Elev=61.74' Inflow=0.11 cfs 0.011 af
12.0" Round Culvert n=0.012 L=177.0' S=0.0033 '/' Outflow=0.11 cfs 0.011 af

Pond 12P: PR-CB-12 Peak Elev=60.87' Inflow=2.70 cfs 0.245 af
18.0" Round Culvert n=0.012 L=201.6' S=0.0030 '/' Outflow=2.70 cfs 0.245 af

Pond 13P: EX-CB-13 Peak Elev=61.70' Inflow=0.61 cfs 0.057 af
12.0" Round Culvert n=0.012 L=95.8' S=0.0172 '/' Outflow=0.61 cfs 0.057 af

Pond 14P: PR-DMH-2 Peak Elev=60.50' Inflow=5.39 cfs 0.492 af
24.0" Round Culvert n=0.012 L=140.0' S=0.0024 '/' Outflow=5.39 cfs 0.492 af

Pond 15P: PR-CB-15 Peak Elev=60.60' Inflow=4.79 cfs 0.435 af
24.0" Round Culvert n=0.012 L=85.0' S=0.0022 '/' Outflow=4.79 cfs 0.435 af

Pond 16P: PR-CB-16 Peak Elev=60.34' Inflow=6.69 cfs 0.605 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0030 '/' Outflow=6.69 cfs 0.605 af

Pond 17P: PR-CB-17 Peak Elev=60.18' Inflow=9.10 cfs 0.810 af
24.0" Round Culvert n=0.012 L=198.4' S=0.0033 '/' Outflow=9.10 cfs 0.810 af

Pond 18P: DMH-7 Peak Elev=59.79' Inflow=29.88 cfs 5.591 af
48.0" x 36.0" Box Culvert n=0.013 L=148.3' S=0.0020 '/' Outflow=29.88 cfs 5.591 af

Pond 19P: PR-CB-19 Peak Elev=59.60' Inflow=3.38 cfs 0.299 af
18.0" Round Culvert n=0.012 L=20.8' S=0.0024 '/' Outflow=3.38 cfs 0.299 af

Pond 20P: PR-CB-20 Peak Elev=62.06' Inflow=0.39 cfs 0.033 af
12.0" Round Culvert n=0.012 L=99.6' S=0.0110 '/' Outflow=0.39 cfs 0.033 af

Pond 21P: PR-CB-21 Peak Elev=61.15' Inflow=0.70 cfs 0.066 af
12.0" Round Culvert n=0.012 L=199.9' S=0.0040 '/' Outflow=0.70 cfs 0.066 af

Pond 22P: PR-CB-22 Peak Elev=60.58' Inflow=2.45 cfs 0.211 af
18.0" Round Culvert n=0.012 L=111.9' S=0.0040 '/' Outflow=2.45 cfs 0.211 af

Pond 23P: PR-CB-23 Peak Elev=60.42' Inflow=4.22 cfs 0.372 af
24.0" Round Culvert n=0.012 L=137.0' S=0.0036 '/' Outflow=4.22 cfs 0.372 af

Pond 24P: PR-CB-24 Peak Elev=60.27' Inflow=6.00 cfs 0.534 af
18.0" Round Culvert n=0.012 L=63.0' S=0.0065 '/' Outflow=6.00 cfs 0.534 af

Pond 25P: PR-CB-25 Peak Elev=59.93' Inflow=18.81 cfs 4.569 af
48.0" x 36.0" Box Culvert n=0.013 L=152.0' S=0.0020 '/' Outflow=18.81 cfs 4.569 af

Pond 26P: PR-CB-26 Peak Elev=60.05' Inflow=6.14 cfs 0.526 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0020 '/' Outflow=6.14 cfs 0.526 af

Pond 27P: PR-CB-27 Peak Elev=60.14' Inflow=4.47 cfs 0.374 af
24.0" Round Culvert n=0.012 L=150.0' S=0.0020 '/' Outflow=4.47 cfs 0.374 af

Pond 28P: PR-CB-28 Peak Elev=60.38' Inflow=1.90 cfs 0.156 af
15.0" Round Culvert n=0.012 L=123.4' S=0.0041 '/' Outflow=1.90 cfs 0.156 af

Pond 29P: PR-CB-29 Peak Elev=59.97' Inflow=2.36 cfs 0.211 af
15.0" Round Culvert n=0.012 L=110.9' S=0.0032 '/' Outflow=2.36 cfs 0.211 af

Pond 30P: PR-CB-30 Peak Elev=60.19' Inflow=1.52 cfs 0.135 af
12.0" Round Culvert n=0.012 L=100.0' S=0.0035 '/' Outflow=1.52 cfs 0.135 af

Pond 31P: EX-CB-31 Peak Elev=59.61' Inflow=0.52 cfs 0.047 af
12.0" Round Culvert n=0.012 L=28.1' S=0.0107 '/' Outflow=0.52 cfs 0.047 af

Pond 32P: PR-CB-32C Peak Elev=60.29' Inflow=4.54 cfs 0.398 af
24.0" Round Culvert n=0.012 L=125.1' S=0.0036 '/' Outflow=4.54 cfs 0.398 af

Pond 33P: PR-CB-33 Peak Elev=60.09' Inflow=0.87 cfs 0.073 af
12.0" Round Culvert n=0.012 L=103.7' S=0.0058 '/' Outflow=0.87 cfs 0.073 af

Pond 34P: PR-CB-34 Peak Elev=59.38' Inflow=8.83 cfs 0.782 af
24.0" Round Culvert n=0.012 L=229.2' S=0.0048 '/' Outflow=8.83 cfs 0.782 af

Pond 40P: PR-WQS-4 Peak Elev=58.44' Inflow=9.42 cfs 4.751 af
18.0" Round Culvert n=0.012 L=6.5' S=0.0077 '/' Outflow=9.42 cfs 4.751 af

Pond 41P: PR-BOX DMH-1 Peak Elev=57.07' Inflow=48.85 cfs 7.231 af
60.0" x 36.0" Box Culvert n=0.012 L=7.1' S=0.0141 '/' Outflow=48.85 cfs 7.231 af

Pond 42P: PR-DMH-6 Peak Elev=60.05' Inflow=10.31 cfs 3.258 af
24.0" Round Culvert n=0.012 L=54.9' S=0.0064 '/' Outflow=10.31 cfs 3.258 af

Pond 43P: DMH-7 Peak Elev=59.97' Inflow=5.41 cfs 0.471 af
18.0" Round Culvert n=0.012 L=124.9' S=0.0048 '/' Outflow=5.41 cfs 0.471 af

Pond 44P: DMH-4-ClaremontManhole Peak Elev=58.57' Inflow=11.45 cfs 1.021 af
24.0" Round Culvert n=0.012 L=30.3' S=0.0036 '/' Outflow=11.45 cfs 1.021 af

Pond 45P: WEST POND Peak Elev=56.94' Storage=0.189 af Inflow=1.90 cfs 0.189 af
Outflow=0.00 cfs 0.000 af

Pond 46P: PR-DMH-RW-32 Peak Elev=63.18' Inflow=10.32 cfs 3.258 af
18.0" Round Culvert n=0.012 L=114.2' S=0.0079 '/' Outflow=10.32 cfs 3.258 af

Pond 57P: Ex-Outfall 1 Peak Elev=66.10' Inflow=0.33 cfs 0.122 af
10.0" Round Culvert n=0.012 L=124.0' S=0.0141 '/' Outflow=0.33 cfs 0.122 af

Pond 63P: Ex-Outfall 2 Peak Elev=69.32' Inflow=0.11 cfs 0.068 af
10.0" Round Culvert n=0.012 L=211.0' S=0.0013 '/' Outflow=0.11 cfs 0.068 af

Pond 66P: Infiltration Trench "32 A" Peak Elev=62.50' Storage=173 cf Inflow=0.17 cfs 0.048 af
Discarded=0.09 cfs 0.048 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.048 af

Pond 69P: EX-CB-TWB-1 Peak Elev=65.10' Inflow=10.32 cfs 3.258 af
18.0" Round Culvert n=0.012 L=143.1' S=0.0079 '/' Outflow=10.32 cfs 3.258 af

Pond 74P: DIVERSION STRUCTURE 1ST CHAMB. Peak Elev=59.07' Inflow=34.66 cfs 6.010 af
Primary=26.20 cfs 1.259 af Secondary=9.42 cfs 4.751 af Outflow=34.66 cfs 6.010 af

Pond 77P: PR-WQS-1A Peak Elev=60.63' Inflow=3.68 cfs 0.321 af
15.0" Round Culvert n=0.012 L=40.7' S=0.0020 '/' Outflow=3.68 cfs 0.321 af

Pond 78P: PR-DMH-8 Peak Elev=59.50' Inflow=33.22 cfs 5.889 af
48.0" x 36.0" Box Culvert n=0.013 L=216.3' S=0.0025 '/' Outflow=33.22 cfs 5.889 af

Pond 80P: SOUTH POND Peak Elev=57.25' Storage=11,498 cf Inflow=3.13 cfs 0.266 af
12.0" Round Culvert n=0.012 L=28.0' S=0.0264 '/' Outflow=0.01 cfs 0.010 af

Pond 81P: DIVERSION STRUCTURE 2ND CHAMB. Peak Elev=57.81' Inflow=34.66 cfs 6.010 af
60.0" x 36.0" Box Culvert n=0.012 L=288.4' S=0.0026 '/' Outflow=34.66 cfs 6.010 af

Pond 82P: PR-CB-32B Peak Elev=60.29' Inflow=0.22 cfs 0.023 af
15.0" Round Culvert n=0.012 L=69.9' S=0.0050 '/' Outflow=0.22 cfs 0.023 af

Pond 83P: PR-WQS-2 Peak Elev=58.15' Inflow=1.69 cfs 0.154 af
Primary=1.52 cfs 0.151 af Secondary=0.18 cfs 0.003 af Outflow=1.69 cfs 0.154 af

Pond 84P: DMH Peak Elev=58.87' Inflow=6.22 cfs 0.538 af
24.0" Round Culvert n=0.012 L=68.3' S=0.0037 '/' Outflow=6.22 cfs 0.538 af

Pond 85P: PR-CB-7 Peak Elev=58.15' Inflow=8.07 cfs 0.696 af
24.0" Round Culvert n=0.012 L=39.4' S=0.0038 '/' Outflow=8.07 cfs 0.696 af

Pond 86P: PR-CB-30A Peak Elev=60.29' Inflow=0.39 cfs 0.032 af
12.0" Round Culvert n=0.012 L=200.0' S=0.0025 '/' Outflow=0.39 cfs 0.032 af

Pond 90P: PR - WQS-5 Peak Elev=58.16' Inflow=11.45 cfs 1.021 af
24.0" Round Culvert n=0.012 L=38.7' S=0.0034 '/' Outflow=11.45 cfs 1.021 af

Link AP-1: ADJACENTWETLANDS Inflow=0.01 cfs 0.010 af
Primary=0.01 cfs 0.010 af

Link AP-2: WEST POND Inflow=1.90 cfs 0.189 af
Primary=1.90 cfs 0.189 af

Link AP-3: SOUTH POND Inflow=3.13 cfs 0.266 af
Primary=3.13 cfs 0.266 af

Link AP-4: SHAWMUT AV. HEADWALL Inflow=48.85 cfs 7.231 af
Primary=48.85 cfs 7.231 af

Link AP-5: CLAREMONTHEADWALL Inflow=11.45 cfs 1.021 af
Primary=11.45 cfs 1.021 af

Total Runoff Area = 143.962 ac Runoff Volume = 9.147 af Average Runoff Depth = 0.76"
72.86% Pervious = 104.887 ac 27.14% Impervious = 39.075 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: CB-1 Runoff Area=1.146 ac 93.80% Impervious Runoff Depth=4.11"
Flow Length=476' Slope=0.0063 '/' Tc=10.0 min CN=94 Runoff=4.51 cfs 0.393 af

Subcatchment2S: CB-2 Runoff Area=0.344 ac 73.26% Impervious Runoff Depth=2.90"
Tc=10.0 min CN=82 Runoff=1.02 cfs 0.083 af

Subcatchment3S: CB-3 Runoff Area=1.030 ac 78.45% Impervious Runoff Depth=3.18"
Flow Length=357' Tc=10.0 min CN=85 Runoff=3.34 cfs 0.273 af

Subcatchment5S: CB-5 Runoff Area=1.180 ac 56.78% Impervious Runoff Depth=2.12"
Tc=10.0 min CN=73 Runoff=2.54 cfs 0.209 af

Subcatchment6S: CB-6 Runoff Area=0.392 ac 67.86% Impervious Runoff Depth=2.63"
Tc=10.0 min CN=79 Runoff=1.06 cfs 0.086 af

Subcatchment8S: CB-8 Runoff Area=1.278 ac 87.95% Impervious Runoff Depth=3.79"
Tc=10.0 min CN=91 Runoff=4.77 cfs 0.403 af

Subcatchment9S: CB-9 Runoff Area=1.080 ac 95.65% Impervious Runoff Depth=4.33"
Tc=10.0 min CN=96 Runoff=4.37 cfs 0.390 af

Subcatchment10S: CB-10 Runoff Area=0.265 ac 70.19% Impervious Runoff Depth=2.72"
Tc=10.0 min CN=80 Runoff=0.74 cfs 0.060 af

Subcatchment11S: CB-11 Runoff Area=0.170 ac 45.88% Impervious Runoff Depth=1.59"
Flow Length=149' Tc=10.0 min CN=66 Runoff=0.26 cfs 0.023 af

Subcatchment12S: CB-12 Runoff Area=0.930 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=3.83 cfs 0.354 af

Subcatchment13S: CB-13 Runoff Area=0.110 ac 15.45% Impervious Runoff Depth=0.51"
Tc=10.0 min CN=48 Runoff=0.03 cfs 0.005 af

Subcatchment14S: TERMINAL ROOFS Runoff Area=0.210 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=0.86 cfs 0.080 af

Subcatchment15S: CB-15 Runoff Area=0.720 ac 100.00% Impervious Runoff Depth=4.56"
Flow Length=250' Slope=0.0118 '/' Tc=10.0 min CN=98 Runoff=2.97 cfs 0.274 af

Subcatchment16S: CB-16 Runoff Area=0.460 ac 97.17% Impervious Runoff Depth=4.33"
Tc=10.0 min CN=96 Runoff=1.86 cfs 0.166 af

Subcatchment17S: CB-17 Runoff Area=0.900 ac 93.33% Impervious Runoff Depth=4.11"
Tc=10.0 min CN=94 Runoff=3.55 cfs 0.308 af

Subcatchment19S: CB-19 Runoff Area=0.450 ac 86.67% Impervious Runoff Depth=3.68"
Tc=10.0 min CN=90 Runoff=1.65 cfs 0.138 af

Subcatchment20S: CB-20 Runoff Area=0.290 ac 65.17% Impervious Runoff Depth=2.46"
Tc=10.0 min CN=77 Runoff=0.73 cfs 0.059 af

Subcatchment21S: CB-21 Runoff Area=0.650 ac 40.46% Impervious Runoff Depth=1.38"
Tc=10.0 min CN=63 Runoff=0.84 cfs 0.075 af

Subcatchment22S: CB-22 Runoff Area=0.740 ac 85.68% Impervious Runoff Depth=3.68"
Flow Length=247' Tc=10.0 min CN=90 Runoff=2.71 cfs 0.227 af

Subcatchment23S: CB-23 Runoff Area=0.610 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.51 cfs 0.232 af

Subcatchment24S: CB-24 Runoff Area=0.614 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.53 cfs 0.233 af

Subcatchment26-1S: CB-25 Runoff Area=0.952 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=3.92 cfs 0.362 af

Subcatchment26-2S: CB-26 Runoff Area=0.574 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.36 cfs 0.218 af

Subcatchment26-3S: CB-27 Runoff Area=0.958 ac 93.32% Impervious Runoff Depth=4.11"
Tc=10.0 min CN=94 Runoff=3.77 cfs 0.328 af

Subcatchment26-4S: CB-29 Runoff Area=0.290 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=1.19 cfs 0.110 af

Subcatchment26-5S: CB-30 Runoff Area=0.390 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=1.61 cfs 0.148 af

Subcatchment28-1S: CB-28 Runoff Area=0.825 ac 84.85% Impervious Runoff Depth=3.58"
Tc=10.0 min CN=89 Runoff=2.95 cfs 0.246 af

Subcatchment28-2S: CB-30A Runoff Area=0.226 ac 72.12% Impervious Runoff Depth=2.90"
Tc=10.0 min CN=82 Runoff=0.67 cfs 0.055 af

Subcatchment30-1S: CB-32A Runoff Area=0.448 ac 100.00% Impervious Runoff Depth=4.56"
Flow Length=268' Tc=10.0 min CN=98 Runoff=1.85 cfs 0.170 af

Subcatchment30-2S: CB-32C Runoff Area=1.129 ac 92.56% Impervious Runoff Depth=4.11"
Flow Length=268' Tc=10.0 min CN=94 Runoff=4.45 cfs 0.387 af

Subcatchment30-3S: CB-32B Runoff Area=0.414 ac 42.27% Impervious Runoff Depth=1.45"
Flow Length=268' Tc=10.0 min CN=64 Runoff=0.57 cfs 0.050 af

Subcatchment31-1S: CB-33 Runoff Area=0.343 ac 89.80% Impervious Runoff Depth=3.89"
Tc=10.0 min CN=92 Runoff=1.31 cfs 0.111 af

Subcatchment31-2S: CB-34 Runoff Area=1.180 ac 100.00% Impervious Runoff Depth=4.56"
Flow Length=170' Slope=0.0089 '/' Tc=10.0 min CN=98 Runoff=4.86 cfs 0.449 af

Subcatchment38S: CB-31 Runoff Area=0.178 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=0.73 cfs 0.068 af

Subcatchment39S: COLONIAL ROOF Runoff Area=0.658 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.71 cfs 0.250 af

Subcatchment40S: PROP-TWA-E1 Runoff Area=1.194 ac 18.93% Impervious Runoff Depth=0.61"
Flow Length=338' Tc=21.4 min CN=50 Runoff=0.35 cfs 0.061 af

Subcatchment41S: ROOFS Runoff Area=0.619 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.55 cfs 0.235 af

Subcatchment42S: PR-WQS-4 Runoff Area=1.062 ac 63.94% Impervious Runoff Depth=2.46"
Tc=10.0 min CN=77 Runoff=2.67 cfs 0.217 af

Subcatchment44S: ROOFS Runoff Area=0.697 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=2.87 cfs 0.265 af

Subcatchment45S: PR-Parking Runoff Area=0.205 ac 100.00% Impervious Runoff Depth=4.56"
Tc=10.0 min CN=98 Runoff=0.84 cfs 0.078 af

Subcatchment47S: PROP-RW23-E2 Runoff Area=22.469 ac 9.29% Impervious Runoff Depth=1.32"
Flow Length=1,209' Tc=18.8 min CN=62 Runoff=21.62 cfs 2.465 af

Subcatchment48S: PROP-RW23-E6 Runoff Area=3.464 ac 23.73% Impervious Runoff Depth=0.77"
Flow Length=353' Tc=10.0 min CN=53 Runoff=1.90 cfs 0.222 af

Subcatchment49S: PROP-RW23-E3 Runoff Area=9.450 ac 11.30% Impervious Runoff Depth=0.42"
Flow Length=1,277' Tc=70.0 min CN=46 Runoff=0.89 cfs 0.334 af

Subcatchment50S: PROP-RW23-E1 Runoff Area=51.158 ac 7.68% Impervious Runoff Depth=0.94"
Flow Length=2,965' Tc=67.6 min CN=56 Runoff=16.53 cfs 4.009 af

Subcatchment51S: PROP-RW32-NE-1 Runoff Area=7.120 ac 13.03% Impervious Runoff Depth=0.47"
Tc=10.0 min CN=47 Runoff=1.55 cfs 0.278 af

Subcatchment52S: PROP-RW23-E4 Runoff Area=10.361 ac 36.22% Impervious Runoff Depth=1.19"
Flow Length=336' Tc=28.6 min CN=60 Runoff=7.33 cfs 1.024 af

Subcatchment53S: PROP-TWA-W1 Runoff Area=4.726 ac 14.47% Impervious Runoff Depth=0.51"
Flow Length=595' Tc=17.6 min CN=48 Runoff=1.10 cfs 0.203 af

Subcatchment54S: PROP-RW5-E5 Runoff Area=2.132 ac 23.64% Impervious Runoff Depth=0.77"
Flow Length=1,056' Tc=46.6 min CN=53 Runoff=0.65 cfs 0.137 af

Subcatchment74S: PROP-RW32-NE-2 Runoff Area=2.900 ac 19.66% Impervious Runoff Depth=0.66"
Flow Length=390' Tc=10.0 min CN=51 Runoff=1.21 cfs 0.160 af

Subcatchment76-1S: PR-WQS-1 Runoff Area=0.539 ac 58.26% Impervious Runoff Depth=2.46"
Flow Length=492' Tc=10.0 min CN=77 Runoff=1.35 cfs 0.110 af

Subcatchment76-2S: PR-WQS-2 Runoff Area=0.584 ac 100.00% Impervious Runoff Depth=4.56"
Flow Length=270' Tc=10.0 min CN=98 Runoff=2.41 cfs 0.222 af

Subcatchment76-3S: PR-COLONIAL-4 Runoff Area=0.568 ac 43.84% Impervious Runoff Depth=1.67"
Flow Length=42' Tc=10.0 min CN=67 Runoff=0.93 cfs 0.079 af

Subcatchment76-4S: DIRECT TO DP#1 Runoff Area=0.123 ac 0.00% Impervious Runoff Depth=0.30"
Tc=0.0 min CN=43 Runoff=0.01 cfs 0.003 af

Subcatchment76-5S: PR-WQS-1A Runoff Area=1.309 ac 96.49% Impervious Runoff Depth=4.33"
Flow Length=466' Tc=10.0 min CN=96 Runoff=5.30 cfs 0.473 af

Subcatchment77-1S: DIRECT TO DP#2 Runoff Area=0.178 ac 24.72% Impervious Runoff Depth=1.45"
Tc=0.0 min CN=64 Runoff=0.35 cfs 0.022 af

Subcatchment77-2S: PR-COLONIAL-1 Runoff Area=0.103 ac 4.85% Impervious Runoff Depth=0.26"
Flow Length=50' Slope=0.0593 '/' Tc=10.0 min CN=42 Runoff=0.01 cfs 0.002 af

Subcatchment78S: PR-COLONIAL-6 Runoff Area=0.867 ac 61.36% Impervious Runoff Depth=2.29"
Flow Length=28' Slope=0.0897 '/' Tc=10.0 min CN=75 Runoff=2.02 cfs 0.165 af

Reach 3R: EX-FLARED END TWA Avg. Flow Depth=0.11' Max Vel=1.86 fps Inflow=0.35 cfs 0.061 af
n=0.012 L=103.0' S=0.0049 '/' Capacity=3.29 cfs Outflow=0.35 cfs 0.061 af

Reach 4R: EX-CB-2 Avg. Flow Depth=0.27' Max Vel=2.43 fps Inflow=1.08 cfs 0.144 af
n=0.012 L=160.0' S=0.0033 '/' Capacity=2.70 cfs Outflow=1.07 cfs 0.144 af

Reach 29R: Drainage Channel Avg. Flow Depth=0.35' Max Vel=1.51 fps Inflow=1.90 cfs 0.222 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=1.79 cfs 0.222 af

Reach 30R: Drainage Channel Avg. Flow Depth=0.27' Max Vel=1.31 fps Inflow=1.10 cfs 0.203 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=1.09 cfs 0.203 af

Reach 31R: TWB-1 to DMH-6 Avg. Flow Depth=1.50' Max Vel=6.51 fps Inflow=34.82 cfs 8.671 af
18.0" Round Pipe n=0.012 L=258.3' S=0.0079 '/' Capacity=10.09 cfs Outflow=10.65 cfs 8.671 af

Pond 1D: Detention Pond #1 Peak Elev=59.17' Storage=6,417 cf Inflow=6.66 cfs 0.586 af
Discarded=0.20 cfs 0.307 af Primary=2.40 cfs 0.136 af Secondary=3.15 cfs 0.144 af Outflow=3.55 cfs 0.586 af

Pond 1P: PR-CB-1 Peak Elev=61.92' Inflow=4.51 cfs 0.393 af
18.0" Round Culvert n=0.012 L=82.9' S=0.0036 '/' Outflow=4.51 cfs 0.393 af

Pond 2D: Detention Pond #2 Peak Elev=59.17' Storage=0.089 af Inflow=2.56 cfs 0.157 af
Outflow=0.12 cfs 0.157 af

Pond 2P: PR-WQS-3 Peak Elev=58.32' Inflow=6.57 cfs 1.335 af
18.0" Round Culvert n=0.012 L=11.9' S=0.0025 '/' Outflow=6.57 cfs 1.335 af

Pond 3P: EX-CB-3 Peak Elev=62.21' Inflow=5.38 cfs 0.500 af
18.0" Round Culvert n=0.012 L=173.5' S=0.0060 '/' Outflow=5.38 cfs 0.500 af

Pond 4P: PR-WQS-1 Peak Elev=59.58' Inflow=6.65 cfs 0.583 af
15.0" Round Culvert n=0.012 L=18.8' S=0.0027 '/' Outflow=6.65 cfs 0.583 af

Pond 5P: PR-CB-5 Peak Elev=61.45' Inflow=12.43 cfs 1.101 af
24.0" Round Culvert n=0.012 L=139.9' S=0.0025 '/' Outflow=12.43 cfs 1.101 af

Pond 6P: PR-CB-6 Peak Elev=60.85' Inflow=13.48 cfs 1.187 af
24.0" Round Culvert n=0.012 L=71.7' S=0.0035 '/' Outflow=13.48 cfs 1.187 af

Pond 7P: PR-CB-9 Peak Elev=58.69' Inflow=22.62 cfs 1.981 af
Primary=16.17 cfs 0.646 af Secondary=6.57 cfs 1.335 af Outflow=22.62 cfs 1.981 af

Pond 8P: PR-CB-8 Peak Elev=59.82' Inflow=18.25 cfs 1.591 af
24.0" Round Culvert n=0.012 L=93.2' S=0.0075 '/' Outflow=18.25 cfs 1.591 af

Pond 9P: PR-CB-32A Peak Elev=61.92' Inflow=1.85 cfs 0.170 af
12.0" Round Culvert n=0.012 L=41.2' S=0.0036 '/' Outflow=1.85 cfs 0.170 af

Pond 10P: EX-CB-10 Peak Elev=62.43' Inflow=1.00 cfs 0.083 af
12.0" Round Culvert n=0.012 L=344.0' S=0.0031 '/' Outflow=1.00 cfs 0.083 af

Pond 11P: EX-CB-11 Peak Elev=62.45' Inflow=0.26 cfs 0.023 af
12.0" Round Culvert n=0.012 L=177.0' S=0.0033 '/' Outflow=0.26 cfs 0.023 af

Pond 12P: PR-CB-12 Peak Elev=62.88' Inflow=3.83 cfs 0.354 af
18.0" Round Culvert n=0.012 L=201.6' S=0.0030 '/' Outflow=3.83 cfs 0.354 af

Pond 13P: EX-CB-13 Peak Elev=62.57' Inflow=0.88 cfs 0.085 af
12.0" Round Culvert n=0.012 L=95.8' S=0.0172 '/' Outflow=0.88 cfs 0.085 af

Pond 14P: PR-DMH-2 Peak Elev=62.51' Inflow=7.68 cfs 0.712 af
24.0" Round Culvert n=0.012 L=140.0' S=0.0024 '/' Outflow=7.68 cfs 0.712 af

Pond 15P: PR-CB-15 Peak Elev=62.63' Inflow=6.80 cfs 0.627 af
24.0" Round Culvert n=0.012 L=85.0' S=0.0022 '/' Outflow=6.80 cfs 0.627 af

Pond 16P: PR-CB-16 Peak Elev=62.29' Inflow=9.54 cfs 0.878 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0030 '/' Outflow=9.54 cfs 0.878 af

Pond 17P: PR-CB-17 Peak Elev=61.99' Inflow=13.09 cfs 1.186 af
24.0" Round Culvert n=0.012 L=198.4' S=0.0033 '/' Outflow=13.09 cfs 1.186 af

Pond 18P: DMH-7 Peak Elev=61.13' Inflow=48.96 cfs 12.153 af
48.0" x 36.0" Box Culvert n=0.013 L=148.3' S=0.0020 '/' Outflow=48.96 cfs 12.153 af

Pond 19P: PR-CB-19 Peak Elev=60.80' Inflow=4.93 cfs 0.441 af
18.0" Round Culvert n=0.012 L=20.8' S=0.0024 '/' Outflow=4.93 cfs 0.441 af

Pond 20P: PR-CB-20 Peak Elev=63.04' Inflow=0.73 cfs 0.059 af
12.0" Round Culvert n=0.012 L=99.6' S=0.0110 '/' Outflow=0.73 cfs 0.059 af

Pond 21P: PR-CB-21 Peak Elev=63.00' Inflow=1.57 cfs 0.134 af
12.0" Round Culvert n=0.012 L=199.9' S=0.0040 '/' Outflow=1.57 cfs 0.134 af

Pond 22P: PR-CB-22 Peak Elev=62.65' Inflow=4.27 cfs 0.361 af
18.0" Round Culvert n=0.012 L=111.9' S=0.0040 '/' Outflow=4.27 cfs 0.361 af

Pond 23P: PR-CB-23 Peak Elev=62.42' Inflow=6.78 cfs 0.593 af
24.0" Round Culvert n=0.012 L=137.0' S=0.0036 '/' Outflow=6.78 cfs 0.593 af

Pond 24P: PR-CB-24 Peak Elev=62.25' Inflow=9.31 cfs 0.827 af
18.0" Round Culvert n=0.012 L=63.0' S=0.0065 '/' Outflow=9.31 cfs 0.827 af

Pond 25P: PR-CB-25 Peak Elev=61.36' Inflow=32.41 cfs 10.653 af
48.0" x 36.0" Box Culvert n=0.013 L=152.0' S=0.0020 '/' Outflow=32.41 cfs 10.653 af

Pond 26P: PR-CB-26 Peak Elev=61.63' Inflow=9.09 cfs 0.793 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0020 '/' Outflow=9.09 cfs 0.793 af

Pond 27P: PR-CB-27 Peak Elev=61.82' Inflow=6.73 cfs 0.574 af
24.0" Round Culvert n=0.012 L=150.0' S=0.0020 '/' Outflow=6.73 cfs 0.574 af

Pond 28P: PR-CB-28 Peak Elev=62.09' Inflow=2.95 cfs 0.246 af
15.0" Round Culvert n=0.012 L=123.4' S=0.0041 '/' Outflow=2.95 cfs 0.246 af

Pond 29P: PR-CB-29 Peak Elev=61.53' Inflow=3.47 cfs 0.313 af
15.0" Round Culvert n=0.012 L=110.9' S=0.0032 '/' Outflow=3.47 cfs 0.313 af

Pond 30P: PR-CB-30 Peak Elev=62.01' Inflow=2.28 cfs 0.203 af
12.0" Round Culvert n=0.012 L=100.0' S=0.0035 '/' Outflow=2.28 cfs 0.203 af

Pond 31P: EX-CB-31 Peak Elev=60.83' Inflow=0.73 cfs 0.068 af
12.0" Round Culvert n=0.012 L=28.1' S=0.0107 '/' Outflow=0.73 cfs 0.068 af

Pond 32P: PR-CB-32C Peak Elev=61.74' Inflow=6.86 cfs 0.607 af
24.0" Round Culvert n=0.012 L=125.1' S=0.0036 '/' Outflow=6.86 cfs 0.607 af

Pond 33P: PR-CB-33 Peak Elev=61.72' Inflow=1.31 cfs 0.111 af
12.0" Round Culvert n=0.012 L=103.7' S=0.0058 '/' Outflow=1.31 cfs 0.111 af

Pond 34P: PR-CB-34 Peak Elev=60.55' Inflow=13.02 cfs 1.167 af
24.0" Round Culvert n=0.012 L=229.2' S=0.0048 '/' Outflow=13.02 cfs 1.167 af

Pond 40P: PR-WQS-4 Peak Elev=59.30' Inflow=9.27 cfs 8.117 af
18.0" Round Culvert n=0.012 L=6.5' S=0.0077 '/' Outflow=9.27 cfs 8.117 af

Pond 41P: PR-BOX DMH-1 Peak Elev=57.96' Inflow=79.17 cfs 14.792 af
60.0" x 36.0" Box Culvert n=0.012 L=7.1' S=0.0141 '/' Outflow=79.17 cfs 14.792 af

Pond 42P: PR-DMH-6 Peak Elev=61.75' Inflow=10.65 cfs 8.671 af
24.0" Round Culvert n=0.012 L=54.9' S=0.0064 '/' Outflow=10.65 cfs 8.671 af

Pond 43P: DMH-7 Peak Elev=61.56' Inflow=8.16 cfs 0.719 af
18.0" Round Culvert n=0.012 L=124.9' S=0.0048 '/' Outflow=8.16 cfs 0.719 af

Pond 44P: DMH-4-ClaremontManhole Peak Elev=59.54' Inflow=16.74 cfs 1.510 af
24.0" Round Culvert n=0.012 L=30.3' S=0.0036 '/' Outflow=16.74 cfs 1.510 af

Pond 45P: WEST POND Peak Elev=57.89' Storage=0.438 af Inflow=4.83 cfs 0.438 af
Outflow=0.00 cfs 0.000 af

Pond 46P: PR-DMH-RW-32 Peak Elev=79.80' Inflow=34.82 cfs 8.671 af
18.0" Round Culvert n=0.012 L=114.2' S=0.0079 '/' Outflow=34.82 cfs 8.671 af

Pond 57P: Ex-Outfall 1 Peak Elev=103.46' Inflow=2.50 cfs 0.425 af
10.0" Round Culvert n=0.012 L=124.0' S=0.0141 '/' Outflow=2.50 cfs 0.425 af

Pond 63P: Ex-Outfall 2 Peak Elev=101.69' Inflow=0.89 cfs 0.334 af
10.0" Round Culvert n=0.012 L=211.0' S=0.0013 '/' Outflow=0.89 cfs 0.334 af

Pond 66P: Infiltration Trench "32 A" Peak Elev=62.79' Storage=1,396 cf Inflow=1.21 cfs 0.160 af
Discarded=0.39 cfs 0.160 af Primary=0.00 cfs 0.000 af Outflow=0.39 cfs 0.160 af

Pond 69P: EX-CB-TWB-1 Peak Elev=101.68' Inflow=34.82 cfs 8.671 af
18.0" Round Culvert n=0.012 L=143.1' S=0.0079 '/' Outflow=34.82 cfs 8.671 af

Pond 74P: DIVERSION STRUCTURE 1ST CHAMB. Peak Elev=59.82' Inflow=56.56 cfs 12.811 af
Primary=48.67 cfs 4.694 af Secondary=9.27 cfs 8.117 af Outflow=56.56 cfs 12.811 af

Pond 77P: PR-WQS-1A Peak Elev=61.13' Inflow=5.30 cfs 0.473 af
15.0" Round Culvert n=0.012 L=40.7' S=0.0020 '/' Outflow=5.30 cfs 0.473 af

Pond 78P: PR-DMH-8 Peak Elev=60.60' Inflow=53.89 cfs 12.594 af
48.0" x 36.0" Box Culvert n=0.013 L=216.3' S=0.0025 '/' Outflow=53.89 cfs 12.594 af

Pond 80P: SOUTH POND Peak Elev=57.42' Storage=13,391 cf Inflow=5.00 cfs 0.422 af
12.0" Round Culvert n=0.012 L=28.0' S=0.0264 '/' Outflow=0.25 cfs 0.165 af

Pond 81P: DIVERSION STRUCTURE 2ND CHAMB. Peak Elev=58.76' Inflow=56.56 cfs 12.811 af
60.0" x 36.0" Box Culvert n=0.012 L=288.4' S=0.0026 '/' Outflow=56.56 cfs 12.811 af

Pond 82P: PR-CB-32B Peak Elev=61.75' Inflow=0.57 cfs 0.050 af
15.0" Round Culvert n=0.012 L=69.9' S=0.0050 '/' Outflow=0.57 cfs 0.050 af

Pond 83P: PR-WQS-2 Peak Elev=58.38' Inflow=2.41 cfs 0.222 af
Primary=2.13 cfs 0.216 af Secondary=0.27 cfs 0.007 af Outflow=2.41 cfs 0.222 af

Pond 84P: DMH Peak Elev=61.71' Inflow=9.89 cfs 0.893 af
24.0" Round Culvert n=0.012 L=68.3' S=0.0037 '/' Outflow=9.89 cfs 0.893 af

Pond 85P: PR-CB-7 Peak Elev=60.31' Inflow=13.48 cfs 1.187 af
24.0" Round Culvert n=0.012 L=39.4' S=0.0038 '/' Outflow=13.48 cfs 1.187 af

Pond 86P: PR-CB-30A Peak Elev=62.08' Inflow=0.67 cfs 0.055 af
12.0" Round Culvert n=0.012 L=200.0' S=0.0025 '/' Outflow=0.67 cfs 0.055 af

Pond 90P: PR - WQS-5 Peak Elev=58.76' Inflow=16.74 cfs 1.510 af
24.0" Round Culvert n=0.012 L=38.7' S=0.0034 '/' Outflow=16.74 cfs 1.510 af

Link AP-1: ADJACENTWETLANDS Inflow=0.25 cfs 0.168 af
Primary=0.25 cfs 0.168 af

Link AP-2: WEST POND Inflow=4.83 cfs 0.438 af
Primary=4.83 cfs 0.438 af

Link AP-3: SOUTH POND Inflow=5.00 cfs 0.422 af
Primary=5.00 cfs 0.422 af

Link AP-4: SHAWMUT AV. HEADWALL Inflow=79.17 cfs 14.792 af
Primary=79.17 cfs 14.792 af

Link AP-5: CLAREMONTHEADWALL Inflow=16.74 cfs 1.510 af
Primary=16.74 cfs 1.510 af

Total Runoff Area = 143.962 ac Runoff Volume = 17.789 af Average Runoff Depth = 1.48"
72.86% Pervious = 104.887 ac 27.14% Impervious = 39.075 ac

Summary for Subcatchment 1S: CB-1

Runoff = 4.51 cfs @ 12.13 hrs, Volume= 0.393 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.071	39	>75% Grass cover, Good, HSG A	Open Space
1.075	98	Paved parking, HSG A	Pavement
1.146	94	Weighted Average	
0.071		6.20% Pervious Area	
1.075		93.80% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	100	0.0063	0.89		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
3.9	376	0.0063	1.61		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.8	476	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 2S: CB-2

Runoff = 1.02 cfs @ 12.14 hrs, Volume= 0.083 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.252	98	Paved parking, HSG A	Pavement
0.092	39	>75% Grass cover, Good, HSG A	Open Space
0.344	82	Weighted Average	
0.092		26.74% Pervious Area	
0.252		73.26% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 3S: CB-3

Runoff = 3.34 cfs @ 12.14 hrs, Volume= 0.273 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.808	98	Paved parking, HSG A	Pavement
0.222	39	>75% Grass cover, Good, HSG A	Open Space
1.030	85	Weighted Average	
0.222		21.55% Pervious Area	
0.808		78.45% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	127	0.0080	1.03		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
7.1	230	0.0060	0.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.2	357	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 5S: CB-5

Runoff = 2.54 cfs @ 12.14 hrs, Volume= 0.209 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.670	98	Paved parking, HSG A	Pavement
0.510	39	>75% Grass cover, Good, HSG A	Open Space
1.180	73	Weighted Average	
0.510		43.22% Pervious Area	
0.670		56.78% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 6S: CB-6

Runoff = 1.06 cfs @ 12.14 hrs, Volume= 0.086 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.126	39	>75% Grass cover, Good, HSG A	Open Space
0.266	98	Paved parking, HSG A	Pavement
0.392	79	Weighted Average	
0.126		32.14% Pervious Area	
0.266		67.86% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 8S: CB-8

Runoff = 4.77 cfs @ 12.14 hrs, Volume= 0.403 af, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.154	39	>75% Grass cover, Good, HSG A	Open Space
1.124	98	Paved parking, HSG A	Pavement
1.278	91	Weighted Average	
0.154		12.05% Pervious Area	
1.124		87.95% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 9S: CB-9

Runoff = 4.37 cfs @ 12.13 hrs, Volume= 0.390 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.869	98	Paved parking, HSG A	Pavement
0.031	39	>75% Grass cover, Good, HSG A	Open Space
0.016	61	>75% Grass cover, Good, HSG B	Open Space
0.164	98	Paved parking, HSG B	Pavement
1.080	96	Weighted Average	
0.047		4.35% Pervious Area	
1.033		95.65% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 10S: CB-10

Runoff = 0.74 cfs @ 12.14 hrs, Volume= 0.060 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.186	98	Paved parking, HSG A	Pavement
0.079	39	>75% Grass cover, Good, HSG A	Open Space
0.265	80	Weighted Average	
0.079		29.81% Pervious Area	
0.186		70.19% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 11S: CB-11

Runoff = 0.26 cfs @ 12.15 hrs, Volume= 0.023 af, Depth= 1.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.078	98	Paved parking, HSG A	Pavement
0.092	39	>75% Grass cover, Good, HSG A	Open Space
0.170	66	Weighted Average	
0.092		54.12% Pervious Area	
0.078		45.88% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	56	0.0124	1.04		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
2.0	93	0.0125	0.78		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1					**Direct Entry,**
5.0	149	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 12S: CB-12

Runoff = 3.83 cfs @ 12.13 hrs, Volume= 0.354 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.930	98	Paved parking, HSG A	Pavement
0.930		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 13S: CB-13

Runoff = 0.03 cfs @ 12.30 hrs, Volume= 0.005 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.017	98	Paved parking, HSG A	Pavement
0.093	39	>75% Grass cover, Good, HSG A	Open Space
0.110	48	Weighted Average	
0.093		84.55% Pervious Area	
0.017		15.45% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 14S: TERMINAL ROOFS

Runoff = 0.86 cfs @ 12.13 hrs, Volume= 0.080 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description	Land Use
*	0.195	98	Roofs, HSG A; TERMINAL	Roofs
*	0.015	98	Roofs, HSG A; UTILITY	Roofs
	0.210	98	Weighted Average	
	0.210		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 15S: CB-15

Runoff = 2.97 cfs @ 12.13 hrs, Volume= 0.274 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.720	98	Paved parking, HSG A	Pavement
0.720		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4					**Direct Entry,**
1.5	100	0.0118	1.15		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
1.1	150	0.0118	2.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	250	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 16S: CB-16

Runoff = 1.86 cfs @ 12.13 hrs, Volume= 0.166 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.447	98	Paved parking, HSG A	Pavement
0.013	39	>75% Grass cover, Good, HSG A	Open Space
0.460	96	Weighted Average	
0.013		2.83% Pervious Area	
0.447		97.17% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 17S: CB-17

Runoff = 3.55 cfs @ 12.13 hrs, Volume= 0.308 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.840	98	Paved parking, HSG A	Pavement
0.060	39	>75% Grass cover, Good, HSG A	Open Space
0.900	94	Weighted Average	
0.060		6.67% Pervious Area	
0.840		93.33% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 19S: CB-19

Runoff = 1.65 cfs @ 12.14 hrs, Volume= 0.138 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.390	98	Paved parking, HSG A	Pavement
0.060	39	>75% Grass cover, Good, HSG A	Open Space
0.450	90	Weighted Average	
0.060		13.33% Pervious Area	
0.390		86.67% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 20S: CB-20

Runoff = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.101	39	>75% Grass cover, Good, HSG A	Open Space
0.189	98	Paved parking, HSG A	Pavement
0.290	77	Weighted Average	
0.101		34.83% Pervious Area	
0.189		65.17% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 21S: CB-21

Runoff = 0.84 cfs @ 12.15 hrs, Volume= 0.075 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.387	39	>75% Grass cover, Good, HSG A	Open Space
0.263	98	Paved parking, HSG A	Pavement
0.650	63	Weighted Average	
0.387		59.54% Pervious Area	
0.263		40.46% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 22S: CB-22

Runoff = 2.71 cfs @ 12.14 hrs, Volume= 0.227 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.634	98	Paved parking, HSG A	Pavement
0.106	39	>75% Grass cover, Good, HSG A	Open Space
0.740	90	Weighted Average	
0.106		14.32% Pervious Area	
0.634		85.68% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5					**Direct Entry,**
0.7	41	0.0110	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
1.6	87	0.0161	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	119	0.0062	1.60		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	247	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 23S: CB-23

Runoff = 2.51 cfs @ 12.13 hrs, Volume= 0.232 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.610	98	Paved parking, HSG A	Pavement
0.610		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 24S: CB-24

Runoff = 2.53 cfs @ 12.13 hrs, Volume= 0.233 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.614	98	Paved parking, HSG A	Pavement
0.614		100.00% Impervious Area	

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

Summary for Subcatchment 26-1S: CB-25

Runoff = 3.92 cfs @ 12.13 hrs, Volume= 0.362 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.952	98	Paved parking, HSG A	Pavement
0.952		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 26-2S: CB-26

Runoff = 2.36 cfs @ 12.13 hrs, Volume= 0.218 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.574	98	Paved parking, HSG A	Pavement
0.574		100.00% Impervious Area	

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

Summary for Subcatchment 26-3S: CB-27

Runoff = 3.77 cfs @ 12.13 hrs, Volume= 0.328 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.894	98	Paved parking, HSG A	Pavement
0.064	39	>75% Grass cover, Good, HSG A	Open Space
0.958	94	Weighted Average	
0.064		6.68% Pervious Area	
0.894		93.32% Impervious Area	

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

Summary for Subcatchment 26-4S: CB-29

Runoff = 1.19 cfs @ 12.13 hrs, Volume= 0.110 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.290	98	Paved parking, HSG A	Pavement
0.290		100.00% Impervious Area	

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

Summary for Subcatchment 26-5S: CB-30

Runoff = 1.61 cfs @ 12.13 hrs, Volume= 0.148 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.390	98	Paved parking, HSG A	Pavement
0.390		100.00% Impervious Area	

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

Summary for Subcatchment 28-1S: CB-28

Runoff = 2.95 cfs @ 12.14 hrs, Volume= 0.246 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.700	98	Paved parking, HSG A	Pavement
0.125	39	>75% Grass cover, Good, HSG A	Open Space
0.825	89	Weighted Average	
0.125		15.15% Pervious Area	
0.700		84.85% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 28-2S: CB-30A

Runoff = 0.67 cfs @ 12.14 hrs, Volume= 0.055 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.163	98	Paved parking, HSG A	Pavement
0.063	39	>75% Grass cover, Good, HSG A	Open Space
0.226	82	Weighted Average	
0.063		27.88% Pervious Area	
0.163		72.12% Impervious Area	

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

Summary for Subcatchment 30-1S: CB-32A

Runoff = 1.85 cfs @ 12.13 hrs, Volume= 0.170 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.448	98	Paved parking, HSG A	Pavement
0.448		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	30	0.0067	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
2.0	238	0.0092	1.95		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.6	268	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 30-2S: CB-32C

Runoff = 4.45 cfs @ 12.13 hrs, Volume= 0.387 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.045	98	Paved parking, HSG A	Pavement
0.084	39	>75% Grass cover, Good, HSG A	Open Space
1.129	94	Weighted Average	
0.084		7.44% Pervious Area	
1.045		92.56% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	30	0.0067	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
2.0	238	0.0092	1.95		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.6	268	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 30-3S: CB-32B

Runoff = 0.57 cfs @ 12.15 hrs, Volume= 0.050 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.175	98	Paved parking, HSG A	Pavement
0.239	39	>75% Grass cover, Good, HSG A	Open Space
0.414	64	Weighted Average	
0.239		57.73% Pervious Area	
0.175		42.27% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	30	0.0067	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
2.0	238	0.0092	1.95		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.6	268	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 31-1S: CB-33

Runoff = 1.31 cfs @ 12.14 hrs, Volume= 0.111 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.308	98	Paved parking, HSG A	Pavement
0.035	39	>75% Grass cover, Good, HSG A	Open Space
0.343	92	Weighted Average	
0.035		10.20% Pervious Area	
0.308		89.80% Impervious Area	

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

Summary for Subcatchment 31-2S: CB-34

Runoff = 4.86 cfs @ 12.13 hrs, Volume= 0.449 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.180	98	Paved parking, HSG A	Pavement
1.180		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5					**Direct Entry,**
2.5	170	0.0089	1.14		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
5.0	170	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 38S: CB-31

Runoff = 0.73 cfs @ 12.13 hrs, Volume= 0.068 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.178	98	Paved parking, HSG D	Pavement
0.178		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 39S: COLONIAL ROOF

Runoff = 2.71 cfs @ 12.13 hrs, Volume= 0.250 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.658	98	Roofs, HSG A	Roofs
0.658		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 40S: PROP-TWA-E1

Runoff = 0.35 cfs @ 12.44 hrs, Volume= 0.061 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.968	39	>75% Grass cover, Good, HSG A	Open Space
0.226	98	Paved parking, HSG A	Pavement
1.194	50	Weighted Average	
0.968		81.07% Pervious Area	
0.226		18.93% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	75	0.0069	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
3.8	163	0.0023	0.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.8	100	0.0022	2.08	1.56	**Pipe Channel,** 18.0" x 6.0" Box Area= 0.8 sf Perim= 4.0' r= 0.19' n= 0.011
21.4	338	Total			

Summary for Subcatchment 41S: ROOFS

Runoff = 2.55 cfs @ 12.13 hrs, Volume= 0.235 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description	Land Use
*	0.163	98	Roofs, HSG A, Maintenance Building,	Roofs
*	0.232	98	Roofs, HSG A, Sandpiper Hangar 1	Roofs
*	0.224	98	Roofs, HSG A, Sandpiper Hangar 2	Roofs
	0.619	98	Weighted Average	
	0.619		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 42S: PR-WQS-4

Runoff = 2.67 cfs @ 12.14 hrs, Volume= 0.217 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.383	39	>75% Grass cover, Good, HSG A	Open Space
0.679	98	Paved parking, HSG A	Pavement
1.062	77	Weighted Average	
0.383		36.06% Pervious Area	
0.679		63.94% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 44S: ROOFS

Runoff = 2.87 cfs @ 12.13 hrs, Volume= 0.265 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description	Land Use
*	0.537	98	Roofs, HSG A; NOR EAST	Roofs
*	0.160	98	Roofs, HSG A; HANGAR 8	Roofs
	0.697	98	Weighted Average	
	0.697		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 45S: PR-Parking

Runoff = 0.84 cfs @ 12.13 hrs, Volume= 0.078 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.205	98	Paved parking, HSG A	Pavement
0.205		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 47S: PROP-RW23-E2

Runoff = 21.62 cfs @ 12.29 hrs, Volume= 2.465 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
2.088	98	Paved parking, HSG A	Pavement
0.049	76	Gravel roads, HSG A	Roadway
8.257	39	>75% Grass cover, Good, HSG A	Open Space
5.292	65	Brush, Good, HSG C	Brush
3.510	74	>75% Grass cover, Good, HSG C	Open Space
0.194	70	Woods, Good, HSG C	Woods
1.637	80	>75% Grass cover, Good, HSG D	Open Space
1.442	77	Woods, Good, HSG D	Woods
22.469	62	Weighted Average	
20.381		90.71% Pervious Area	
2.088		9.29% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	300	0.0050	1.01		**Sheet Flow, Over Grass** Smooth surfaces n= 0.011 P2= 3.40"
13.7	811	0.0200	0.99		**Shallow Concentrated Flow, Shallow through grass** Short Grass Pasture Kv= 7.0 fps
0.2	98	0.0100	8.85	53.11	**Channel Flow, Through ditch** Area= 6.0 sf Perim= 4.0' r= 1.50' n= 0.022 Earth, clean & straight
18.8	1,209	Total			

Summary for Subcatchment 48S: PROP-RW23-E6

Runoff = 1.90 cfs @ 12.18 hrs, Volume= 0.222 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.822	98	Paved parking, HSG A	Pavement
2.642	39	>75% Grass cover, Good, HSG A	Open Space
3.464	53	Weighted Average	
2.642		76.27% Pervious Area	
0.822		23.73% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0526	0.13		**Sheet Flow, Overland thru Grass** Grass: Dense n= 0.240 P2= 3.40"
2.1	210	0.0125	1.68		**Shallow Concentrated Flow, Shallow Concentrated Flow** Grassed Waterway Kv= 15.0 fps
1.5	124	0.0010	1.38	0.75	**Pipe Channel, Pipe Flow to Existing Outfall** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.012 Concrete pipe, finished
6.1	353	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 49S: PROP-RW23-E3

Runoff = 0.89 cfs @ 13.30 hrs, Volume= 0.334 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.068	98	Paved parking, HSG A	Pasture
8.382	39	>75% Grass cover, Good, HSG A	Pasture
9.450	46	Weighted Average	
8.382		88.70% Pervious Area	
1.068		11.30% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	37	0.0100	0.88		**Sheet Flow, Over Taxiway** Smooth surfaces n= 0.011 P2= 3.40"
54.7	300	0.0058	0.09		**Sheet Flow, Over Land** Grass: Dense n= 0.240 P2= 3.40"
13.7	828	0.0045	1.01		**Shallow Concentrated Flow, Shallow Concentrated Flow** Grassed Waterway Kv= 15.0 fps
0.9	112	0.0025	2.18	1.19	**Pipe Channel, Pipe to Existing Outfall** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.012 Concrete pipe, finished
70.0	1,277	Total			

Summary for Subcatchment 50S: PROP-RW23-E1

Runoff = 16.53 cfs @ 13.07 hrs, Volume= 4.009 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.928	98	Paved parking, HSG A	Pavement
14.445	30	Brush, Good, HSG A	Brush
9.888	39	>75% Grass cover, Good, HSG A	Open Space
2.010	76	Gravel roads, HSG A	Roadway
0.790	30	Woods, Good, HSG A	Woods
5.006	83	1/4 acre lots, 38% imp, HSG C	Residential
0.807	74	>75% Grass cover, Good, HSG C	Open Space
2.172	70	Woods, Good, HSG C	Woods
0.262	87	1/4 acre lots, 38% imp, HSG D	Residential
7.250	73	Brush, Good, HSG D	Brush
0.969	80	>75% Grass cover, Good, HSG D	Open Space
5.631	77	Woods, Good, HSG D	Woods
51.158	56	Weighted Average	
47.228		92.32% Pervious Area	
3.930		7.68% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	100	0.0200	0.08		**Sheet Flow, Through Woods** Woods: Light underbrush n= 0.400 P2= 3.40"
37.8	1,280	0.0065	0.56		**Shallow Concentrated Flow, Through Wetlands** Short Grass Pasture Kv= 7.0 fps
9.0	1,585	0.0036	2.92	122.82	**Channel Flow, Through Wetlands** Area= 42.0 sf Perim= 20.0' r= 2.10' n= 0.050 Scattered brush, heavy weeds
67.6	2,965	Total			

Summary for Subcatchment 51S: PROP-RW32-NE-1

Runoff = 1.55 cfs @ 12.34 hrs, Volume= 0.278 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.928	98	Paved parking, HSG A	Pavement
6.192	39	>75% Grass cover, Good, HSG A	Open Space
7.120	47	Weighted Average	
6.192		86.97% Pervious Area	
0.928		13.03% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 52S: PROP-RW23-E4

Runoff = 7.33 cfs @ 12.46 hrs, Volume= 1.024 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
3.753	98	Paved parking, HSG A	Pavement
6.608	39	>75% Grass cover, Good, HSG A	Open Space
10.361	60	Weighted Average	
6.608		63.78% Pervious Area	
3.753		36.22% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	126	0.0100	1.13		**Sheet Flow, Over Pavement**
					Smooth surfaces n= 0.011 P2= 3.40"
26.7	210	0.0171	0.13		**Sheet Flow, Over Grass**
					Grass: Dense n= 0.240 P2= 3.40"
28.6	336	Total			

Summary for Subcatchment 53S: PROP-TWA-W1

Runoff = 1.10 cfs @ 12.44 hrs, Volume= 0.203 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.684	98	Paved parking, HSG A	Pavement
4.042	39	>75% Grass cover, Good, HSG A	Open Space
4.726	48	Weighted Average	
4.042		85.53% Pervious Area	
0.684		14.47% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	123	0.0390	0.16		**Sheet Flow, Sheet Flow**
					Grass: Dense n= 0.240 P2= 3.40"
3.6	261	0.0066	1.22		**Shallow Concentrated Flow, Shallow Concentrated Flow**
					Grassed Waterway Kv= 15.0 fps
1.5	211	0.0022	2.31	1.81	**Pipe Channel, Pipe Flow**
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
17.6	595	Total			

Summary for Subcatchment 54S: PROP-RW5-E5

Runoff = 0.65 cfs @ 12.79 hrs, Volume= 0.137 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.504	98	Paved parking, HSG A	Pavement
1.628	39	>75% Grass cover, Good, HSG A	Open Space
2.132	53	Weighted Average	
1.628		76.36% Pervious Area	
0.504		23.64% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	77	0.0129	1.13		**Sheet Flow, Over Pavement** Smooth surfaces n= 0.011 P2= 3.40"
35.9	179	0.0059	0.08		**Sheet Flow, Over Grass** Grass: Dense n= 0.240 P2= 3.40"
9.6	800	0.0020	1.38	0.27	**Pipe Channel, Pipe to Drainage System B** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.012 Concrete pipe, finished
46.6	1,056	Total			

Summary for Subcatchment 74S: PROP-RW32-NE-2

Runoff = 1.21 cfs @ 12.19 hrs, Volume= 0.160 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.570	98	Paved parking, HSG A	Pavement
2.330	39	>75% Grass cover, Good, HSG A	Open Space
2.900	51	Weighted Average	
2.330		80.34% Pervious Area	
0.570		19.66% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	40	0.0144	1.04		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
7.6	350	0.0119	0.76		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	390	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 76-1S: PR-WQS-1

Runoff = 1.35 cfs @ 12.14 hrs, Volume= 0.110 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.314	98	Paved parking, HSG A	Pavement
0.194	39	>75% Grass cover, Good, HSG A	Open Space
0.031	96	Gravel surface, HSG A	Roadway
0.539	77	Weighted Average	
0.225		41.74% Pervious Area	
0.314		58.26% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0115	0.99		**Sheet Flow, Over pavement** Smooth surfaces n= 0.011 P2= 3.40"
4.7	401	0.0050	1.44		**Shallow Concentrated Flow, Over pavement** Paved Kv= 20.3 fps
0.1	15	0.0100	4.91	3.86	**Pipe Channel, From CB to OW** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.1	26		8.02		**Lake or Reservoir, Infiltration Basin** Mean Depth= 2.00'
5.7	492	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 76-2S: PR-WQS-2

Runoff = 2.41 cfs @ 12.13 hrs, Volume= 0.222 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.584	98	Paved parking, HSG A	Pavement
0.584		100.00% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0126	1.03		**Sheet Flow, Over pavement** Smooth surfaces n= 0.011 P2= 3.40"
2.3	188	0.0126	1.34		**Sheet Flow, Over pavement** Smooth surfaces n= 0.011 P2= 3.40"
0.2	25	0.0022	2.31	1.81	**Pipe Channel, CB to DMH** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.0	7	0.0022	3.02	5.34	**Pipe Channel, OW to FE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'

n= 0.012 Concrete pipe, finished

3.3	270	Total, Increased to minimum Tc = 10.0 min

Summary for Subcatchment 76-3S: PR-COLONIAL-4

Runoff = 0.93 cfs @ 12.15 hrs, Volume= 0.079 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.249	98	Water Surface, HSG A	Open Water
0.051	96	Gravel surface, HSG A	Roadway
0.178	30	Brush, Good, HSG A	Brush
0.090	39	>75% Grass cover, Good, HSG A	Open Space
0.568	67	Weighted Average	
0.319		56.16% Pervious Area	
0.249		43.84% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	13	0.0090	0.69		**Sheet Flow, Over Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.7	21	0.0047	0.48		**Shallow Concentrated Flow, Through Grass** Short Grass Pasture Kv= 7.0 fps
0.2	8	0.0158	0.63		**Shallow Concentrated Flow, Through Brush** Woodland Kv= 5.0 fps
1.2	42	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 76-4S: DIRECT TO DP#1

Runoff = 0.01 cfs @ 12.28 hrs, Volume= 0.003 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.009	96	Gravel surface, HSG A	Roadway
0.114	39	>75% Grass cover, Good, HSG A	Open Space
0.123	43	Weighted Average	
0.123		100.00% Pervious Area	

Summary for Subcatchment 76-5S: PR-WQS-1A

Runoff = 5.30 cfs @ 12.13 hrs, Volume= 0.473 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
1.263	98	Paved parking, HSG A	Pavement
0.046	39	>75% Grass cover, Good, HSG A	Open Space
1.309	96	Weighted Average	
0.046		3.51% Pervious Area	
1.263		96.49% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0115	0.99		**Sheet Flow, Over pavement** Smooth surfaces n= 0.011 P2= 3.40"
4.7	401	0.0050	1.44		**Shallow Concentrated Flow, Over pavement** Paved Kv= 20.3 fps
0.1	15	0.0100	4.91	3.86	**Pipe Channel, From CB to OW** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
5.6	466	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 77-1S: DIRECT TO DP#2

Runoff = 0.35 cfs @ 12.00 hrs, Volume= 0.022 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.044	98	Paved parking, HSG A	Pavement
0.031	96	Gravel surface, HSG A	Roadway
0.103	39	>75% Grass cover, Good, HSG A	Open Space
0.178	64	Weighted Average	
0.134		75.28% Pervious Area	
0.044		24.72% Impervious Area	

Summary for Subcatchment 77-2S: PR-COLONIAL-1

Runoff = 0.01 cfs @ 12.47 hrs, Volume= 0.002 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.005	98	Paved parking, HSG A	Roadway
0.098	39	>75% Grass cover, Good, HSG A	Open Space
0.103	42	Weighted Average	
0.098		95.15% Pervious Area	
0.005		4.85% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0593	0.11		**Sheet Flow, Through brush** Woods: Light underbrush n= 0.400 P2= 3.40"
7.7	50	Total, Increased to minimum Tc = 10.0 min			

Summary for Subcatchment 78S: PR-COLONIAL-6

Runoff = 2.02 cfs @ 12.14 hrs, Volume= 0.165 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description	Land Use
0.176	98	Paved parking, HSG A	Pavement
0.293	30	Brush, Good, HSG A	Brush
0.356	98	Water Surface, HSG A	Open Water
0.042	96	Gravel surface, HSG A	Roadway
0.867	75	Weighted Average	
0.335		38.64% Pervious Area	
0.532		61.36% Impervious Area	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	28	0.0897	0.11		**Sheet Flow, Through brush to open water** Woods: Light underbrush n= 0.400 P2= 3.40"
4.1	28	Total, Increased to minimum Tc = 10.0 min			

Summary for Reach 3R: EX-FLARED END TWA

Inflow Area = 1.194 ac, 18.93% Impervious, Inflow Depth = 0.61" for 10-Year event
Inflow = 0.35 cfs @ 12.44 hrs, Volume= 0.061 af
Outflow = 0.35 cfs @ 12.45 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.86 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 2.1 min

Peak Storage= 19 cf @ 12.45 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 0.8 sf, Capacity= 3.29 cfs

1.66' x 0.50' deep channel, n= 0.012 Concrete pipe, finished
Length= 103.0' Slope= 0.0049 '/'
Inlet Invert= 59.74', Outlet Invert= 59.24'



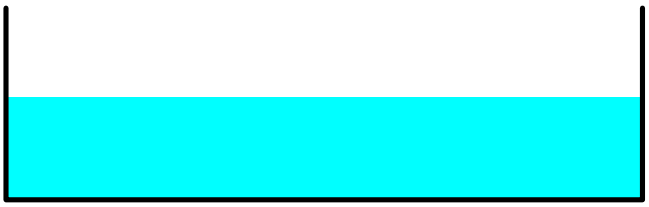
Summary for Reach 4R: EX-CB-2

Inflow Area = 1.538 ac, 31.08% Impervious, Inflow Depth = 1.12" for 10-Year event
Inflow = 1.08 cfs @ 12.15 hrs, Volume= 0.144 af
Outflow = 1.07 cfs @ 12.17 hrs, Volume= 0.144 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.43 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 3.3 min

Peak Storage= 71 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.50' Flow Area= 0.8 sf, Capacity= 2.70 cfs

1.66' x 0.50' deep channel, n= 0.012 Concrete pipe, finished
Length= 160.0' Slope= 0.0033 '/'
Inlet Invert= 59.68', Outlet Invert= 59.16'



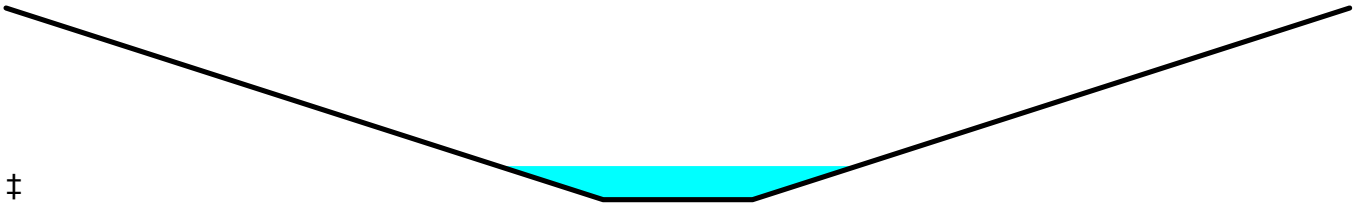
Summary for Reach 29R: Drainage Channel

Inflow Area = 3.464 ac, 23.73% Impervious, Inflow Depth = 0.77" for 10-Year event
Inflow = 1.90 cfs @ 12.18 hrs, Volume= 0.222 af
Outflow = 1.79 cfs @ 12.23 hrs, Volume= 0.222 af, Atten= 5%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.51 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 7.1 min

Peak Storage= 334 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 81.66 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 281.0' Slope= 0.0061 '/'
Inlet Invert= 68.00', Outlet Invert= 66.28'



‡

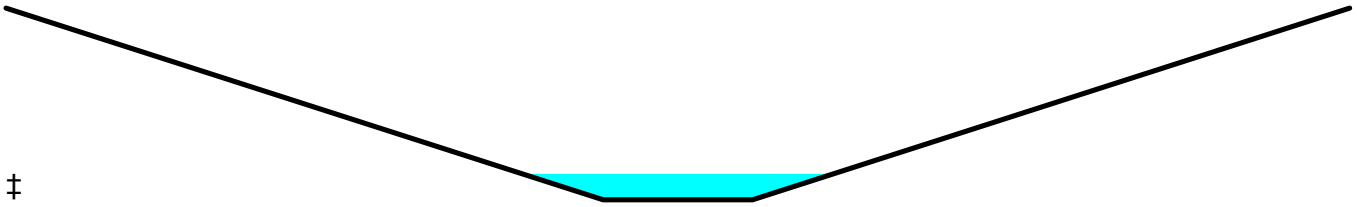
Summary for Reach 30R: Drainage Channel

Inflow Area = 4.726 ac, 14.47% Impervious, Inflow Depth = 0.51" for 10-Year event
Inflow = 1.10 cfs @ 12.44 hrs, Volume= 0.203 af
Outflow = 1.09 cfs @ 12.48 hrs, Volume= 0.203 af, Atten= 1%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.31 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 7.1 min

Peak Storage= 233 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 81.66 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 281.0' Slope= 0.0061 '/'
Inlet Invert= 68.00', Outlet Invert= 66.28'



‡

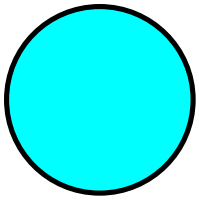
Summary for Reach 31R: TWB-1 to DMH-6

Inflow Area = 113.780 ac, 12.61% Impervious, Inflow Depth = 0.91" for 10-Year event
Inflow = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af
Outflow = 10.65 cfs @ 12.08 hrs, Volume= 8.671 af, Atten= 69%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.51 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 4.54 fps, Avg. Travel Time= 0.9 min

Peak Storage= 456 cf @ 12.09 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.09 cfs

18.0" Round Pipe
n= 0.012
Length= 258.3' Slope= 0.0079 '/'
Inlet Invert= 60.34', Outlet Invert= 58.31'



Summary for Pond 1D: Detention Pond #1

Inflow Area = 1.971 ac, 80.01% Impervious, Inflow Depth = 3.57" for 10-Year event
Inflow = 6.66 cfs @ 12.14 hrs, Volume= 0.586 af
Outflow = 3.55 cfs @ 12.26 hrs, Volume= 0.586 af, Atten= 47%, Lag= 7.5 min
Discarded = 0.20 cfs @ 12.35 hrs, Volume= 0.307 af
Primary = 2.40 cfs @ 12.15 hrs, Volume= 0.136 af
Secondary = 3.15 cfs @ 12.35 hrs, Volume= 0.144 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 59.17' @ 12.35 hrs Surf.Area= 3,504 sf Storage= 6,417 cf
Flood Elev= 59.20' Surf.Area= 3,528 sf Storage= 6,529 cf

Plug-Flow detention time= 183.3 min calculated for 0.586 af (100% of inflow)
Center-of-Mass det. time= 183.3 min (964.3 - 781.0)

Volume	Invert	Avail.Storage	Storage Description
#1	56.50'	7,250 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
56.50	1,385	180.0	0	0	1,385
57.00	1,742	190.0	780	780	1,694
58.00	2,520	220.0	2,119	2,899	2,694
59.00	3,380	245.0	2,939	5,839	3,648
59.40	3,680	255.0	1,412	7,250	4,058

Device	Routing	Invert	Outlet Devices
#1	Discarded	56.50'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.05'
#2	Secondary	59.00'	**18.0' 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
#3	Primary	57.25'	**15.0" Round Culvert** L= 85.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 57.25' / 57.08' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Discarded OutFlow Max=0.20 cfs @ 12.35 hrs HW=59.17' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=2.02 cfs @ 12.15 hrs HW=58.81' TW=58.69' (Dynamic Tailwater)
3=Culvert (Outlet Controls 2.02 cfs @ 1.69 fps)

Secondary OutFlow Max=3.14 cfs @ 12.35 hrs HW=59.17' TW=0.00' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Weir Controls 3.14 cfs @ 1.04 fps)

Summary for Pond 1P: PR-CB-1

Inflow Area = 1.146 ac, 93.80% Impervious, Inflow Depth = 4.11" for 10-Year event
Inflow = 4.51 cfs @ 12.13 hrs, Volume= 0.393 af
Outflow = 4.51 cfs @ 12.13 hrs, Volume= 0.393 af, Atten= 0%, Lag= 0.0 min
Primary = 4.51 cfs @ 12.13 hrs, Volume= 0.393 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.92' @ 12.18 hrs
Flood Elev= 61.04'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.35'	**18.0" Round RCP_Round 18"** L= 82.9' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 57.35' / 57.05' S= 0.0036 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.13 hrs HW=60.90' TW=61.01' (Dynamic Tailwater)
1=RCP_Round 18" (Controls 0.00 cfs)

Summary for Pond 2D: Detention Pond #2

Inflow Area = 2.149 ac, 75.43% Impervious, Inflow Depth = 0.88" for 10-Year event
Inflow = 2.56 cfs @ 12.15 hrs, Volume= 0.157 af
Outflow = 0.12 cfs @ 12.34 hrs, Volume= 0.157 af, Atten= 95%, Lag= 11.6 min
Discarded = 0.12 cfs @ 12.34 hrs, Volume= 0.157 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 59.17' @ 12.34 hrs Surf.Area= 0.049 ac Storage= 0.089 af
Flood Elev= 59.20' Surf.Area= 0.049 ac Storage= 0.091 af

Plug-Flow detention time= 395.3 min calculated for 0.157 af (100% of inflow)
Center-of-Mass det. time= 395.3 min (1,228.1 - 832.8)

Volume	Invert	Avail.Storage	Storage Description
#1	56.50'	0.101 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
56.50	0.020	0.000	0.000
57.00	0.024	0.011	0.011
58.00	0.035	0.029	0.040
59.00	0.046	0.040	0.081
59.40	0.052	0.020	0.101

Device	Routing	Invert	Outlet Devices
#1	Discarded	56.50'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.05'

Discarded OutFlow Max=0.12 cfs @ 12.34 hrs HW=59.17' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.12 cfs)

Summary for Pond 2P: PR-WQS-3

Inflow = 6.57 cfs @ 12.13 hrs, Volume= 1.335 af
Outflow = 6.57 cfs @ 12.13 hrs, Volume= 1.335 af, Atten= 0%, Lag= 0.0 min
Primary = 6.57 cfs @ 12.13 hrs, Volume= 1.335 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 58.32' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	54.90'	**18.0" Round RCP_Round 18"** L= 11.9' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 54.90' / 54.87' S= 0.0025 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=6.38 cfs @ 12.13 hrs HW=58.31' TW=57.95' (Dynamic Tailwater)
1=RCP_Round 18" (Inlet Controls 6.38 cfs @ 3.61 fps)

Summary for Pond 3P: EX-CB-3

Inflow Area = 3.003 ac, 51.62% Impervious, Inflow Depth = 2.00" for 10-Year event
Inflow = 5.38 cfs @ 12.14 hrs, Volume= 0.500 af
Outflow = 5.38 cfs @ 12.14 hrs, Volume= 0.500 af, Atten= 0%, Lag= 0.0 min
Primary = 5.38 cfs @ 12.14 hrs, Volume= 0.500 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.21' @ 12.18 hrs
Flood Elev= 61.99'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.11'	**18.0" Round RCP_Round 18"** L= 173.5' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.11' / 58.07' S= 0.0060 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.62 cfs @ 12.14 hrs HW=61.53' TW=61.27' (Dynamic Tailwater)
1=RCP_Round 18" (Outlet Controls 3.62 cfs @ 2.05 fps)

Summary for Pond 4P: PR-WQS-1

Inflow Area = 1.848 ac, 85.34% Impervious, Inflow Depth = 3.79" for 10-Year event
Inflow = 6.65 cfs @ 12.14 hrs, Volume= 0.583 af
Outflow = 6.65 cfs @ 12.14 hrs, Volume= 0.583 af, Atten= 0%, Lag= 0.0 min
Primary = 6.65 cfs @ 12.14 hrs, Volume= 0.583 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 59.58' @ 12.17 hrs
Flood Elev= 59.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.30'	**15.0" Round RCP_Round 15"** L= 18.8' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 57.30' / 57.25' S= 0.0027 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=6.44 cfs @ 12.14 hrs HW=59.50' TW=58.74' (Dynamic Tailwater)
↑**1=RCP_Round 15"** (Inlet Controls 6.44 cfs @ 5.25 fps)

Summary for Pond 5P: PR-CB-5

Inflow Area = 5.329 ac, 61.83% Impervious, Inflow Depth = 2.48" for 10-Year event
Inflow = 12.43 cfs @ 12.14 hrs, Volume= 1.101 af
Outflow = 12.43 cfs @ 12.14 hrs, Volume= 1.101 af, Atten= 0%, Lag= 0.0 min
Primary = 12.43 cfs @ 12.14 hrs, Volume= 1.101 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.45' @ 12.17 hrs
Flood Elev= 60.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	56.70'	**24.0" Round RCP_Round 24"** L= 139.9' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 56.70' / 56.35' S= 0.0025 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=10.66 cfs @ 12.14 hrs HW=61.15' TW=60.67' (Dynamic Tailwater)
↑**1=RCP_Round 24"** (Outlet Controls 10.66 cfs @ 3.39 fps)

Summary for Pond 6P: PR-CB-6

Inflow Area = 5.721 ac, 62.24% Impervious, Inflow Depth = 2.49" for 10-Year event
Inflow = 13.48 cfs @ 12.14 hrs, Volume= 1.187 af
Outflow = 13.48 cfs @ 12.14 hrs, Volume= 1.187 af, Atten= 0%, Lag= 0.0 min
Primary = 13.48 cfs @ 12.14 hrs, Volume= 1.187 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 60.85' @ 12.16 hrs
Flood Elev= 60.67'

Device	Routing	Invert	Outlet Devices
#1	Primary	56.30'	**24.0" Round RCP_Round 24"** L= 71.7' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 56.30' / 56.05' S= 0.0035 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=11.78 cfs @ 12.14 hrs HW=60.67' TW=60.24' (Dynamic Tailwater)
↑—**1=RCP_Round 24"** (Outlet Controls 11.78 cfs @ 3.75 fps)

Summary for Pond 7P: PR-CB-9

Inflow Area = 8.079 ac, 70.78% Impervious, Inflow Depth = 2.94" for 10-Year event
Inflow = 22.62 cfs @ 12.14 hrs, Volume= 1.981 af
Outflow = 22.62 cfs @ 12.14 hrs, Volume= 1.981 af, Atten= 0%, Lag= 0.0 min
Primary = 16.17 cfs @ 12.14 hrs, Volume= 0.646 af
Secondary = 6.57 cfs @ 12.13 hrs, Volume= 1.335 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 58.69' @ 12.14 hrs
Flood Elev= 59.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	55.65'	**24.0" Round RCP_Round 24"** L= 12.3' Ke= 0.200 Inlet / Outlet Invert= 55.65' / 55.10' S= 0.0447 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	54.92'	**18.0" Round RCP_Round 18"** L= 8.8' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 54.92' / 54.90' S= 0.0023 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=16.17 cfs @ 12.14 hrs HW=58.68' TW=57.95' (Dynamic Tailwater)
↑—**1=RCP_Round 24"** (Inlet Controls 16.17 cfs @ 5.15 fps)

Secondary OutFlow Max=6.13 cfs @ 12.13 hrs HW=58.64' TW=58.31' (Dynamic Tailwater)
↑—**2=RCP_Round 18"** (Inlet Controls 6.13 cfs @ 3.47 fps)

Summary for Pond 8P: PR-CB-8

Inflow Area = 6.999 ac, 66.94% Impervious, Inflow Depth = 2.73" for 10-Year event
Inflow = 18.25 cfs @ 12.14 hrs, Volume= 1.591 af
Outflow = 18.25 cfs @ 12.14 hrs, Volume= 1.591 af, Atten= 0%, Lag= 0.0 min
Primary = 18.25 cfs @ 12.14 hrs, Volume= 1.591 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 59.82' @ 12.15 hrs
Flood Elev= 60.18'

Device	Routing	Invert	Outlet Devices
#1	Primary	55.80'	**24.0" Round RCP_Round 24"** L= 93.2' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 55.80' / 55.10' S= 0.0075 '/' Cc= 0.900

n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=17.96 cfs @ 12.14 hrs HW=59.79' TW=58.68' (Dynamic Tailwater)
↑—**1=RCP_Round 24"** (Outlet Controls 17.96 cfs @ 5.72 fps)

Summary for Pond 9P: PR-CB-32A

Inflow Area = 0.448 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 1.85 cfs @ 12.13 hrs, Volume= 0.170 af
Outflow = 1.85 cfs @ 12.13 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min
Primary = 1.85 cfs @ 12.13 hrs, Volume= 0.170 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.92' @ 12.17 hrs
Flood Elev= 62.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.15'	**12.0" Round Culvert** L= 41.2' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.15' / 59.00' S= 0.0036 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.07 cfs @ 12.13 hrs HW=61.45' TW=61.45' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.07 cfs @ 0.08 fps)

Summary for Pond 10P: EX-CB-10

Inflow Area = 0.435 ac, 60.69% Impervious, Inflow Depth = 2.28" for 10-Year event
Inflow = 1.00 cfs @ 12.14 hrs, Volume= 0.083 af
Outflow = 1.00 cfs @ 12.14 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min
Primary = 1.00 cfs @ 12.14 hrs, Volume= 0.083 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.43' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.89'	**12.0" Round RCP_Round 12"** L= 344.0' Ke= 0.400 Inlet / Outlet Invert= 60.89' / 59.81' S= 0.0031 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.58 cfs @ 12.14 hrs HW=61.70' TW=61.50' (Dynamic Tailwater)
↑—**1=RCP_Round 12"** (Outlet Controls 0.58 cfs @ 1.17 fps)

Summary for Pond 11P: EX-CB-11

Inflow Area = 0.170 ac, 45.88% Impervious, Inflow Depth = 1.59" for 10-Year event
Inflow = 0.26 cfs @ 12.15 hrs, Volume= 0.023 af
Outflow = 0.26 cfs @ 12.15 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.15 hrs, Volume= 0.023 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 62.45' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	61.52'	**12.0" Round RCP_Round 12"** L= 177.0' Ke= 0.400 Inlet / Outlet Invert= 61.52' / 60.94' S= 0.0033 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.17 cfs @ 12.15 hrs HW=61.92' TW=61.80' (Dynamic Tailwater)
↑**1=RCP_Round 12"** (Outlet Controls 0.17 cfs @ 0.88 fps)

Summary for Pond 12P: PR-CB-12

Inflow Area = 0.930 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 3.83 cfs @ 12.13 hrs, Volume= 0.354 af
Outflow = 3.83 cfs @ 12.13 hrs, Volume= 0.354 af, Atten= 0%, Lag= 0.0 min
Primary = 3.83 cfs @ 12.13 hrs, Volume= 0.354 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.88' @ 12.19 hrs
Flood Elev= 63.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.60'	**18.0" Round RCP_Round 18"** L= 201.6' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.60' / 59.00' S= 0.0030 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=2.43 cfs @ 12.13 hrs HW=62.20' TW=62.07' (Dynamic Tailwater)
↑**1=RCP_Round 18"** (Outlet Controls 2.43 cfs @ 1.38 fps)

Summary for Pond 13P: EX-CB-13

Inflow Area = 0.320 ac, 70.94% Impervious, Inflow Depth = 3.17" for 10-Year event
Inflow = 0.88 cfs @ 12.14 hrs, Volume= 0.085 af
Outflow = 0.88 cfs @ 12.14 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min
Primary = 0.88 cfs @ 12.14 hrs, Volume= 0.085 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.57' @ 12.18 hrs
Flood Elev= 64.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	61.35'	**12.0" Round RCP_Round 12"** L= 95.8' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 61.35' / 59.70' S= 0.0172 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.46 cfs @ 12.14 hrs HW=62.14' TW=62.09' (Dynamic Tailwater)
↑**1=RCP_Round 12"** (Outlet Controls 0.46 cfs @ 0.94 fps)

Summary for Pond 14P: PR-DMH-2

Inflow Area = 1.970 ac, 95.28% Impervious, Inflow Depth = 4.34" for 10-Year event
Inflow = 7.68 cfs @ 12.13 hrs, Volume= 0.712 af
Outflow = 7.68 cfs @ 12.13 hrs, Volume= 0.712 af, Atten= 0%, Lag= 0.0 min
Primary = 7.68 cfs @ 12.13 hrs, Volume= 0.712 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.51' @ 12.17 hrs
Flood Elev= 64.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.53'	**24.0" Round RCP_Round 24"** L= 140.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.53' / 58.20' S= 0.0024 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=5.08 cfs @ 12.13 hrs HW=62.07' TW=61.96' (Dynamic Tailwater)
1=RCP_Round 24" (Outlet Controls 5.08 cfs @ 1.62 fps)

Summary for Pond 15P: PR-CB-15

Inflow Area = 1.650 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 6.80 cfs @ 12.13 hrs, Volume= 0.627 af
Outflow = 6.80 cfs @ 12.13 hrs, Volume= 0.627 af, Atten= 0%, Lag= 0.0 min
Primary = 6.80 cfs @ 12.13 hrs, Volume= 0.627 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.63' @ 12.18 hrs
Flood Elev= 64.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.75'	**24.0" Round RCP_Round 24"** L= 85.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.75' / 58.56' S= 0.0022 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf

Primary OutFlow Max=1.50 cfs @ 12.13 hrs HW=62.07' TW=62.06' (Dynamic Tailwater)
1=RCP_Round 24" (Outlet Controls 1.50 cfs @ 0.48 fps)

Summary for Pond 16P: PR-CB-16

Inflow Area = 2.430 ac, 95.64% Impervious, Inflow Depth = 4.34" for 10-Year event
Inflow = 9.54 cfs @ 12.13 hrs, Volume= 0.878 af
Outflow = 9.54 cfs @ 12.13 hrs, Volume= 0.878 af, Atten= 0%, Lag= 0.0 min
Primary = 9.54 cfs @ 12.13 hrs, Volume= 0.878 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.29' @ 12.16 hrs
Flood Elev= 63.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.15'	**24.0" Round RCP_Round 24"** L= 100.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.15' / 57.85' S= 0.0030 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=7.30 cfs @ 12.13 hrs HW=61.96' TW=61.77' (Dynamic Tailwater)
↑—**1=RCP_Round 24"** (Outlet Controls 7.30 cfs @ 2.32 fps)

Summary for Pond 17P: PR-CB-17

Inflow Area = 3.330 ac, 95.02% Impervious, Inflow Depth = 4.28" for 10-Year event
Inflow = 13.09 cfs @ 12.13 hrs, Volume= 1.186 af
Outflow = 13.09 cfs @ 12.13 hrs, Volume= 1.186 af, Atten= 0%, Lag= 0.0 min
Primary = 13.09 cfs @ 12.13 hrs, Volume= 1.186 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.99' @ 12.15 hrs
Flood Elev= 62.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**24.0" Round RCP_Round 24"** L= 198.4' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 57.80' / 57.15' S= 0.0033 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=12.22 cfs @ 12.13 hrs HW=61.77' TW=60.99' (Dynamic Tailwater)
↑—**1=RCP_Round 24"** (Outlet Controls 12.22 cfs @ 3.89 fps)

Summary for Pond 18P: DMH-7

Inflow Area = 124.229 ac, 19.15% Impervious, Inflow Depth = 1.17" for 10-Year event
Inflow = 48.96 cfs @ 12.13 hrs, Volume= 12.153 af
Outflow = 48.96 cfs @ 12.13 hrs, Volume= 12.153 af, Atten= 0%, Lag= 0.0 min
Primary = 48.96 cfs @ 12.13 hrs, Volume= 12.153 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.13' @ 12.15 hrs
Flood Elev= 63.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	56.70'	**48.0" W x 36.0" H Box Culvert** L= 148.3' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 56.70' / 56.40' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.00 sf

Primary OutFlow Max=43.70 cfs @ 12.13 hrs HW=61.01' TW=60.58' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 43.70 cfs @ 3.64 fps)

Summary for Pond 19P: PR-CB-19

Inflow Area = 1.247 ac, 95.19% Impervious, Inflow Depth = 4.25" for 10-Year event
Inflow = 4.93 cfs @ 12.13 hrs, Volume= 0.441 af
Outflow = 4.93 cfs @ 12.13 hrs, Volume= 0.441 af, Atten= 0%, Lag= 0.0 min
Primary = 4.93 cfs @ 12.13 hrs, Volume= 0.441 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 60.80' @ 12.15 hrs
Flood Elev= 62.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**18.0" Round RCP_Round 18"** L= 20.8' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.00' / 57.95' S= 0.0024 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.28 cfs @ 12.13 hrs HW=60.67' TW=60.58' (Dynamic Tailwater)
1=RCP_Round 18" (Inlet Controls 3.28 cfs @ 1.85 fps)

Summary for Pond 20P: PR-CB-20

Inflow Area = 0.290 ac, 65.17% Impervious, Inflow Depth = 2.46" for 10-Year event
Inflow = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af
Outflow = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.14 hrs, Volume= 0.059 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 63.04' @ 12.20 hrs
Flood Elev= 64.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	61.75'	**12.0" Round RCP_Round 12"** L= 99.6' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 61.75' / 60.65' S= 0.0110 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=62.47' TW=62.49' (Dynamic Tailwater)
1=RCP_Round 12" (Controls 0.00 cfs)

Summary for Pond 21P: PR-CB-21

Inflow Area = 0.940 ac, 48.09% Impervious, Inflow Depth = 1.71" for 10-Year event
Inflow = 1.57 cfs @ 12.15 hrs, Volume= 0.134 af
Outflow = 1.57 cfs @ 12.15 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min
Primary = 1.57 cfs @ 12.15 hrs, Volume= 0.134 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 63.00' @ 12.19 hrs
Flood Elev= 63.88'

Device	Routing	Invert	Outlet Devices
#1	Primary	60.60'	**12.0" Round CMP_Round 12"** L= 199.9' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 60.60' / 59.80' S= 0.0040 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.35 cfs @ 12.15 hrs HW=62.57' TW=62.27' (Dynamic Tailwater)
↑—**1=CMP_Round 12"** (Outlet Controls 1.35 cfs @ 1.71 fps)

Summary for Pond 22P: PR-CB-22

Inflow Area = 1.680 ac, 64.64% Impervious, Inflow Depth = 2.58" for 10-Year event
Inflow = 4.27 cfs @ 12.14 hrs, Volume= 0.361 af
Outflow = 4.27 cfs @ 12.14 hrs, Volume= 0.361 af, Atten= 0%, Lag= 0.0 min
Primary = 4.27 cfs @ 12.14 hrs, Volume= 0.361 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.65' @ 12.18 hrs
Flood Elev= 63.42'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.30'	**18.0" Round RCP_Round 18"** L= 111.9' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.30' / 58.85' S= 0.0040 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.40 cfs @ 12.14 hrs HW=62.20' TW=62.03' (Dynamic Tailwater)
↑—**1=RCP_Round 18"** (Outlet Controls 3.40 cfs @ 1.92 fps)

Summary for Pond 23P: PR-CB-23

Inflow Area = 2.290 ac, 74.06% Impervious, Inflow Depth = 3.11" for 10-Year event
Inflow = 6.78 cfs @ 12.14 hrs, Volume= 0.593 af
Outflow = 6.78 cfs @ 12.14 hrs, Volume= 0.593 af, Atten= 0%, Lag= 0.0 min
Primary = 6.78 cfs @ 12.14 hrs, Volume= 0.593 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.42' @ 12.17 hrs
Flood Elev= 62.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.80'	**24.0" Round RCP_Round 24"** L= 137.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.80' / 58.30' S= 0.0036 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=2.01 cfs @ 12.14 hrs HW=62.01' TW=61.99' (Dynamic Tailwater)
↑—**1=RCP_Round 24"** (Outlet Controls 2.01 cfs @ 0.64 fps)

Summary for Pond 24P: PR-CB-24

Inflow Area = 2.904 ac, 79.55% Impervious, Inflow Depth = 3.42" for 10-Year event
Inflow = 9.31 cfs @ 12.14 hrs, Volume= 0.827 af
Outflow = 9.31 cfs @ 12.14 hrs, Volume= 0.827 af, Atten= 0%, Lag= 0.0 min
Primary = 9.31 cfs @ 12.14 hrs, Volume= 0.827 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.25' @ 12.16 hrs
Flood Elev= 62.19'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.25'	**18.0" Round RCP_Round 18"** L= 63.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.25' / 57.84' S= 0.0065 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=8.76 cfs @ 12.14 hrs HW=61.97' TW=61.14' (Dynamic Tailwater)
1=RCP_Round 18" (Outlet Controls 8.76 cfs @ 4.96 fps)

Summary for Pond 25P: PR-CB-25

Inflow Area = 119.993 ac, 16.48% Impervious, Inflow Depth = 1.07" for 10-Year event
Inflow = 32.41 cfs @ 12.14 hrs, Volume= 10.653 af
Outflow = 32.41 cfs @ 12.14 hrs, Volume= 10.653 af, Atten= 0%, Lag= 0.0 min
Primary = 32.41 cfs @ 12.14 hrs, Volume= 10.653 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.36' @ 12.16 hrs
Flood Elev= 61.78'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.00'	**48.0" W x 36.0" H Box Culvert** L= 152.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 57.00' / 56.70' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.00 sf

Primary OutFlow Max=21.80 cfs @ 12.14 hrs HW=61.13' TW=61.02' (Dynamic Tailwater)
1=Culvert (Outlet Controls 21.80 cfs @ 1.82 fps)

Summary for Pond 26P: PR-CB-26

Inflow Area = 2.357 ac, 91.98% Impervious, Inflow Depth = 4.04" for 10-Year event
Inflow = 9.09 cfs @ 12.13 hrs, Volume= 0.793 af
Outflow = 9.09 cfs @ 12.13 hrs, Volume= 0.793 af, Atten= 0%, Lag= 0.0 min
Primary = 9.09 cfs @ 12.13 hrs, Volume= 0.793 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.63' @ 12.17 hrs
Flood Elev= 61.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.75'	**24.0" Round RCP_Round 24"** L= 100.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 57.75' / 57.55' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=6.81 cfs @ 12.13 hrs HW=61.29' TW=61.13' (Dynamic Tailwater)
1=RCP_Round 24" (Outlet Controls 6.81 cfs @ 2.17 fps)

Summary for Pond 27P: PR-CB-27

Inflow Area = 1.783 ac, 89.40% Impervious, Inflow Depth = 3.87" for 10-Year event
Inflow = 6.73 cfs @ 12.14 hrs, Volume= 0.574 af
Outflow = 6.73 cfs @ 12.14 hrs, Volume= 0.574 af, Atten= 0%, Lag= 0.0 min
Primary = 6.73 cfs @ 12.14 hrs, Volume= 0.574 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.82' @ 12.17 hrs
Flood Elev= 61.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.05'	**24.0" Round RCP_Round 24"** L= 150.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.05' / 57.75' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=3.57 cfs @ 12.14 hrs HW=61.36' TW=61.30' (Dynamic Tailwater)
1=RCP_Round 24" (Outlet Controls 3.57 cfs @ 1.14 fps)

Summary for Pond 28P: PR-CB-28

Inflow Area = 0.825 ac, 84.85% Impervious, Inflow Depth = 3.58" for 10-Year event
Inflow = 2.95 cfs @ 12.14 hrs, Volume= 0.246 af
Outflow = 2.95 cfs @ 12.14 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min
Primary = 2.95 cfs @ 12.14 hrs, Volume= 0.246 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.09' @ 12.18 hrs
Flood Elev= 61.99'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.35'	**15.0" Round RCP_Round 15"** L= 123.4' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.35' / 58.85' S= 0.0041 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=2.50 cfs @ 12.14 hrs HW=61.60' TW=61.36' (Dynamic Tailwater)
1=RCP_Round 15" (Outlet Controls 2.50 cfs @ 2.04 fps)

Summary for Pond 29P: PR-CB-29

Inflow Area = 0.906 ac, 93.05% Impervious, Inflow Depth = 4.15" for 10-Year event
Inflow = 3.47 cfs @ 12.13 hrs, Volume= 0.313 af
Outflow = 3.47 cfs @ 12.13 hrs, Volume= 0.313 af, Atten= 0%, Lag= 0.0 min
Primary = 3.47 cfs @ 12.13 hrs, Volume= 0.313 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.53' @ 12.16 hrs
Flood Elev= 62.32'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**15.0" Round Culvert** L= 110.9' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.50' / 58.15' S= 0.0032 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=2.92 cfs @ 12.13 hrs HW=61.31' TW=61.01' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.92 cfs @ 2.38 fps)

Summary for Pond 30P: PR-CB-30

Inflow Area = 0.616 ac, 89.77% Impervious, Inflow Depth = 3.95" for 10-Year event
Inflow = 2.28 cfs @ 12.14 hrs, Volume= 0.203 af
Outflow = 2.28 cfs @ 12.14 hrs, Volume= 0.203 af, Atten= 0%, Lag= 0.0 min
Primary = 2.28 cfs @ 12.14 hrs, Volume= 0.203 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.01' @ 12.16 hrs
Flood Elev= 62.21'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.10'	**12.0" Round RCP_Round 12"** L= 100.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.10' / 58.75' S= 0.0035 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.00 cfs @ 12.14 hrs HW=61.70' TW=61.31' (Dynamic Tailwater)
1=RCP_Round 12" (Outlet Controls 2.00 cfs @ 2.55 fps)

Summary for Pond 31P: EX-CB-31

Inflow Area = 0.178 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 0.73 cfs @ 12.13 hrs, Volume= 0.068 af
Outflow = 0.73 cfs @ 12.13 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.13 hrs, Volume= 0.068 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 60.83' @ 12.16 hrs
Flood Elev= 62.31'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.50'	**12.0" Round RCP_Round 12"** L= 28.1' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.50' / 58.20' S= 0.0107 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.13 hrs HW=60.58' TW=60.65' (Dynamic Tailwater)
↑—**1=RCP_Round 12"** (Controls 0.00 cfs)

Summary for Pond 32P: PR-CB-32C

Inflow Area = 1.991 ac, 83.78% Impervious, Inflow Depth = 3.66" for 10-Year event
Inflow = 6.86 cfs @ 12.14 hrs, Volume= 0.607 af
Outflow = 6.86 cfs @ 12.14 hrs, Volume= 0.607 af, Atten= 0%, Lag= 0.0 min
Primary = 6.86 cfs @ 12.14 hrs, Volume= 0.607 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.74' @ 12.16 hrs
Flood Elev= 61.61'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.95'	**24.0" Round Culvert** L= 125.1' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.95' / 58.50' S= 0.0036 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=2.44 cfs @ 12.14 hrs HW=61.51' TW=61.48' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 2.44 cfs @ 0.79 fps)

Summary for Pond 33P: PR-CB-33

Inflow Area = 0.343 ac, 89.80% Impervious, Inflow Depth = 3.89" for 10-Year event
Inflow = 1.31 cfs @ 12.14 hrs, Volume= 0.111 af
Outflow = 1.31 cfs @ 12.14 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min
Primary = 1.31 cfs @ 12.14 hrs, Volume= 0.111 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.72' @ 12.16 hrs
Flood Elev= 62.31'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.20'	**12.0" Round RCP_Round 12"** L= 103.7' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.20' / 58.60' S= 0.0058 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 12.14 hrs HW=61.48' TW=61.48' (Dynamic Tailwater)
↑—**1=RCP_Round 12"** (Outlet Controls 0.19 cfs @ 0.24 fps)

Summary for Pond 34P: PR-CB-34

Inflow Area = 3.514 ac, 89.81% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 13.02 cfs @ 12.13 hrs, Volume= 1.167 af
Outflow = 13.02 cfs @ 12.13 hrs, Volume= 1.167 af, Atten= 0%, Lag= 0.0 min
Primary = 13.02 cfs @ 12.13 hrs, Volume= 1.167 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 60.55' @ 12.14 hrs
Flood Elev= 61.57'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.60'	**24.0" Round Culvert** L= 229.2' Ke= 0.400 Inlet / Outlet Invert= 57.60' / 56.50' S= 0.0048 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=12.78 cfs @ 12.13 hrs HW=60.51' TW=59.53' (Dynamic Tailwater)
1=Culvert (Outlet Controls 12.78 cfs @ 4.07 fps)

Summary for Pond 40P: PR-WQS-4

Inflow = 9.27 cfs @ 11.98 hrs, Volume= 8.117 af
Outflow = 9.27 cfs @ 11.98 hrs, Volume= 8.117 af, Atten= 0%, Lag= 0.0 min
Primary = 9.27 cfs @ 11.98 hrs, Volume= 8.117 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 59.30' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	56.05'	**18.0" Round RCP_Round 18"** L= 6.5' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 56.05' / 56.00' S= 0.0077 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=8.94 cfs @ 11.98 hrs HW=58.10' TW=57.40' (Dynamic Tailwater)
1=RCP_Round 18" (Inlet Controls 8.94 cfs @ 5.06 fps)

Summary for Pond 41P: PR-BOX DMH-1

Inflow Area = 134.617 ac, 23.30% Impervious, Inflow Depth = 1.32" for 10-Year event
Inflow = 79.17 cfs @ 12.14 hrs, Volume= 14.792 af
Outflow = 79.17 cfs @ 12.14 hrs, Volume= 14.792 af, Atten= 0%, Lag= 0.0 min
Primary = 79.17 cfs @ 12.14 hrs, Volume= 14.792 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 57.96' @ 12.14 hrs
Flood Elev= 58.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	54.85'	**60.0" W x 36.0" H Box Culvert** L= 7.1' RCP, groove end projecting, Ke= 0.200

Inlet / Outlet Invert= 54.85' / 54.75' S= 0.0141 '/' Cc= 0.900
n= 0.012, Flow Area= 15.00 sf

Primary OutFlow Max=79.09 cfs @ 12.14 hrs HW=57.96' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 79.09 cfs @ 6.79 fps)

Summary for Pond 42P: PR-DMH-6

Inflow Area = 113.780 ac, 12.61% Impervious, Inflow Depth = 0.91" for 10-Year event
Inflow = 10.65 cfs @ 12.08 hrs, Volume= 8.671 af
Outflow = 10.65 cfs @ 12.08 hrs, Volume= 8.671 af, Atten= 0%, Lag= 0.0 min
Primary = 10.65 cfs @ 12.08 hrs, Volume= 8.671 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.75' @ 12.17 hrs
Flood Elev= 62.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.80'	**24.0" Round RCP_Round 24"** L= 54.9' Ke= 0.400 Inlet / Outlet Invert= 57.80' / 57.45' S= 0.0064 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=8.66 cfs @ 12.08 hrs HW=60.78' TW=60.50' (Dynamic Tailwater)
└**1=RCP_Round 24"** (Inlet Controls 8.66 cfs @ 2.76 fps)

Summary for Pond 43P: DMH-7

Inflow Area = 2.334 ac, 84.66% Impervious, Inflow Depth = 3.69" for 10-Year event
Inflow = 8.16 cfs @ 12.14 hrs, Volume= 0.719 af
Outflow = 8.16 cfs @ 12.14 hrs, Volume= 0.719 af, Atten= 0%, Lag= 0.0 min
Primary = 8.16 cfs @ 12.14 hrs, Volume= 0.719 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.56' @ 12.15 hrs
Flood Elev= 62.64'

Device	Routing	Invert	Outlet Devices
#1	Primary	58.45'	**18.0" Round Culvert** L= 124.9' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 58.45' / 57.85' S= 0.0048 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=7.86 cfs @ 12.14 hrs HW=61.48' TW=60.52' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 7.86 cfs @ 4.45 fps)

Summary for Pond 44P: DMH-4-Claremont Manhole

Inflow Area = 4.416 ac, 91.89% Impervious, Inflow Depth = 4.10" for 10-Year event
Inflow = 16.74 cfs @ 12.13 hrs, Volume= 1.510 af
Outflow = 16.74 cfs @ 12.13 hrs, Volume= 1.510 af, Atten= 0%, Lag= 0.0 min
Primary = 16.74 cfs @ 12.13 hrs, Volume= 1.510 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 59.54' @ 12.14 hrs
Flood Elev= 61.51'

Device	Routing	Invert	Outlet Devices
#1	Primary	56.44'	**24.0" Round Culvert** L= 30.3' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 56.44' / 56.33' S= 0.0036 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=16.62 cfs @ 12.13 hrs HW=59.53' TW=58.76' (Dynamic Tailwater)
1=Culvert (Inlet Controls 16.62 cfs @ 5.29 fps)

Summary for Pond 45P: WEST POND

Inflow Area = 1.152 ac, 72.31% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 4.83 cfs @ 12.33 hrs, Volume= 0.438 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 57.89' @ 24.58 hrs Surf.Area= 0.291 ac Storage= 0.438 af

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	56.00'	0.563 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
56.00	0.166	0.000	0.000
57.00	0.240	0.203	0.203
58.00	0.297	0.269	0.472
58.30	0.316	0.092	0.563

Device	Routing	Invert	Outlet Devices
#1	Primary	58.25'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=56.00' TW=0.00' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 46P: PR-DMH-RW-32

Inflow Area = 113.780 ac, 12.61% Impervious, Inflow Depth = 0.91" for 10-Year event
Inflow = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af
Outflow = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af, Atten= 0%, Lag= 0.0 min
Primary = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 79.80' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	59.21'	**18.0" Round RCP_Round 18"** L= 114.2' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.21' / 58.31' S= 0.0079 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=34.82 cfs @ 12.37 hrs HW=79.80' TW=61.84' (Dynamic Tailwater)
1=RCP_Round 18" (Outlet Controls 34.82 cfs @ 19.70 fps)

Summary for Pond 57P: Ex-Outfall 1

Inflow Area = 8.190 ac, 18.39% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 2.50 cfs @ 12.37 hrs, Volume= 0.425 af
Outflow = 2.50 cfs @ 12.37 hrs, Volume= 0.425 af, Atten= 0%, Lag= 0.0 min
Primary = 2.50 cfs @ 12.37 hrs, Volume= 0.425 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 103.46' @ 12.39 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	65.80'	**10.0" Round Culvert** L= 124.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 65.80' / 64.05' S= 0.0141 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.55 sf

Primary OutFlow Max=2.46 cfs @ 12.37 hrs HW=103.40' TW=101.68' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.46 cfs @ 4.52 fps)

Summary for Pond 63P: Ex-Outfall 2

Inflow Area = 9.450 ac, 11.30% Impervious, Inflow Depth = 0.42" for 10-Year event
Inflow = 0.89 cfs @ 13.30 hrs, Volume= 0.334 af
Outflow = 0.89 cfs @ 13.30 hrs, Volume= 0.334 af, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 13.30 hrs, Volume= 0.334 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 101.69' @ 12.39 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	69.06'	**10.0" Round Culvert** L= 211.0' RCP, groove end projecting, Ke= 0.200

Inlet / Outlet Invert= 69.06' / 68.78' S= 0.0013 '/' Cc= 0.900
n= 0.012 Concrete pipe, finished, Flow Area= 0.55 sf

Primary OutFlow Max=1.16 cfs @ 13.30 hrs HW=80.80' TW=80.21' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.16 cfs @ 2.12 fps)

Summary for Pond 66P: Infiltration Trench "32 A"

Inflow Area = 2.900 ac, 19.66% Impervious, Inflow Depth = 0.66" for 10-Year event
Inflow = 1.21 cfs @ 12.19 hrs, Volume= 0.160 af
Outflow = 0.39 cfs @ 12.79 hrs, Volume= 0.160 af, Atten= 68%, Lag= 36.0 min
Discarded = 0.39 cfs @ 12.79 hrs, Volume= 0.160 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.79' @ 12.79 hrs Surf.Area= 6,969 sf Storage= 1,396 cf

Plug-Flow detention time= 42.8 min calculated for 0.160 af (100% of inflow)
Center-of-Mass det. time= 42.8 min (961.5 - 918.7)

Volume	Invert	Avail.Storage	Storage Description
#1	62.32'	3,139 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	61.00'	43 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 107 cf Overall x 40.0% Voids
		3,181 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.32	0	0	0
62.50	1,485	134	134
63.00	10,535	3,005	3,139

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	0	0	0
62.32	162	107	107

Device	Routing	Invert	Outlet Devices
#1	Discarded	61.00'	**2.410 in/hr Exfiltration over Surface area above 61.00'** Excluded Surface area = 0 sf
#2	Primary	62.80'	**4.0" x 4.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 48.0" Grate (35% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.39 cfs @ 12.79 hrs HW=62.79' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=61.00' TW=59.21' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Summary for Pond 69P: EX-CB-TWB-1

Inflow Area = 110.880 ac, 12.42% Impervious, Inflow Depth = 0.94" for 10-Year event
Inflow = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af
Outflow = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af, Atten= 0%, Lag= 0.0 min
Primary = 34.82 cfs @ 12.37 hrs, Volume= 8.671 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 101.68' @ 12.38 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	60.34'	**18.0" Round CMP_Round 18"** L= 143.1' Ke= 0.400 Inlet / Outlet Invert= 60.34' / 59.21' S= 0.0079 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=34.81 cfs @ 12.37 hrs HW=101.68' TW=79.80' (Dynamic Tailwater)
↑—**1=CMP_Round 18"** (Outlet Controls 34.81 cfs @ 19.70 fps)

Summary for Pond 74P: DIVERSION STRUCTURE 1ST CHAMB.

Inflow Area = 126.538 ac, 20.27% Impervious, Inflow Depth = 1.21" for 10-Year event
Inflow = 56.56 cfs @ 12.14 hrs, Volume= 12.811 af
Outflow = 56.56 cfs @ 12.14 hrs, Volume= 12.811 af, Atten= 0%, Lag= 0.0 min
Primary = 48.67 cfs @ 12.14 hrs, Volume= 4.694 af
Secondary = 9.27 cfs @ 11.98 hrs, Volume= 8.117 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 59.82' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	57.95'	**7.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Secondary	56.10'	**18.0" Round RCP_Round 18"** L= 6.5' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 56.10' / 56.05' S= 0.0077 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=48.40 cfs @ 12.14 hrs HW=59.81' TW=58.76' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 48.40 cfs @ 3.92 fps)

Secondary OutFlow Max=8.92 cfs @ 11.98 hrs HW=58.81' TW=58.10' (Dynamic Tailwater)
↑—**2=RCP_Round 18"** (Inlet Controls 8.92 cfs @ 5.05 fps)

Summary for Pond 77P: PR-WQS-1A

Inflow Area = 1.309 ac, 96.49% Impervious, Inflow Depth = 4.33" for 10-Year event
Inflow = 5.30 cfs @ 12.13 hrs, Volume= 0.473 af
Outflow = 5.30 cfs @ 12.13 hrs, Volume= 0.473 af, Atten= 0%, Lag= 0.0 min
Primary = 5.30 cfs @ 12.13 hrs, Volume= 0.473 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 61.13' @ 12.13 hrs
Flood Elev= 60.06'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.38'	**15.0" Round RCP_Round 15"** L= 40.7' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.38' / 59.30' S= 0.0020 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=5.29 cfs @ 12.13 hrs HW=61.13' TW=59.49' (Dynamic Tailwater)
↑—**1=RCP_Round 15"** (Barrel Controls 5.29 cfs @ 4.31 fps)

Summary for Pond 78P: PR-DMH-8

Inflow Area = 125.476 ac, 19.90% Impervious, Inflow Depth = 1.20" for 10-Year event
Inflow = 53.89 cfs @ 12.13 hrs, Volume= 12.594 af
Outflow = 53.89 cfs @ 12.13 hrs, Volume= 12.594 af, Atten= 0%, Lag= 0.0 min
Primary = 53.89 cfs @ 12.13 hrs, Volume= 12.594 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 60.60' @ 12.14 hrs
Flood Elev= 62.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	56.40'	**48.0" W x 36.0" H Box Culvert** L= 216.3' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 56.40' / 55.85' S= 0.0025 '/' Cc= 0.900 n= 0.013, Flow Area= 12.00 sf

Primary OutFlow Max=53.15 cfs @ 12.13 hrs HW=60.58' TW=59.81' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 53.15 cfs @ 4.43 fps)

Summary for Pond 80P: SOUTH POND

Inflow Area = 2.677 ac, 75.57% Impervious, Inflow Depth = 1.89" for 10-Year event
Inflow = 5.00 cfs @ 12.14 hrs, Volume= 0.422 af
Outflow = 0.25 cfs @ 15.03 hrs, Volume= 0.165 af, Atten= 95%, Lag= 173.6 min
Primary = 0.25 cfs @ 15.03 hrs, Volume= 0.165 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 57.42' @ 15.03 hrs Surf.Area= 11,475 sf Storage= 13,391 cf
Flood Elev= 58.80' Surf.Area= 13,689 sf Storage= 31,167 cf

Plug-Flow detention time= 517.2 min calculated for 0.165 af (39% of inflow)
Center-of-Mass det. time= 373.4 min (1,160.0 - 786.6)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	33,924 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
56.00	7,233	0	0
57.00	10,433	8,833	8,833
58.00	12,936	11,685	20,518
59.00	13,877	13,407	33,924

Device	Routing	Invert	Outlet Devices
#1	Primary	57.20'	**12.0" Round RCP_Round 12"** L= 28.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 57.20' / 56.46' S= 0.0264 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.25 cfs @ 15.03 hrs HW=57.42' TW=0.00' (Dynamic Tailwater)
↑—**1=RCP_Round 12"** (Inlet Controls 0.25 cfs @ 1.98 fps)

Summary for Pond 81P: DIVERSION STRUCTURE 2ND CHAMB.

Inflow Area = 126.538 ac, 20.27% Impervious, Inflow Depth = 1.21" for 10-Year event
Inflow = 56.56 cfs @ 12.14 hrs, Volume= 12.811 af
Outflow = 56.56 cfs @ 12.14 hrs, Volume= 12.811 af, Atten= 0%, Lag= 0.0 min
Primary = 56.56 cfs @ 12.14 hrs, Volume= 12.811 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 58.76' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	55.70'	**60.0" W x 36.0" H Box Culvert** L= 288.4' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 55.70' / 54.95' S= 0.0026 '/' Cc= 0.900 n= 0.012, Flow Area= 15.00 sf

Primary OutFlow Max=56.18 cfs @ 12.14 hrs HW=58.76' TW=57.96' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 56.18 cfs @ 4.90 fps)

Summary for Pond 82P: PR-CB-32B

Inflow Area = 0.414 ac, 42.27% Impervious, Inflow Depth = 1.45" for 10-Year event
Inflow = 0.57 cfs @ 12.15 hrs, Volume= 0.050 af
Outflow = 0.57 cfs @ 12.15 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.15 hrs, Volume= 0.050 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.75' @ 12.17 hrs
Flood Elev= 62.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.35'	**15.0" Round Culvert** L= 69.9' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.35' / 59.00' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 12.15 hrs HW=61.63' TW=61.71' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Summary for Pond 83P: PR-WQS-2

Inflow Area = 0.584 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 2.41 cfs @ 12.13 hrs, Volume= 0.222 af
Outflow = 2.41 cfs @ 12.13 hrs, Volume= 0.222 af, Atten= 0%, Lag= 0.0 min
Primary = 2.13 cfs @ 12.13 hrs, Volume= 0.216 af
Secondary = 0.27 cfs @ 12.13 hrs, Volume= 0.007 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 58.38' @ 12.13 hrs
Flood Elev= 59.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.30'	**12.0" Round Culvert** L= 140.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 57.30' / 56.95' S= 0.0025 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	57.80'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.13 cfs @ 12.13 hrs HW=58.38' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 2.13 cfs @ 3.13 fps)

Secondary OutFlow Max=0.27 cfs @ 12.13 hrs HW=58.38' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Orifice Controls 0.27 cfs @ 3.10 fps)

Summary for Pond 84P: DMH

Inflow Area = 4.149 ac, 63.27% Impervious, Inflow Depth = 2.58" for 10-Year event
Inflow = 9.89 cfs @ 12.14 hrs, Volume= 0.893 af
Outflow = 9.89 cfs @ 12.14 hrs, Volume= 0.893 af, Atten= 0%, Lag= 0.0 min
Primary = 9.89 cfs @ 12.14 hrs, Volume= 0.893 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 61.71' @ 12.18 hrs
Flood Elev= 61.61'

Device	Routing	Invert	Outlet Devices
#1	Primary	57.00'	**24.0" Round RCP_Round 24"** L= 68.3' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 57.00' / 56.75' S= 0.0037 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=3.58 cfs @ 12.14 hrs HW=61.17' TW=61.13' (Dynamic Tailwater)
↑—**1=RCP_Round 24"** (Outlet Controls 3.58 cfs @ 1.14 fps)

Summary for Pond 85P: PR-CB-7

Inflow Area = 5.721 ac, 62.24% Impervious, Inflow Depth = 2.49" for 10-Year event
Inflow = 13.48 cfs @ 12.14 hrs, Volume= 1.187 af
Outflow = 13.48 cfs @ 12.14 hrs, Volume= 1.187 af, Atten= 0%, Lag= 0.0 min
Primary = 13.48 cfs @ 12.14 hrs, Volume= 1.187 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 60.31' @ 12.16 hrs
Flood Elev= 60.32'

Device	Routing	Invert	Outlet Devices
#1	Primary	56.00'	**24.0" Round RCP_Round 24"** L= 39.4' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 56.00' / 55.85' S= 0.0038 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=12.62 cfs @ 12.14 hrs HW=60.24' TW=59.80' (Dynamic Tailwater)
1=RCP_Round 24" (Inlet Controls 12.62 cfs @ 4.02 fps)

Summary for Pond 86P: PR-CB-30A

Inflow Area = 0.226 ac, 72.12% Impervious, Inflow Depth = 2.90" for 10-Year event
Inflow = 0.67 cfs @ 12.14 hrs, Volume= 0.055 af
Outflow = 0.67 cfs @ 12.14 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.14 hrs, Volume= 0.055 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 62.08' @ 12.17 hrs
Flood Elev= 62.97'

Device	Routing	Invert	Outlet Devices
#1	Primary	59.65'	**12.0" Round RCP_Round 12"** L= 200.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 59.65' / 59.15' S= 0.0025 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=61.68' TW=61.77' (Dynamic Tailwater)
1=RCP_Round 12" (Controls 0.00 cfs)

Summary for Pond 90P: PR - WQS-5

Inflow Area = 4.416 ac, 91.89% Impervious, Inflow Depth = 4.10" for 10-Year event
Inflow = 16.74 cfs @ 12.13 hrs, Volume= 1.510 af
Outflow = 16.74 cfs @ 12.13 hrs, Volume= 1.510 af, Atten= 0%, Lag= 0.0 min
Primary = 16.74 cfs @ 12.13 hrs, Volume= 1.510 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 58.76' @ 12.13 hrs
Flood Elev= 61.42'

Device	Routing	Invert	Outlet Devices
#1	Primary	56.33'	**24.0" Round RCP_Round 24"** L= 38.7' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 56.33' / 56.20' S= 0.0034 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=16.72 cfs @ 12.13 hrs HW=58.76' TW=0.00' (Dynamic Tailwater)
↑└**1=RCP_Round 24"** (Barrel Controls 16.72 cfs @ 5.57 fps)

Summary for Link AP-1: ADJACENT WETLANDS

Inflow Area = 2.780 ac, 72.95% Impervious, Inflow Depth > 0.72" for 10-Year event
Inflow = 0.25 cfs @ 15.01 hrs, Volume= 0.168 af
Primary = 0.25 cfs @ 15.01 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link AP-2: WEST POND

Inflow Area = 1.152 ac, 72.31% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 4.83 cfs @ 12.33 hrs, Volume= 0.438 af
Primary = 4.83 cfs @ 12.33 hrs, Volume= 0.438 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link AP-3: SOUTH POND

Inflow Area = 2.677 ac, 75.57% Impervious, Inflow Depth = 1.89" for 10-Year event
Inflow = 5.00 cfs @ 12.14 hrs, Volume= 0.422 af
Primary = 5.00 cfs @ 12.14 hrs, Volume= 0.422 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link AP-4: SHAWMUT AV. HEADWALL

Inflow Area = 134.617 ac, 23.30% Impervious, Inflow Depth = 1.32" for 10-Year event
Inflow = 79.17 cfs @ 12.14 hrs, Volume= 14.792 af
Primary = 79.17 cfs @ 12.14 hrs, Volume= 14.792 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link AP-5: CLAREMONT HEADWALL

Inflow Area = 4.416 ac, 91.89% Impervious, Inflow Depth = 4.10" for 10-Year event
Inflow = 16.74 cfs @ 12.13 hrs, Volume= 1.510 af
Primary = 16.74 cfs @ 12.13 hrs, Volume= 1.510 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: CB-1 Runoff Area=1.146 ac 93.80% Impervious Runoff Depth=6.29"
Flow Length=476' Slope=0.0063 '/' Tc=10.0 min CN=94 Runoff=6.75 cfs 0.601 af

Subcatchment2S: CB-2 Runoff Area=0.344 ac 73.26% Impervious Runoff Depth=4.92"
Tc=10.0 min CN=82 Runoff=1.71 cfs 0.141 af

Subcatchment3S: CB-3 Runoff Area=1.030 ac 78.45% Impervious Runoff Depth=5.25"
Flow Length=357' Tc=10.0 min CN=85 Runoff=5.40 cfs 0.451 af

Subcatchment5S: CB-5 Runoff Area=1.180 ac 56.78% Impervious Runoff Depth=3.94"
Tc=10.0 min CN=73 Runoff=4.76 cfs 0.387 af

Subcatchment6S: CB-6 Runoff Area=0.392 ac 67.86% Impervious Runoff Depth=4.58"
Tc=10.0 min CN=79 Runoff=1.83 cfs 0.150 af

Subcatchment8S: CB-8 Runoff Area=1.278 ac 87.95% Impervious Runoff Depth=5.94"
Tc=10.0 min CN=91 Runoff=7.30 cfs 0.632 af

Subcatchment9S: CB-9 Runoff Area=1.080 ac 95.65% Impervious Runoff Depth=6.52"
Tc=10.0 min CN=96 Runoff=6.45 cfs 0.587 af

Subcatchment10S: CB-10 Runoff Area=0.265 ac 70.19% Impervious Runoff Depth=4.69"
Tc=10.0 min CN=80 Runoff=1.26 cfs 0.104 af

Subcatchment11S: CB-11 Runoff Area=0.170 ac 45.88% Impervious Runoff Depth=3.20"
Flow Length=149' Tc=10.0 min CN=66 Runoff=0.55 cfs 0.045 af

Subcatchment12S: CB-12 Runoff Area=0.930 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=5.61 cfs 0.524 af

Subcatchment13S: CB-13 Runoff Area=0.110 ac 15.45% Impervious Runoff Depth=1.49"
Tc=10.0 min CN=48 Runoff=0.14 cfs 0.014 af

Subcatchment14S: TERMINAL ROOFS Runoff Area=0.210 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=1.27 cfs 0.118 af

Subcatchment15S: CB-15 Runoff Area=0.720 ac 100.00% Impervious Runoff Depth=6.76"
Flow Length=250' Slope=0.0118 '/' Tc=10.0 min CN=98 Runoff=4.34 cfs 0.406 af

Subcatchment16S: CB-16 Runoff Area=0.460 ac 97.17% Impervious Runoff Depth=6.52"
Tc=10.0 min CN=96 Runoff=2.75 cfs 0.250 af

Subcatchment17S: CB-17 Runoff Area=0.900 ac 93.33% Impervious Runoff Depth=6.29"
Tc=10.0 min CN=94 Runoff=5.30 cfs 0.472 af

Subcatchment19S: CB-19 Runoff Area=0.450 ac 86.67% Impervious Runoff Depth=5.82"
Tc=10.0 min CN=90 Runoff=2.54 cfs 0.218 af

Subcatchment20S: CB-20 Runoff Area=0.290 ac 65.17% Impervious Runoff Depth=4.37"
Tc=10.0 min CN=77 Runoff=1.29 cfs 0.106 af

Subcatchment21S: CB-21 Runoff Area=0.650 ac 40.46% Impervious Runoff Depth=2.90"
Tc=10.0 min CN=63 Runoff=1.90 cfs 0.157 af

Subcatchment22S: CB-22 Runoff Area=0.740 ac 85.68% Impervious Runoff Depth=5.82"
Flow Length=247' Tc=10.0 min CN=90 Runoff=4.18 cfs 0.359 af

Subcatchment23S: CB-23 Runoff Area=0.610 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.68 cfs 0.344 af

Subcatchment24S: CB-24 Runoff Area=0.614 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.70 cfs 0.346 af

Subcatchment26-1S: CB-25 Runoff Area=0.952 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=5.74 cfs 0.536 af

Subcatchment26-2S: CB-26 Runoff Area=0.574 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.46 cfs 0.323 af

Subcatchment26-3S: CB-27 Runoff Area=0.958 ac 93.32% Impervious Runoff Depth=6.29"
Tc=10.0 min CN=94 Runoff=5.64 cfs 0.502 af

Subcatchment26-4S: CB-29 Runoff Area=0.290 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=1.75 cfs 0.163 af

Subcatchment26-5S: CB-30 Runoff Area=0.390 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=2.35 cfs 0.220 af

Subcatchment28-1S: CB-28 Runoff Area=0.825 ac 84.85% Impervious Runoff Depth=5.71"
Tc=10.0 min CN=89 Runoff=4.60 cfs 0.392 af

Subcatchment28-2S: CB-30A Runoff Area=0.226 ac 72.12% Impervious Runoff Depth=4.92"
Tc=10.0 min CN=82 Runoff=1.12 cfs 0.093 af

Subcatchment30-1S: CB-32A Runoff Area=0.448 ac 100.00% Impervious Runoff Depth=6.76"
Flow Length=268' Tc=10.0 min CN=98 Runoff=2.70 cfs 0.252 af

Subcatchment30-2S: CB-32C Runoff Area=1.129 ac 92.56% Impervious Runoff Depth=6.29"
Flow Length=268' Tc=10.0 min CN=94 Runoff=6.65 cfs 0.592 af

Subcatchment30-3S: CB-32B Runoff Area=0.414 ac 42.27% Impervious Runoff Depth=3.00"
Flow Length=268' Tc=10.0 min CN=64 Runoff=1.25 cfs 0.104 af

Subcatchment31-1S: CB-33 Runoff Area=0.343 ac 89.80% Impervious Runoff Depth=6.05"
Tc=10.0 min CN=92 Runoff=1.98 cfs 0.173 af

Subcatchment31-2S: CB-34 Runoff Area=1.180 ac 100.00% Impervious Runoff Depth=6.76"
Flow Length=170' Slope=0.0089 '/' Tc=10.0 min CN=98 Runoff=7.11 cfs 0.665 af

Subcatchment38S: CB-31 Runoff Area=0.178 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=1.07 cfs 0.100 af

Subcatchment39S: COLONIAL ROOF Runoff Area=0.658 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.97 cfs 0.371 af

Subcatchment40S: PROP-TWA-E1 Runoff Area=1.194 ac 18.93% Impervious Runoff Depth=1.67"
Flow Length=338' Tc=21.4 min CN=50 Runoff=1.32 cfs 0.166 af

Subcatchment41S: ROOFS Runoff Area=0.619 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=3.73 cfs 0.349 af

Subcatchment42S: PR-WQS-4 Runoff Area=1.062 ac 63.94% Impervious Runoff Depth=4.37"
Tc=10.0 min CN=77 Runoff=4.74 cfs 0.386 af

Subcatchment44S: ROOFS Runoff Area=0.697 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=4.20 cfs 0.393 af

Subcatchment45S: PR-Parking Runoff Area=0.205 ac 100.00% Impervious Runoff Depth=6.76"
Tc=10.0 min CN=98 Runoff=1.24 cfs 0.115 af

Subcatchment47S: PROP-RW23-E2 Runoff Area=22.469 ac 9.29% Impervious Runoff Depth=2.80"
Flow Length=1,209' Tc=18.8 min CN=62 Runoff=49.76 cfs 5.245 af

Subcatchment48S: PROP-RW23-E6 Runoff Area=3.464 ac 23.73% Impervious Runoff Depth=1.94"
Flow Length=353' Tc=10.0 min CN=53 Runoff=6.23 cfs 0.559 af

Subcatchment49S: PROP-RW23-E3 Runoff Area=9.450 ac 11.30% Impervious Runoff Depth=1.32"
Flow Length=1,277' Tc=70.0 min CN=46 Runoff=4.14 cfs 1.040 af

Subcatchment50S: PROP-RW23-E1 Runoff Area=51.158 ac 7.68% Impervious Runoff Depth=2.22"
Flow Length=2,965' Tc=67.6 min CN=56 Runoff=45.38 cfs 9.456 af

Subcatchment51S: PROP-RW32-NE-1 Runoff Area=7.120 ac 13.03% Impervious Runoff Depth=1.41"
Tc=10.0 min CN=47 Runoff=8.19 cfs 0.834 af

Subcatchment52S: PROP-RW23-E4 Runoff Area=10.361 ac 36.22% Impervious Runoff Depth=2.60"
Flow Length=336' Tc=28.6 min CN=60 Runoff=17.68 cfs 2.248 af

Subcatchment53S: PROP-TWA-W1 Runoff Area=4.726 ac 14.47% Impervious Runoff Depth=1.49"
Flow Length=595' Tc=17.6 min CN=48 Runoff=4.83 cfs 0.587 af

Subcatchment54S: PROP-RW5-E5 Runoff Area=2.132 ac 23.64% Impervious Runoff Depth=1.94"
Flow Length=1,056' Tc=46.6 min CN=53 Runoff=2.00 cfs 0.344 af

Subcatchment74S: PROP-RW32-NE-2 Runoff Area=2.900 ac 19.66% Impervious Runoff Depth=1.76"
Flow Length=390' Tc=10.0 min CN=51 Runoff=4.58 cfs 0.424 af

Subcatchment76-1S: PR-WQS-1 Runoff Area=0.539 ac 58.26% Impervious Runoff Depth=4.37"
Flow Length=492' Tc=10.0 min CN=77 Runoff=2.40 cfs 0.196 af

Subcatchment76-2S: PR-WQS-2 Runoff Area=0.584 ac 100.00% Impervious Runoff Depth=6.76"
Flow Length=270' Tc=10.0 min CN=98 Runoff=3.52 cfs 0.329 af

Subcatchment76-3S: PR-COLONIAL-4 Runoff Area=0.568 ac 43.84% Impervious Runoff Depth=3.31"
Flow Length=42' Tc=10.0 min CN=67 Runoff=1.91 cfs 0.157 af

Subcatchment76-4S: DIRECT TO DP#1 Runoff Area=0.123 ac 0.00% Impervious Runoff Depth=1.07"
Tc=0.0 min CN=43 Runoff=0.13 cfs 0.011 af

Subcatchment76-5S: PR-WQS-1A Runoff Area=1.309 ac 96.49% Impervious Runoff Depth=6.52"
Flow Length=466' Tc=10.0 min CN=96 Runoff=7.82 cfs 0.712 af

Subcatchment77-1S: DIRECT TO DP#2 Runoff Area=0.178 ac 24.72% Impervious Runoff Depth=3.00"
Tc=0.0 min CN=64 Runoff=0.76 cfs 0.045 af

Subcatchment77-2S: PR-COLONIAL-1 Runoff Area=0.103 ac 4.85% Impervious Runoff Depth=1.00"
Flow Length=50' Slope=0.0593 '/' Tc=10.0 min CN=42 Runoff=0.07 cfs 0.009 af

Subcatchment78S: PR-COLONIAL-6 Runoff Area=0.867 ac 61.36% Impervious Runoff Depth=4.15"
Flow Length=28' Slope=0.0897 '/' Tc=10.0 min CN=75 Runoff=3.68 cfs 0.300 af

Reach 3R: EX-FLARED END TWA Avg. Flow Depth=0.27' Max Vel=2.97 fps Inflow=1.32 cfs 0.166 af
n=0.012 L=103.0' S=0.0049 '/' Capacity=3.29 cfs Outflow=1.32 cfs 0.166 af

Reach 4R: EX-CB-2 Avg. Flow Depth=0.46' Max Vel=3.15 fps Inflow=2.43 cfs 0.307 af
n=0.012 L=160.0' S=0.0033 '/' Capacity=2.70 cfs Outflow=2.42 cfs 0.307 af

Reach 29R: Drainage Channel Avg. Flow Depth=0.63' Max Vel=2.10 fps Inflow=6.23 cfs 0.559 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=6.02 cfs 0.559 af

Reach 30R: Drainage Channel Avg. Flow Depth=0.57' Max Vel=1.97 fps Inflow=4.83 cfs 0.587 af
n=0.030 L=281.0' S=0.0061 '/' Capacity=81.66 cfs Outflow=4.76 cfs 0.587 af

Reach 31R: TWB-1 to DMH-6 Avg. Flow Depth=1.50' Max Vel=6.51 fps Inflow=96.65 cfs 20.392 af
18.0" Round Pipe n=0.012 L=258.3' S=0.0079 '/' Capacity=10.09 cfs Outflow=10.86 cfs 20.392 af

Pond 1D: Detention Pond #1 Peak Elev=59.35' Storage=7,055 cf Inflow=10.30 cfs 0.919 af
Discarded=0.20 cfs 0.353 af Primary=1.45 cfs 0.141 af Secondary=9.53 cfs 0.425 af Outflow=9.73 cfs 0.919 af

Pond 1P: PR-CB-1 Peak Elev=69.86' Inflow=6.75 cfs 0.601 af
18.0" Round Culvert n=0.012 L=82.9' S=0.0036 '/' Outflow=6.75 cfs 0.601 af

Pond 2D: Detention Pond #2 Peak Elev=59.40' Storage=0.100 af Inflow=2.21 cfs 0.185 af
Outflow=0.13 cfs 0.185 af

Pond 2P: PR-WQS-3 Peak Elev=59.88' Inflow=10.50 cfs 1.985 af
18.0" Round Culvert n=0.012 L=11.9' S=0.0025 '/' Outflow=10.50 cfs 1.985 af

Pond 3P: EX-CB-3 Peak Elev=70.99' Inflow=9.51 cfs 0.907 af
18.0" Round Culvert n=0.012 L=173.5' S=0.0060 '/' Outflow=9.51 cfs 0.907 af

Pond 4P: PR-WQS-1 Peak Elev=61.24' Inflow=10.22 cfs 0.908 af
15.0" Round Culvert n=0.012 L=18.8' S=0.0027 '/' Outflow=10.22 cfs 0.908 af

Pond 5P: PR-CB-5 Peak Elev=68.67' Inflow=21.00 cfs 1.894 af
24.0" Round Culvert n=0.012 L=139.9' S=0.0025 '/' Outflow=21.00 cfs 1.894 af

Pond 6P: PR-CB-6 Peak Elev=66.92' Inflow=22.83 cfs 2.044 af
24.0" Round Culvert n=0.012 L=71.7' S=0.0035 '/' Outflow=22.83 cfs 2.044 af

Pond 7P: PR-CB-9 Peak Elev=60.83' Inflow=36.57 cfs 3.264 af
Primary=26.12 cfs 1.279 af Secondary=10.50 cfs 1.985 af Outflow=36.57 cfs 3.264 af

Pond 8P: PR-CB-8 Peak Elev=63.94' Inflow=30.12 cfs 2.676 af
24.0" Round Culvert n=0.012 L=93.2' S=0.0075 '/' Outflow=30.12 cfs 2.676 af

Pond 9P: PR-CB-32A Peak Elev=67.11' Inflow=2.70 cfs 0.252 af
12.0" Round Culvert n=0.012 L=41.2' S=0.0036 '/' Outflow=2.70 cfs 0.252 af

Pond 10P: EX-CB-10 Peak Elev=71.72' Inflow=1.82 cfs 0.149 af
12.0" Round Culvert n=0.012 L=344.0' S=0.0031 '/' Outflow=1.82 cfs 0.149 af

Pond 11P: EX-CB-11 Peak Elev=71.76' Inflow=0.55 cfs 0.045 af
12.0" Round Culvert n=0.012 L=177.0' S=0.0033 '/' Outflow=0.55 cfs 0.045 af

Pond 12P: PR-CB-12 Peak Elev=67.23' Inflow=5.61 cfs 0.524 af
18.0" Round Culvert n=0.012 L=201.6' S=0.0030 '/' Outflow=5.61 cfs 0.524 af

Pond 13P: EX-CB-13 Peak Elev=66.55' Inflow=1.40 cfs 0.132 af
12.0" Round Culvert n=0.012 L=95.8' S=0.0172 '/' Outflow=1.40 cfs 0.132 af

Pond 14P: PR-DMH-2 Peak Elev=66.37' Inflow=11.34 cfs 1.062 af
24.0" Round Culvert n=0.012 L=140.0' S=0.0024 '/' Outflow=11.34 cfs 1.062 af

Pond 15P: PR-CB-15 Peak Elev=66.67' Inflow=9.94 cfs 0.930 af
24.0" Round Culvert n=0.012 L=85.0' S=0.0022 '/' Outflow=9.94 cfs 0.930 af

Pond 16P: PR-CB-16 Peak Elev=65.92' Inflow=14.09 cfs 1.312 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0030 '/' Outflow=14.09 cfs 1.312 af

Pond 17P: PR-CB-17 Peak Elev=65.29' Inflow=19.39 cfs 1.783 af
24.0" Round Culvert n=0.012 L=198.4' S=0.0033 '/' Outflow=19.39 cfs 1.783 af

Pond 18P: DMH-7 Peak Elev=63.48' Inflow=68.86 cfs 25.716 af
48.0" x 36.0" Box Culvert n=0.013 L=148.3' S=0.0020 '/' Outflow=68.86 cfs 25.716 af

Pond 19P: PR-CB-19 Peak Elev=62.90' Inflow=7.34 cfs 0.667 af
18.0" Round Culvert n=0.012 L=20.8' S=0.0024 '/' Outflow=7.34 cfs 0.667 af

Pond 20P: PR-CB-20 Peak Elev=68.85' Inflow=1.29 cfs 0.106 af
12.0" Round Culvert n=0.012 L=99.6' S=0.0110 '/' Outflow=1.29 cfs 0.106 af

Pond 21P: PR-CB-21 Peak Elev=68.71' Inflow=3.19 cfs 0.263 af
12.0" Round Culvert n=0.012 L=199.9' S=0.0040 '/' Outflow=3.19 cfs 0.263 af

Pond 22P: PR-CB-22 Peak Elev=67.19' Inflow=7.36 cfs 0.622 af
18.0" Round Culvert n=0.012 L=111.9' S=0.0040 '/' Outflow=7.36 cfs 0.622 af

Pond 23P: PR-CB-23 Peak Elev=66.47' Inflow=11.04 cfs 0.965 af
24.0" Round Culvert n=0.012 L=137.0' S=0.0036 '/' Outflow=11.04 cfs 0.965 af

Pond 24P: PR-CB-24 Peak Elev=66.02' Inflow=14.74 cfs 1.311 af
18.0" Round Culvert n=0.012 L=63.0' S=0.0065 '/' Outflow=14.74 cfs 1.311 af

Pond 25P: PR-CB-25 Peak Elev=63.90' Inflow=44.25 cfs 23.457 af
48.0" x 36.0" Box Culvert n=0.013 L=152.0' S=0.0020 '/' Outflow=44.25 cfs 23.457 af

Pond 26P: PR-CB-26 Peak Elev=64.48' Inflow=13.70 cfs 1.218 af
24.0" Round Culvert n=0.012 L=100.0' S=0.0020 '/' Outflow=13.70 cfs 1.218 af

Pond 27P: PR-CB-27 Peak Elev=64.86' Inflow=10.24 cfs 0.894 af
24.0" Round Culvert n=0.012 L=150.0' S=0.0020 '/' Outflow=10.24 cfs 0.894 af

Pond 28P: PR-CB-28 Peak Elev=65.49' Inflow=4.60 cfs 0.392 af
15.0" Round Culvert n=0.012 L=123.4' S=0.0041 '/' Outflow=4.60 cfs 0.392 af

Pond 29P: PR-CB-29 Peak Elev=64.36' Inflow=5.22 cfs 0.476 af
15.0" Round Culvert n=0.012 L=110.9' S=0.0032 '/' Outflow=5.22 cfs 0.476 af

Pond 30P: PR-CB-30 Peak Elev=65.41' Inflow=3.47 cfs 0.312 af
12.0" Round Culvert n=0.012 L=100.0' S=0.0035 '/' Outflow=3.47 cfs 0.312 af

Pond 31P: EX-CB-31 Peak Elev=62.95' Inflow=1.07 cfs 0.100 af
12.0" Round Culvert n=0.012 L=28.1' S=0.0107 '/' Outflow=1.07 cfs 0.100 af

Pond 32P: PR-CB-32C Peak Elev=66.72' Inflow=10.60 cfs 0.948 af
24.0" Round Culvert n=0.012 L=125.1' S=0.0036 '/' Outflow=10.60 cfs 0.948 af

Pond 33P: PR-CB-33 Peak Elev=66.67' Inflow=1.98 cfs 0.173 af
12.0" Round Culvert n=0.012 L=103.7' S=0.0058 '/' Outflow=1.98 cfs 0.173 af

Pond 34P: PR-CB-34 Peak Elev=63.87' Inflow=19.69 cfs 1.785 af
24.0" Round Culvert n=0.012 L=229.2' S=0.0048 '/' Outflow=19.69 cfs 1.785 af

Pond 40P: PR-WQS-4 Peak Elev=60.61' Inflow=9.31 cfs 16.945 af
18.0" Round Culvert n=0.012 L=6.5' S=0.0077 '/' Outflow=9.31 cfs 16.945 af

Pond 41P: PR-BOX DMH-1 Peak Elev=58.92' Inflow=117.51 cfs 30.034 af
60.0" x 36.0" Box Culvert n=0.012 L=7.1' S=0.0141 '/' Outflow=117.51 cfs 30.034 af

Pond 42P: PR-DMH-6 Peak Elev=64.29' Inflow=10.86 cfs 20.392 af
24.0" Round Culvert n=0.012 L=54.9' S=0.0064 '/' Outflow=10.86 cfs 20.392 af

Pond 43P: DMH-7 Peak Elev=66.30' Inflow=12.58 cfs 1.121 af
18.0" Round Culvert n=0.012 L=124.9' S=0.0048 '/' Outflow=12.58 cfs 1.121 af

Pond 44P: DMH-4-ClaremontManhole Peak Elev=61.56' Inflow=25.12 cfs 2.294 af
24.0" Round Culvert n=0.012 L=30.3' S=0.0036 '/' Outflow=25.12 cfs 2.294 af

Pond 45P: WEST POND Peak Elev=58.41' Storage=0.563 af Inflow=14.31 cfs 0.897 af
Outflow=4.23 cfs 0.349 af

Pond 46P: PR-DMH-RW-32 Peak Elev=200.23' Inflow=96.65 cfs 20.392 af
18.0" Round Culvert n=0.012 L=114.2' S=0.0079 '/' Outflow=96.65 cfs 20.392 af

Pond 57P: Ex-Outfall 1 Peak Elev=381.58' Inflow=9.76 cfs 1.147 af
10.0" Round Culvert n=0.012 L=124.0' S=0.0141 '/' Outflow=9.76 cfs 1.147 af

Pond 63P: Ex-Outfall 2 Peak Elev=358.63' Inflow=4.14 cfs 1.040 af
10.0" Round Culvert n=0.012 L=211.0' S=0.0013 '/' Outflow=4.15 cfs 1.040 af

Pond 66P: Infiltration Trench "32 A" Peak Elev=200.25' Storage=3,181 cf Inflow=4.58 cfs 0.424 af
Discarded=0.60 cfs 0.346 af Primary=3.74 cfs 0.078 af Outflow=4.34 cfs 0.424 af

Pond 69P: EX-CB-TWB-1 Peak Elev=358.47' Inflow=93.69 cfs 20.313 af
18.0" Round Culvert n=0.012 L=143.1' S=0.0079 '/' Outflow=93.69 cfs 20.313 af

Pond 74P: DIVERSION STRUCTURE 1ST CHAMB. Peak Elev=60.91' Inflow=80.94 cfs 26.770 af
Primary=75.10 cfs 9.825 af Secondary=9.31 cfs 16.945 af Outflow=80.94 cfs 26.770 af

Pond 77P: PR-WQS-1A Peak Elev=62.49' Inflow=7.82 cfs 0.712 af
15.0" Round Culvert n=0.012 L=40.7' S=0.0020 '/' Outflow=7.82 cfs 0.712 af

Pond 78P: PR-DMH-8 Peak Elev=62.45' Inflow=76.20 cfs 26.384 af
48.0" x 36.0" Box Culvert n=0.013 L=216.3' S=0.0025 '/' Outflow=76.20 cfs 26.384 af

Pond 80P: SOUTH POND Peak Elev=57.90' Storage=19,294 cf Inflow=8.10 cfs 1.033 af
12.0" Round Culvert n=0.012 L=28.0' S=0.0264 '/' Outflow=2.11 cfs 0.776 af

Pond 81P: DIVERSION STRUCTURE 2ND CHAMB. Peak Elev=60.06' Inflow=80.94 cfs 26.770 af
60.0" x 36.0" Box Culvert n=0.012 L=288.4' S=0.0026 '/' Outflow=80.94 cfs 26.770 af

Pond 82P: PR-CB-32B Peak Elev=66.76' Inflow=1.25 cfs 0.104 af
15.0" Round Culvert n=0.012 L=69.9' S=0.0050 '/' Outflow=1.25 cfs 0.104 af

Pond 83P: PR-WQS-2 Peak Elev=59.12' Inflow=3.52 cfs 0.329 af
Primary=3.07 cfs 0.316 af Secondary=0.45 cfs 0.013 af Outflow=3.52 cfs 0.329 af

Pond 84P: DMH Peak Elev=69.40' Inflow=16.24 cfs 1.507 af
24.0" Round Culvert n=0.012 L=68.3' S=0.0037 '/' Outflow=16.24 cfs 1.507 af

Pond 85P: PR-CB-7 Peak Elev=65.37' Inflow=22.83 cfs 2.044 af
24.0" Round Culvert n=0.012 L=39.4' S=0.0038 '/' Outflow=22.83 cfs 2.044 af

Pond 86P: PR-CB-30A Peak Elev=65.59' Inflow=1.12 cfs 0.093 af
12.0" Round Culvert n=0.012 L=200.0' S=0.0025 '/' Outflow=1.12 cfs 0.093 af

Pond 90P: PR - WQS-5 Peak Elev=59.80' Inflow=25.12 cfs 2.294 af
24.0" Round Culvert n=0.012 L=38.7' S=0.0034 '/' Outflow=25.12 cfs 2.294 af

Link AP-1: ADJACENTWETLANDS Inflow=2.13 cfs 0.784 af
Primary=2.13 cfs 0.784 af

Link AP-2: WEST POND Inflow=14.31 cfs 0.897 af
Primary=14.31 cfs 0.897 af

Link AP-3: SOUTH POND Inflow=8.10 cfs 1.033 af
Primary=8.10 cfs 1.033 af

Link AP-4: SHAWMUT AV. HEADWALL Inflow=117.51 cfs 30.034 af
Primary=117.51 cfs 30.034 af

Link AP-5: CLAREMONTHEADWALL Inflow=25.12 cfs 2.294 af
Primary=25.12 cfs 2.294 af

Total Runoff Area = 143.962 ac Runoff Volume = 34.801 af Average Runoff Depth = 2.90"
72.86% Pervious = 104.887 ac 27.14% Impervious = 39.075 ac

APPENDIX D

TSS REMOVAL CALCULATIONS

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

NEW BEDFORD REGIONAL AIRPORT
NEW BEDORD, MA

Area	1.58 ac	Unit Site Designation	WQS-1
Weighted C	0.9	Rainfall Station #	66
t_c	10 min		
CDS Model	2015-4	CDS Treatment Capacity	**1.4 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.08	35.3%	35.3%	0.11	0.11	34.4
0.16	23.8%	59.1%	0.23	0.23	22.3
0.24	12.9%	72.0%	0.34	0.34	11.6
0.32	7.8%	79.8%	0.45	0.45	6.7
0.40	4.9%	84.7%	0.57	0.57	4.0
0.48	3.5%	88.3%	0.68	0.68	2.7
0.56	1.7%	90.0%	0.79	0.79	1.3
0.64	1.8%	91.8%	0.91	0.91	1.3
0.72	1.9%	93.7%	1.02	1.02	1.2
0.80	0.9%	94.6%	1.14	1.14	0.6
1.00	2.3%	96.9%	1.42	1.40	1.2
2.00	2.9%	99.8%	2.84	1.40	0.8
3.00	0.2%	100.0%	4.26	1.40	0.0
					88.2
				Removal Efficiency Adjustment[2] =	0.0%
				Predicted % Annual Rainfall Treated =	98.4%
				Predicted Net Annual Load Removal Efficiency =	**88.2%**

1 - Based on 14 years of 15 minute precipitation data from NCDC station 3821, Hyannis, in Barnstable County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

NEW BEDFORD REGIONAL AIRPORT
NEW BEDORD, MA

Area	0.584 ac	Unit Site Designation	WQS-2
Weighted C	0.9	Rainfall Station #	66
t_c	10 min		
CDS Model	2015-4	CDS Treatment Capacity	**1.4 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.08	35.3%	35.3%	0.04	0.04	35.3
0.16	23.8%	59.1%	0.08	0.08	23.4
0.24	12.9%	72.0%	0.13	0.13	12.5
0.32	7.8%	79.8%	0.17	0.17	7.5
0.40	4.9%	84.7%	0.21	0.21	4.6
0.48	3.5%	88.3%	0.25	0.25	3.3
0.56	1.7%	90.0%	0.29	0.29	1.6
0.64	1.8%	91.8%	0.34	0.34	1.6
0.72	1.9%	93.7%	0.38	0.38	1.7
0.80	0.9%	94.6%	0.42	0.42	0.8
1.00	2.3%	96.9%	0.53	0.53	1.9
2.00	2.9%	99.8%	1.05	1.05	1.9
3.00	0.2%	100.0%	1.58	1.40	0.1
					96.2
				Removal Efficiency Adjustment[2] =	0.0%
				Predicted % Annual Rainfall Treated =	100.0%
				Predicted Net Annual Load Removal Efficiency =	**96.2%**

1 - Based on 14 years of 15 minute precipitation data from NCDC station 3821, Hyannis, in Barnstable County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

New Bedford Regional Airport

New Bedford, MA

WQS-3

AREA	5.72	acres	**CASCADE MODEL**	CS-4
WEIGHTED C	0.90			
TC	10.00	minutes	**RAINFALL STATION**	66

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Hydraulic Loading Rate (gpm/ft2)	Removal Efficiency (%)	Incremental Removal (%)
0.08	35.3%	14.71	100.0	35.3
0.16	23.8%	29.42	92.3	22.0
0.24	12.9%	44.13	84.0	10.8
0.32	7.8%	58.84	75.8	5.9
0.40	4.9%	71.43	66.8	3.3
0.48	3.5%	71.43	55.7	2.0
0.56	1.7%	71.43	47.7	0.8
0.64	1.8%	71.43	41.8	0.8
0.72	1.9%	71.43	37.1	0.7
0.80	0.9%	71.43	33.4	0.3
1.00	2.3%	71.43	26.7	0.6
2.00	2.9%	71.43	13.4	0.4
3.00	0.2%	71.43	8.9	0.0
				82.9
			Removal Efficiency Adjustment[2] =	0.0%
			Predicted % Annual Rainfall Treated =	92.7%
			Predicted Net Annual Load Removal Efficiency =	**82.9%**

1 - Based on 14 years of 15 minute precipitation data from NCDC station 3821, Hyannis, in Barnstable County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

VORTECHS SYSTEM® ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON AN AVERAGE PARTICLE SIZE OF 250 MICRONS
NEW BEDFORD REGIONAL AIRPORT
NEW BEDFORD, MA
MODEL NAME VORTECHS 5000
SITE DESIGNATION WQ-4

Design Ratio[1] = $\frac{\text{(11.3 acres) x (0.9) x (449 gpm/cfs)}}{\text{(38.5 sf)}}$ **= 118.6**

Bypass occurs at an elevation of 58' (at approximately 19 gpm/sf)

Rainfall Intensity "/hr	Operating Rate[2] gpm/sf	Treated Flow cfs	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.08	9.5	0.81	35.3%	100.0%	35.3%
0.16	19.0	1.61	23.8%	100.0%	23.8%
0.24	27.6	2.34	12.5%	100.0%	12.5%
0.32	31.5	2.68	6.5%	99.0%	6.4%
0.40	32.9	2.80	3.4%	98.5%	3.4%
0.48	33.1	2.81	2.0%	98.5%	2.0%
0.56	33.9	2.88	0.9%	98.5%	0.9%
0.64	33.3	2.83	0.8%	98.5%	0.8%
0.72	37.5	3.19	0.8%	97.0%	0.8%
0.80	36.4	3.09	0.3%	97.5%	0.3%
1.00	37.0	3.14	0.7%	97.5%	0.7%
2.00	47.8	4.06	0.6%	93.0%	0.5%
3.00	56.7	4.82	0.0%	89.0%	0.0%
					87.4%
				% rain falling at >3"/hr or bypassing treatment =	12.3%
				Assumed removal efficiency for bypassed flows =	0.0%
				Predicted Net Annual Load Removal Efficiency =	**87%**

1 - Design Ratio = (Total Drainage Area) x (Runoff Coefficient) x (cfs to gpm conversion) / Grit Chamber Area
2 - Operating Rate (gpm/sf) = intensity ("/hr) x Design Ratio.
3 - Based on 14 years of 15 minute precipitation data from NCDC station 3821, Hyannis, in Barnstable County, MA

Calculated by: DRA 1/14/2020

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

New Bedford Regional Airport

New Bedford, MA

WQS-5

AREA	4.06	acres	**CASCADE MODEL**	CS-5
WEIGHTED C	0.90			
TC	10.00	minutes	**RAINFALL STATION**	66

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Hydraulic Loading Rate (gpm/ft2)	Removal Efficiency (%)	Incremental Removal (%)
0.08	35.3%	6.68	100.0	35.3
0.16	23.8%	13.36	99.3	23.6
0.24	12.9%	20.04	93.1	12.0
0.32	7.8%	26.72	86.8	6.8
0.40	4.9%	33.39	80.5	4.0
0.48	3.5%	40.07	74.2	2.6
0.56	1.7%	46.75	68.0	1.2
0.64	1.8%	53.43	61.7	1.1
0.72	1.9%	60.11	55.4	1.0
0.80	0.9%	66.79	49.1	0.4
1.00	2.3%	80.01	35.2	0.8
2.00	2.9%	80.01	17.6	0.5
3.00	0.2%	80.01	11.7	0.0
				89.4
			Removal Efficiency Adjustment[2] =	0.0%
			Predicted % Annual Rainfall Treated =	98.2%
			Predicted Net Annual Load Removal Efficiency =	**89.4%**

1 - Based on 14 years of 15 minute precipitation data from NCDC station 3821, Hyannis, in Barnstable County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

APPENDIX E

GEOTECH REPORT

R. W. Gillespie & Associates, Inc.
Geotechnical Engineering • Geohydrology • Materials Testing Services

18 November 2009

Michael L Bramhall, P.E.
Airport Solutions Group, LLC
390 Main Street, Suite 100
Woburn, MA 01801

Subject: Geotechnical Evaluation
Pavement Rehabilitation Strategies for Ramps
New Bedford Regional Airport
New Bedford, Massachusetts
RWG&A Project No. 1229-01

Dear Mr. Bramhall:

In accordance with Airport Solutions Group, LLC (ASG)'s request and authorization, R. W. Gillespie & Associates, Inc., (RWG&A) has completed a subsurface investigation and laboratory testing program for the subject project. Our work was completed in general accordance with our proposal to you dated 21 July 2009 (note: RWG&A Proposal No. P-7255GI). Preliminary copies of laboratory testing and the exploration logs were provided to you via email on 02 and 05 November 2009. Our work scope included the following:

1. Drilled, logged, and sampled thirty-eight (38) borings (B-1 to B-36 and TP-1 and TP-2) at locations provided by ASG.

2. Completed sieve/hydrometer analyses of sixty-two (62) soil samples, Atterberg Limit determinations on sixteen (16) soil samples, and extraction, gradation, and absorption tests on twelve (12) asphaltic pavement core samples. Delivered the remaining asphaltic pavement core samples and recovered liquid asphalt to the UMass-Dartmouth laboratory.

3. Performed twelve (12) field California Bearing Ratio (CBR) tests at locations selected by Airport Solutions Group, LLC.

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Portsmouth, NH 03801
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207-286-8008 • Fax 207-286-2882
www.rwgillespie.com

P.O. Box 289
Augusta, ME 04344
207-623-4914 • Fax 207-623-3429

4. Prepared this summary of the work, together with the final exploration logs.

The project location is shown on Figure 1, *Locus Map*. The general location of the borings and field CBRs are shown on Figure 2, *Exploration Location Plan*. The boring and CBR locations were selected and marked in the field by ASG prior to drilling. The explorations were drilled by Great Works Pump & Test Boring, Inc., of Rollinsford, New Hampshire, using a track-mounted drill rig during the time period from 21 to 28 September 2009. Exploration activities were coordinated and monitored by RWG&A personnel who prepared the exploration logs. The soils were described in general accordance with *ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*.

Laboratory and field results have been summarized in tabular form; field CBR results are also presented in graphical format, and individual exploration logs are presented in Appendix A. A summary of the data is as follows:

TABLE I. Summary of Sieve Analyses
TABLE II. Summary of Field CBR Values
APPENDIX A. Exploration Logs
APPENDIX B. Sieve / Hydrometer Tests and Atterberg Limits
APPENDIX C. Field CBR Tests
APPENDIX D. Asphalt Extraction/Gradation Tests

Asphaltic pavement was encountered at each of the exploration locations; thicknesses ranged from 2 to 6 inches. Concrete pavement was encountered below asphaltic pavement in borings B-13 and B-14, with thicknesses of 6 and 5 inches, respectively. Subsoils at the project site generally consist of fill over naturally deposited sand and silty sand. Organic silt was encountered in a few explorations, generally at the fill/naturally deposited soil interface. The fill soils generally consisted of coarse to fine sand with little silt and have USCS classifications of GP-GM, GW-GM, SW-SM, SP-SM and SM. The underlying naturally deposited soils generally consisted of interbedded layers of sand and silty sand, with USCS classifications of SP, SP-SM, SW-SM, and SM. Groundwater was observed in several of the explorations at depths of 2.5 to 7 feet below current ground surface. Field CBR values ranged from 1.6 to 72.6, with most values in the range of 3 to 7.5.

Comparison of grain size distribution tests to frost susceptibility criteria suggests moderate to high susceptibility, although observation of existing pavement did not reveal evidence of frost heaving or ice lense formation. ASG should evaluate a design governed by frost, as well as one which is based on aircraft for comparative purposes.

Proximity of groundwater to pavement section subgrade could be problematic with respect to compaction of subgrade and/or subbase materials; test sections at the start of construction might be advantageous. Dewatering in areas of shallow groundwater should be anticipated in the design, and construction documents.

We trust the foregoing meets your present needs, and if you have any questions, please contact us.

Very truly yours,
R. W. GILLESPIE & ASSOCIATES, INC.

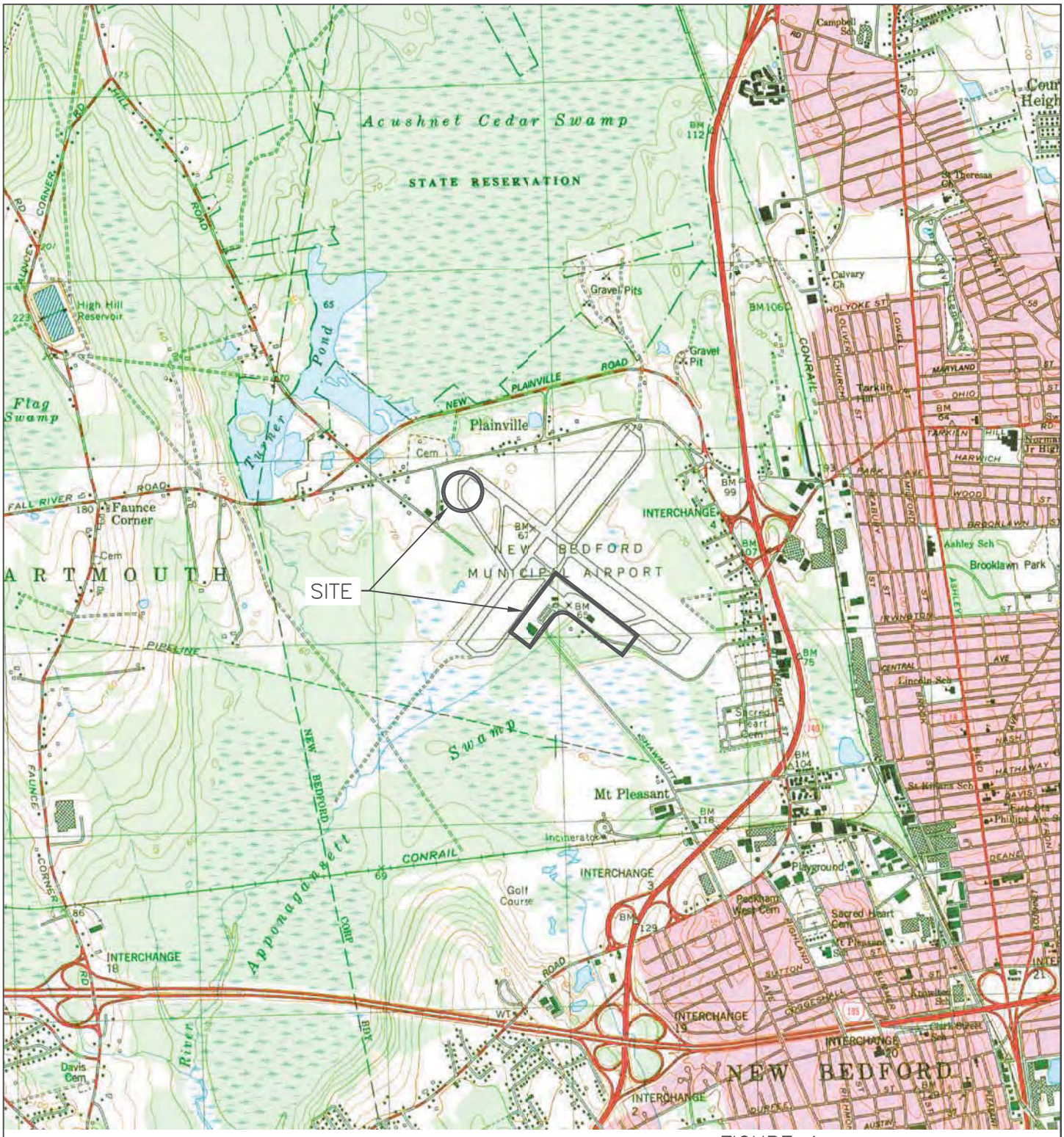
Marc R. Grenier, P.E.
Project Geotechnical Engineer

Robert W. Gillespie, P. E.
Principal Geotechnical Engineer

MRG/RWG:md
In quadruplicate

Attachments:
Figure 1, Locus Map
Figure 2, Exploration Location Plan
Table I, Summary of Sieve Analyses
Table II, Summary of Field CBR Values
Appendix A, Exploration Logs
Appendix B. Sieve / Hydrometer Tests and Atterberg Limits
Appendix C. Field CBR Tests
Appendix D. Asphalt Extraction/Gradation Tests

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N

0 2000 3000 4000

SCALE, FEET

SOURCE:
USGS 7.5–MINUTE TOPOGRAPHIC QUADRANGLE
OF NEW BEDFORD NORTH, DATED 1990.

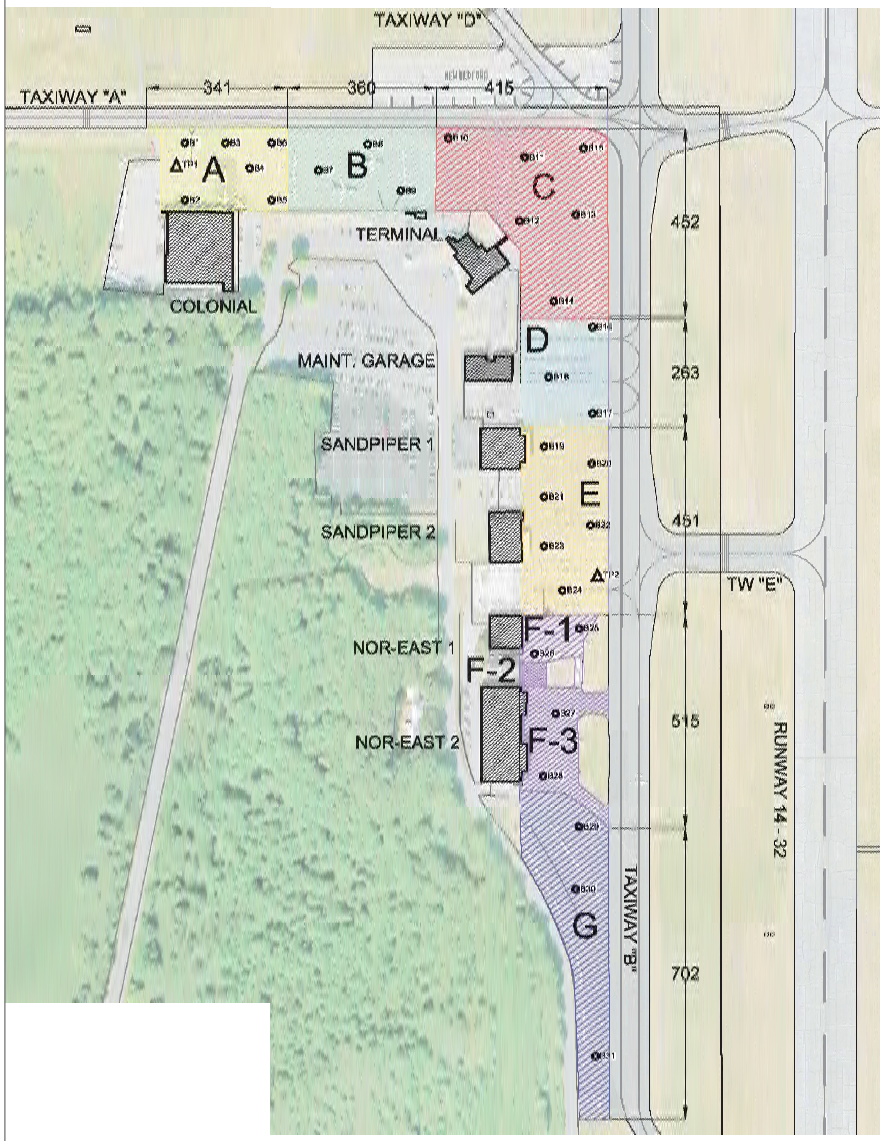
FIGURE 1
LOCUS MAP
PAVEMENT REHABILITATION STRATEGIES FOR RAMPS
NEW BEDFORD REGIONAL AIRPORT
NEW BEDFORD, MASSACHUSETTS

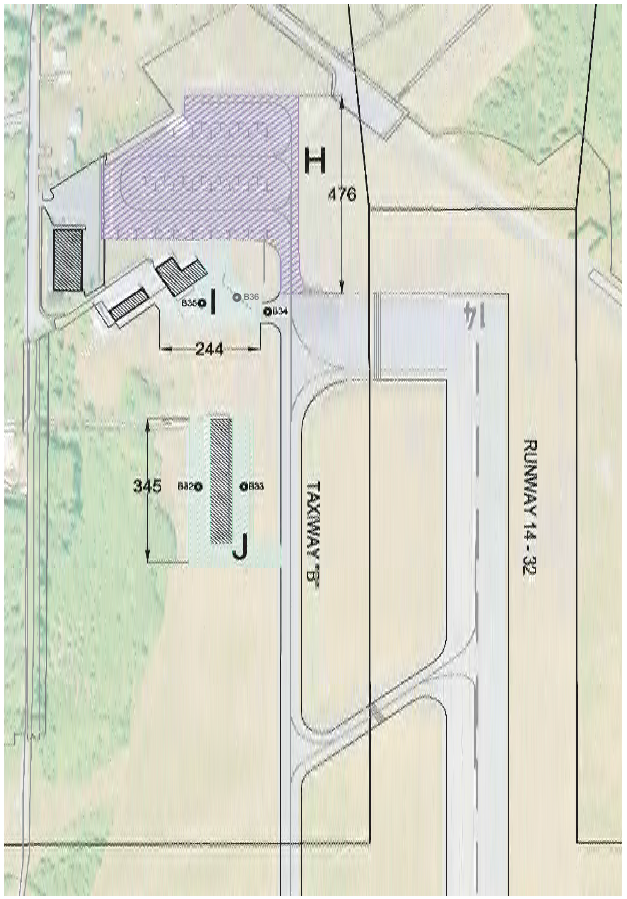
NOVEMBER 2009 PROJECT NO. 1229–01

R.W Gillespie & Associates, Inc.
CONSULTING GEOTECHNICAL & ENVIRONMENTAL SPECIALISTS

86 Industrial Park Rd., Suite 4 Saco, Maine 04072 (207) 286–8008
Fax: (207) 286–2882 E–mail: rwg–a@rwg–a.com

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LEGEND:

TP1 PROPOSED TEST PIT LOCATION

B1 PROPOSED BORING LOCATION

SOURCE:
DRAWING TITLED "PROPOSED AIRCRAFT APRON BORING LOCATIONS" SHEETS 1 AND 2 BY AIRPORT SOLUTIONS GROUP, DATED 14 MAY 2009

N

0 300 450 600
SCALE, FEET

FIGURE 2
EXPLORATION LOCATION PLAN
PAVEMENT REHABILITATION STRATEGIES FOR RAMPS
NEW BEDFORD REGIONAL AIRPORT
NEW BEDFORD, MASSACHUSETTS

NOVEMBER 2009 PROJECT NO. 1229-01

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TABLE I

Summary of Sieve Analyses

Pavement Rehabilitation Strategies for Ramps

New Bedford Regional Airport, New Bedford, Massachusetts

Sieve Analysis														
Boring Number	Depth of Sample, ft	Percent Passing Screen or Sieve Size											% Finer than 0.005 mm	USCS
		1"	3/4"	1/2"	3/8"	4	10	20	40	80	140	200		
B-1, S-1	0.3 - 2.3	100.0	90.5	86.4	81.7	75.1	63.7	50.5	37.8	21.7	16.5	14.2	3.7	SM
B-2, S-1	0.3 - 2.3	89.2	89.2	87.1	86.3	83.3	76.0	64.5	51.8	25.2	13.6	9.6	2.3	SP-SM
B-2, S-3	4.3 - 6.3			100.0	98.4	93.4	89.0	83.9	69.6	33.5	14.2	10.4	2.4	SP-SM
B-3, S-1	0.4 - 2.4	90.6	90.6	78.7	70.4	60.6	50.8	40.0	28.0	14.3	10.1	8.4	2.4	SP-SM
B-4, S-1	0.3 - 2.3		100.0	98.5	96.0	89.8	80.1	76.4	51.2	29.5	21.4	17.5	5.0	SM
B-5, S-1	0.3 - 2.3	100.0	87.7	73.7	67.5	57.4	47.0	35.9	26.0	14.9	10.2	7.9	2.4	SP-SM
B-5, S-3	4.3 - 6.3				100.0	96.3	92.0	83.1	67.5	37.1	27.1	22.4	2.2	SM
B-6, S-1	0.4 - 2.4	100.0	83.6	78.2	77.1	70.1	59.2	46.0	33.3	17.9	13.1	10.9	3.4	SP-SM
B-6, S-3	4.5 - 6.5		100.0	98.0	96.7	92.6	69.9	38.9	19.7	9.4	6.7	5.5	1.3	SW-SM
B-7, S-1	0.4 - 2.4	85.9	85.9	81.4	79.2	73.3	61.5	49.3	36.7	22.4	17.0	14.1	4.1	SM
B-8, S-1	0.5 - 2.5		100.0	92.7	86.6	76.8	61.9	45.9	32.3	15.9	11.3	9.5	2.5	SP-SM
B-8, S-3	4.5 - 6.5		100.0	97.4	97.4	92.9	82.7	57.7	22.2	7.4	5.7	4.8	1.4	SP
B-9, S-1	0.5 - 2.5	100.0	91.8	82.4	75.8	72.2	64.8	55.8	42.5	23.7	18.3	15.0	4.1	SM

TABLE I, Continued
Summary of Sieve Analyses
Pavement Rehabilitation Strategies for Ramps
New Bedford Regional Airport, New Bedford, Massachusetts

Sieve Analysis														
Boring Number	Depth of Sample, ft	Percent Passing Screen or Sieve Size											% Finer than 0.02 mm	USCS
		1"	3/4"	1/2"	3/8"	4	10	20	40	80	140	200		
B-10, S-1	0.4 - 2.4	100.0	61.7	54.8	51.4	48.2	45.1	40.9	37.0	15.8	6.4	5.0	1.5	GP-GM
B-10, S-3	4.4 - 6.4					100.0	97.5	88.9	73.1	49.4	37.9	29.2	0.5	SM
B-11, S-1	0.4 - 2.4	100.0	93.5	84.2	76.6	66.7	55.6	43.5	33.3	21.6	16.5	14.0	3.2	SM
B-12, S-1	0.4 - 2.4	100.0	94.3	77.6	62.5	47.6	35.5	25.3	17.2	10.5	8.3	7.2	1.6	GW-GM
B-12, S-3	4.4 - 6.4	100.0	81.2	70.6	67.3	56.5	45.5	33.3	24.6	15.5	12.2	10.6	1.6	SW-SM
B-12, S-4	6.4 - 8.4					100.0	99.9	89.2	66.1	30.5	20.7	17.5	2.0	SM
B-13, S-1	1.0 - 3.0	83.8	83.8	70.1	66.3	57.3	46.8	36.0	25.1	13.0	9.4	7.6	1.2	SP-SM
B-14, S-1	0.7 - 2.7	83.7	83.7	77.8	71.2	63.1	51.1	35.4	22.3	11.1	8.2	7.0	1.5	SP-SM
B-14, S-3	4.7 - 6.7			100.0	99.2	93.9	77.2	50.8	22.1	6.1	4.5	3.8	0.9	SP
B-15, S-1	0.4 - 2.4	89.5	85.1	80.2	72.9	59.8	45.3	33.3	24.8	16.4	12.9	11.3	2.7	SW-SM
B-16, S-1	0.3 - 2.3	86.9	70.7	67.8	63.7	56.3	45.9	36.5	24.6	13.6	10.5	9.0	2.2	SP-SM
B-16, S-3	4.3 - 6.3			100.0	97.3	88.7	71.3	38.0	13.9	5.2	3.9	3.3	0.5	SP
B-17, S-1	0.5 - 2.5		100.0	94.2	87.2	81.1	71.5	58.1	39.1	17.0	12.2	10.5	2.9	SW-SM

TABLE I, Continued
Summary of Sieve Analyses
Pavement Rehabilitation Strategies for Ramps
New Bedford Regional Airport, New Bedford, Massachusetts

Sieve Analysis														
Boring Number	Depth of Sample, ft	Percent Passing Screen or Sieve Size											% Finer than 0.02 mm	USCS
		1"	3/4"	1/2"	3/8"	4	10	20	40	80	140	200		
B-18, S-1	0.5 - 2.5	100.0	92.9	80.6	80.6	73.7	62.6	50.5	34.7	18.6	13.5	11.0	3.7	SW-SM
B-19, S-1	0.2 - 2.2	78.5	78.5	70.1	67.2	59.4	48.2	37.5	27.5	16.4	12.0	9.8	2.4	SP-SM
B-19, S-3	4.0 - 6.0		100.0	89.4	87.8	74.1	53.5	33.5	20.4	10.4	7.2	5.6	1.9	SW-SM
B-19, S-4	6.0 - 8.0				100.0	99.7	96.1	86.8	76.3	52.5	39.3	29.8	1.4	SM
B-20, S-1	0.2 - 2.2		100.0	93.2	92.1	88.5	80.6	73.0	62.8	41.4	29.3	23.6	6.9	SM
B-20, S-3	4.2 - 6.2						100.0	99.9	99.9	76.2	26.3	14.2	1.9	SM
B-20, S-4	6.0 - 8.0					100.0	99.5	97.3	93.3	54.1	20.0	9.9	1.9	SP-SM
B-21, S-1	0.5 - 2.5				100.0	99.1	96.3	91.3	77.1	42.0	24.6	18.1	7.0	SM
B-21, S-4	6.5 - 8.5				100.0	99.3	96.1	85.6	68.7	24.9	10.8	7.3	1.4	SP-SM
B-22, S-1	0.3 - 2.3	81.0	81.0	81.0	78.6	74.4	66.4	53.8	40.2	23.6	17.1	14.0	3.9	SM
B-22, S-3	4.3 - 6.3					100.0	99.8	94.4	81.2	36.9	14..5	8.0	1.5	SP-SM
B-23, S-1	0.3 - 2.3			100.0	94.6	89.1	75.9	56.4	39.2	22.3	16.6	14.0	2.5	SM
B-24, S-1	0.4 - 2.4		100.0	98.3	96.9	90.2	79.0	65.0	48.2	22.8	16.2	14.0	1.3	SM

TABLE I, Continued
Summary of Sieve Analyses
Pavement Rehabilitation Strategies for Ramps
New Bedford Regional Airport, New Bedford, Massachusetts

Sieve Analysis														
Boring Number	Depth of Sample, ft	Percent Passing Screen or Sieve Size											% Finer than 0.02 mm	USCS
		1"	3/4"	1/2"	3/8"	4	10	20	40	80	140	200		
B-24, S-3	4.4 - 6.4				100.0	99.5	95.7	89.2	76.8	34.3	16.3	10.1	1.6	SP-SM
B-25, S-1	0.3 - 2.3	100.0	87.2	87.2	83.6	75.6	65.0	53.7	41.5	26.6	20.5	17.4	1.8	SM
B-26, S-1	0.2 - 2.2			100.0	96.1	82.1	81.8	69.0	54.4	34.4	25.0	20.2	2.5	SM
B-26, S-3	4.2 - 6.2				100.0	98.3	90.9	67.5	28.5	6.7	4.7	4.1	2.0	SP
B-27, S-1	0.3 - 2.3		100.0	95.4	92.9	79.3	60.5	42.7	28.1	15.6	11.3	9.3	2.5	SW-SM
B-28, S-1	0.5 - 2.5	100.0	87.6	82.8	76.4	66.6	56.1	43.9	30.4	12.9	8.5	7.1	2.4	SP-SM
B-28, S-2	2.5 - 4.5		100.0	92.2	88.4	79.9	70.8	62.1	52.1	33.0	21.7	16.4	3.3	SM
B-28, S-4	6.0 - 8.0							100.0	99.7	83.5	57.9	44.5	3.3	SM
B-29, S-1	0.3 - 2.3	79.8	75.7	70.1	61.7	52.6	42.8	35.1	26.1	16.4	12.4	10.2	3.4	GP-GM
B-30, S-1	0.3 - 2.3		100.0	83.9	70.9	62.5	49.9	38.9	29.1	18.5	14.0	12.0	4.3	SW-SM
B-30, S-3	4.5 - 6.5		100.0	96.9	94.9	89.0	78.6	67.3	56.1	39.8	30.5	23.3	5.7	SM
B-31, S-1	0.5 - 2.5	82.8	77.3	76.0	73.9	64.8	56.7	47.1	35.8	13.1	17.9	15.1	5.3	SM
B-32, S-1	0.2 - 2.2		100.0	90.5	86.2	80.4	70.5	60.9	51.4	39.9	33.7	30.3	5.0	SM

TABLE I, Continued

Summary of Sieve Analyses

Pavement Rehabilitation Strategies for Ramps

New Bedford Regional Airport, New Bedford, Massachusetts

Sieve Analysis														
Boring Number	Depth of Sample, ft	Percent Passing Screen or Sieve Size											% Finer than 0.02 mm	USCS
		1"	3/4"	1/2"	3/8"	4	10	20	40	80	140	200		
B-32, S-3	4.2 - 6.2			100.0	97.9	92.2	80.3	62.7	43.4	24.9	19.7	16.6	3.3	SM
B-32, S-4	6.2 - 8.2				100.0	98.8	96.8	95.3	93.1	61.6	29.1	17.1	2.3	SM
B-33, S-1	2.0 - 4.0	100.0	91.6	85.8	81.2	68.6	50.7	34.9	18.7	9.8	7.7	6.5	2	SP-SM
B-34, S-1	0.2 - 2.2		100.0	98.3	94.6	80.6	85.6	77.9	67.3	42.8	27.4	20.3	5.3	SM
B-34, S-3	4.0 - 6.0	100.0	86.3	65.1	64.0	56.2	46.7	35.9	26.4	16.8	12.4	10.0	2.2	SP-SM
B-35, S-1	0.2 - 2.2		100.0	90.8	85.6	73.3	57.3	40.5	27.5	13.0	8.0	6.0	2.9	SP-SM
B-36, S-1	0.2 - 2.2				100.0	90.4	75.4	62.3	51.6	36.2	27.6	22.6	4.1	SM
B-36, S-3	4.2 - 6.2		100.0	92.3	86.0	72.4	52.7	33.9	20.0	10.3	7.4	6.0	1.7	SW-SM
TP-1, S-1	0.3 - 2.3	100.0	93.1	84.3	77.7	68.4	58.3	46.5	33.3	17.2	12.3	10.3	2.7	SP-SM
TP-2, S-1	0.3 - 2.3	93.2	93.2	92.7	91.0	85.1	75.5	63.9	49.9	29.0	19.1	15.4	3.5	SM

TABLE II

Summary of Field CBR Values

Project: Pavement Rehabilitation Strategies for Ramps Client: Airport Solutions Group, LLC
RWG&A Project No: 1229-01 Date: September 2009
Location: New Bedford Regional Airport, New Bedford, Massachusetts

Location	Depth	CBR Value at 0.1" penetration
B-6	27"	7.0
B-8	30"	31.6
B-15	26"	72.6
B-18	26"	4.3
B-20	26"	1.6
B-25	27"	7.5
B-27	27"	33.0
B-30	28"	14.8
B-33	16"	2.8
B-35	24"	11.5
TP-1	27"	4.1
TP-2	28"	4.4

APPENDIX A

EXPLORATION LOGS

Pavement Rehabilitation Strategies for Ramps
New Bedford Regional Airport
New Bedford, Massachusetts

R.W. Gillespie & Associates, Inc.
Geotechnical Engineering • Geohydrology • Materials Testing Services

Boring Log: B-1
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 3.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/21/09
Date Completed: 09/21/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (3 inches). FILL; Gravelly silty sand, medium dense, moist, fine to medium sand, few gravel, few to trace coarse sand, light brown to gray.	13	9 10 6 2	16	9	GS
2.5			S-2	ORGANIC SILT (OL); Soft, moist, silt with sand, little organics, dark brown.	14	3 2 2 3	4		
			S-3	SILTY SAND (SM); Very loose, wet, fine to medium sand, little silt, few coarse sand, gray.	6	2 2 5 12	7		
5			S-4		12	12 19 19 17	38		
7.5				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-2
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: Not Obs.

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/21/09
Date Completed: 09/21/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (3.5 inches).	10	12 10 9 5	19	11	GS
				FILL; Sand with silt, medium dense, moist, fine to medium sand, few silt, trace coarse sand, light brown then dark brown.					
				FILL; Sand, medium dense, moist, fine medium sand, trace coarse sand, light brown.					
2.5			S-2		12	2 3 7 7	10		
				ORGANIC SILT (OL); Soft, moist, silt with sand, trace organics, organic odor, dark brown to black.					
				SILTY SAND (SP-SM); Dense, moist, fine to medium sand, few coarse sand, few silt, trace gravel, gray.					
			S-3		16	9 18 25 24	42	16	GS
5									
			S-4		18	15 19 20 20	39		
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-3
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 3.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/21/09
Date Completed: 09/21/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (4 inches).					
			S-1	FILL; Sand with gravel, medium dense, moist, fine to medium sand, little gravel, light brown.	6	9 12 4 4	16	6	GS
2.5			S-2	FILL; Sand with silt, loose, moist, fine sand, few medium sand, few silt, trace organics, dark brown to black.	20	3 3 3 8	6		
			S-3		12	10 13 12 13	25		
5				SILTY SAND (SP-SM); Medium dense, wet, fine sand, little silt, light brown.					
			S-4	SAND (SP); Medium dense, wet, fine to medium sand, trace coarse sand, light brown.	20	8 9 10 12	19		
7.5				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-4
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/21/09
Date Completed: 09/21/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (3.5 inches). FILL; Sand, medium dense, moist, fine to medium sand, few silt, trace coarse sand, dark brown.	15	12 10 18 7	28	14	GS
2.5			S-2		0	5 4 7 12	11		
			S-3	SAND (SP); Dense, wet, fine to medium sand, trace coarse sand, trace silt, gray.	1	23 26 22 17	48		
5 ▽			S-4		7	11 12 13 17	25		
7.5				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-5
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/21/09
Date Completed: 09/21/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (3 inches).	12	7 14 12 8	26	6	GS
				FILL; Gravelly sand, medium dense, moist, fine to medium sand, little gravel, few coarse sand, trace silt, light brown.					
2.5			S-2	FILL; Silty sand medium dense, moist, fine sand, few silt, trace medium sand, dark brown.	7	11 22 27 25	49		
				FILL; Silty sand with gravel, dense, moist, fine to medium sand, little silt, few gravel, gray.					
			S-3	SAND (SP); Medium dense, wet, fine to medium sand, little silt, gray.	21	9 12 13 13	25	28	GS
5									
			S-4		20	7 8 9 9	17	12	AL
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-6

Total Depth (ft): 8.5

Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/18/09
Date Completed: 09/18/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (3.5 inches).					
			S-1	FILL; Gravelly sand, loose, moist, fine to medium sand, few gravel, dark brown to light brown.	6	2 5 4 3	9	12	GS
2.5			S-2	FILL; Sand with silt, loose, moist, fine to medium sand, little to few coarse sand, few silt, moist, dark brown.	6	4 4 5 9	9		
				SAND (SW-SM); Loose, moist then wet, fine to medium sand, few coarse sand, trace silt, light brown.					
5			S-3		16	12 12 12 8	24	12	GS
7.5			S-4		20	5 3 4 3	7		
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-7
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/18/09
Date Completed: 09/18/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (4.5 inches).					
			S-1	FILL; Gravelly sand, medium dense, moist, fine to medium sand, little gravel to coarse sand, dark brown.	17	13 17 12 16	29	7	GS
				FILL; Sand, medium dense, moist, fine to medium sand, few coarse sand, trace gravel, light brown.					
2.5			S-2	FILL; Sand with silt, medium dense, moist, fine to medium sand, few silt, trace gravel, dark brown then gray. Fill grades finer.	14	18 23 27 15	50	12	AL
	▽		S-3	SAND (SP); Medium dense, wet, fine to medium sand, little to few coarse sand, light brown.	14	16 13 10 10	23		
5									
			S-4		10	6 7 6 7	13		
7.5									
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-8
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/18/09
Date Completed: 09/18/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (5.5 inches).					
			S-1	FILL; Gravelly sand, very dense, moist, fine to medium sand, little gravel to coarse sand, few silt, dark brown.	17	25 35 21 25	56	5	GS
2.5			S-2	FILL; Sand, very dense, moist, fine to medium sand, few coarse sand, light brown.	16	13 16 15 12	31		
			S-3	SAND (SP); Medium dense to loose, wet, fine to medium sand, few coarse sand, light brown.	14	7 7 6 7	13	16	GS
7.5			S-4		20	5 4 3 4	7		
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-9
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/18/09
Date Completed: 09/18/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (6 inches).					
			S-1	FILL; Sandy gravel, dense, moist, fine gravel, little fine to medium sand, dark brown.	17	20 20 13 18	33	9	GS
				FILL; Sandy gravel, medium dense, moist, fine gravel, little fine to medium few silt, sand, dark brown.					
2.5			S-2		11	20 21 24 22	45	6	AL
▽			S-3	SAND (SP); Medium dense, wet, fine to medium sand, trace coarse sand, light brown.	10	16 12 9 8	21		
5									
			S-4		10	7 7 6 6	13		
7.5									
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-10
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: Not Obs.

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/18/09
Date Completed: 09/18/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (4.5 inches).					
			S-1	FILL; Gravelly sand, dense, moist, fine to medium sand, some gravel, dark brown.	13	18 21 18 23	39	4	GS
				FILL; Sand, dense, moist, fine sand, trace silt, light brown.					
2.5			S-2	FILL; Sand, dense, moist, fine to medium sand, few coarse sand, light brown.	16	19 17 19 17	36		
			S-3	SAND (SP); Medium dense to loose, moist, fine sand, few medium sand, little silt, light brown.	12	13 11 9 9	20	17	GS
5									
			S-4		16	5 5 5 10	10	16	AL
7.5									
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-11
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/17/09
Date Completed: 09/17/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (4.5 inches).					
			S-1	FILL; Gravelly sand, very dense, moist, fine to medium sand, few gravel, few coarse sand, dark brown.	12	28 32 26 27	58	6	GS
2.5			S-2	FILL; Sand, very dense, moist, fine sand, few medium to coarse sand, trace gravel, few silt, light brown.	8	21 21 11 12	32	5	AL
5			S-3	SAND (SP); Medium densse to dense, wet, fine sand, trace medium sand and silt, light brown.	10	11 10 9 9	19		
7.5			S-4		8	21 21 11 12	32		
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Geotechnical Engineering • Geohydrology • Materials Testing Services

Boring Log: B-12
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/17/09
Date Completed: 09/17/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (4.5 inches).					
			S-1	FILL; Gravelly sand, dense, moist, fine to medium sand, few gravel, few coarse sand, dark brown.	13	22 24 17 17	41	3	GS
2.5			S-2	FILL; Sand, dense, moist, fine sand, few medium to coarse sand, trace gravel, few silt, light brown.	8	19 24 34 28	58		
5			S-3	SAND (SW-SM); Dense, moist, fine to medium sand, few coarse sand, light brown.	6	28 22 21 19	43	6	GS
7.5			S-4	SILTY SAND (SM); Medium dense, wet, fine sand, little to few silt, light brown.	6	7 8 11 10	19	17	GS
10				Bottom of Exploration at 8.5'; Not refusal.					
12.5									
15									

Notes:

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Boring Log: B-13
Total Depth (ft): 9
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/17/09
Date Completed: 09/17/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (5.5 inches).					
				CONCRETE (6 inches).					
			S-1	FILL; Gravelly sand, medium dense, moist, fine to medium sand, few gravel and coarse sand, trace silt, brown.	10	8 13 15 23	28	5	GS
2.5			S-2		12	13 16 13 9	29		
5			S-3	SAND (SP); Dense to medium dense, wet, fine to medium sand, trace coarse sand, light brown.	13	12 18 16 11	34	12	AL
7.5			S-4		20	9 6 7 7	13		
				Bottom of Exploration at 9'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-14
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/17/09
Date Completed: 09/17/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (3.5 inches).					
				CONCRETE (5 inches).					
			S-1	FILL; Sand, medium dense, moist, fine to coarse sand, trace gravel, light brown.	12	6 15 12 11	27	5	GS
2.5			S-2			14 21 23 17	44		
				FILL; Gravelly sand, dense, fine to coarse sand, few gravel, moist to wet, light brown.					
5			S-3	SAND (SP); Medium dense, wet, fine to medium sand, few coarse sand, trace gravel, light brown.	21	11 15 15 16	30	14	GS
			S-4		20	17 15 13 10	28		
7.5				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-15
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: Chris Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/17/09
Date Completed: 09/17/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (4.5 inches).					
			S-1	FILL; Gravelly sand, very dense, moist, fine to medium sand, few gravel, few to trace coarse sand, few silt, dark brown.	14	27 31 20 25	51	5	GS
				FILL; Sand, very dense, moist, fine sand, few medium to coarse sand, trace gravel, trace silt, light brown.					
2.5			S-2		12	11 17 18 18	35		
			S-3		7	14 10 7 7	17		
5				SAND (SP); Medium dense, wet, fine to medium sand, trace coarse sand, light brown.					
			S-4		10	6 6 7 5	13		
7.5				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-16
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (4 inches). FILL; Gravelly sand, dense, moist, fine to medium sand, little gravel, trace silt, orange-brown.	11	16 18 20 17	38	4	GS
2.5			S-2	SAND (SP); Dense, moist then wet, fine to medium sand, trace coarse sand, yellow-brown.	6	14 17 16 13	33		
			S-3		20	10 11 13 12	24	14	GS
5									
			S-4		22	14 15 14 11	29		
7.5				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-17
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 3'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (5 inches).					
			S-1	FILL; Sand, dense, moist, fine to medium sand, trace, gravel and coarse sand, few silt, orange-brown.	12	16 20 18 20	38	9	GS
2.5			S-2		20	14 15 12 10	27		
				ORGANIC SILT (OL); Medium dense, wet, silt, organic odor, red-brown.					
				SAND (SP-SM); Medium dense, wet, fine to medium sand, few silt, trace coarse sand, gray then brown.					
5			S-3		18	10 13 10 8	23	20	AL
			S-4		11	5 5 7 8	12		
7.5									
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-18
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (5 inches).					
			S-1	FILL; Sand, dense, moist, fine to medium sand, trace coarse sand, few silt, dark brown to orange.	15	17 18 21 10	39	9	GS
2.5			S-2	FILL; Silty sand, medium dense, moist, fine sand, few silt, trace medium sand, dark brown.	11	3 3 10 9	13	33	AL
				SAND (SP); Medium dense, wet, fine to medium sand, light brown.					
5			S-3		1	17 14 15 11	29		
			S-4		16	13 19 18 20	37		
7.5									
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-19
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (2.5 inches).	3	10 25 11 6	36	7	GS
				FILL; Sand with silt, dense, moist, fine to medium sand, few silt, fine to medium sand, few silt, trace gravel.					
2.5			S-2	FILL; Silty sand, loose, moist, fine sand, little silt, few medium sand, dark brown.	15	2 3 3 4	6		
			S-3	SAND (SW-SM); Dense, wet, fine to medium sand, trace coarse sand, gray.	13	6 14 17 16	31	14	GS
5									
			S-4	SILTY SAND (SM); Medium dense, wet, fine sand, little silt, gray.	16	11 13 14 24	27	21	GS
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-20
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (2.5 inches).	9	8 5 1 1	6	22	GS
				FILL; Gravelly silty sand, loose, moist, medium to coarse sand, few gravel, little silt, brown					
				FILL; Silty sand, loose, moist, fine sand, little to few silt, trace medium sand, gray-brown.					
2.5			S-2	SILTY SAND (SM); Medium dense, moist, fine sand, few silt, gray.	16	4 6 6 7	12	24	AL
			S-3		21	7 10 14 14	24	25	GS
5									
			S-4		18	8 9 7 8	16	26	GS
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-21
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 3'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (6 inches).					
			S-1	FILL; Sand, very loose, moist, fine to medium sand, trace silt, orange-brown.	20	4 1 1 1	2	32	GS
				FILL; Silty sand, very loose, moist to wet, fine sand, little silt, trace medium to coarse sand, dark brown.					
2.5			S-2	FILL; Gravelly sand, medium dense, wet, medium coarse sand, few gravel, trace fine sand, light brown.	13	3 5 7 10	12		
			S-3	SILTY SAND (SP-SM); Medium dense, wet, fine sand, little silt, brown-gray.	15	9 10 11 9	21		
5			S-4		16	7 20 14 6	34	19	GS
7.5				SAND WITH SILT (SM); Dense, wet, fine to medium sand, few to trace silt, orange-brown.					
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-22
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 3'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (3 inches).	6	6 5 10 16	15	12	GS
				FILL; Sand with silt, medium dense, moist, fine to medium sand, few silt, trace gravel, dark brown.					
2.5			S-2	SAND (SP-SM); Medium dense, moist then wet, fine to medium sand, trace silt, light brown.	16	11 12 14 12	26		
			S-3		14	9 9 13 14	22	21	GS
5			S-4		12	7 7 7 9	14		
7.5				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-23
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 3'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (3 inches).	13	5 11 11 17	22	6	GS
				FILL; Sand, medium dense, moist fine to medium sand, few coarse sand, few silt, orange-brown.					
2.5			S-2	SAND (SP); Medium dense to loose, moist then wet, fine to medium sand, few coarse sand, trace silt, light brown.	15	17 11 10 8	21		
			S-3		17	6 5 6 7	11		
5									
			S-4		20	5 4 4 4	8	23	AL
7.5				SILTY SAND (SP-SM); Loose, wet, fine sand, little silt, light brown.					
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-24
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (4.5 inches).					
			S-1	FILL; Sand, medium dense, moist, fine to medium sand, trace gravel and coarse sand, few silt, yellow-brown.	12	6 11 15 15	26	6	GS
2.5			S-2		11	15 14 14 12	28		
			S-3	SAND (SP-SM); Medium dense, wet, fine to medium sand, trace gravel and coarse sand, yellow-brown.	16	15 9 9 7	18	21	GS
5			S-4		10	3 3 3 3	6	24	AL
7.5				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-25
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (3 inches).					
			S-1	FILL; Sand, very dense, moist, fine to medium sand, few to trace silt, dark brown.	1	16 28 28 33	56	11	GS
				FILL; Gravelly sand, very dense, moist, fine to medium sand, few gravel, trace coarse sand, orange-brown.					
2.5			S-2		16	18 14 8 7	22		
				SAND (SP); Medium dense to loose, wet, fine to medium sand, trace coarse sand, yellow-brown.					
			S-3		12	5 6 5 4	11		
5									
			S-4		18	4 4 5 6	9		
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-26
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (2.5 inches).	8	10	19	17	GS
				FILL; Sand with silt, medium dense, moist, fine sand, few silt, dark brown.	20	11			
						8			
						10			
2.5			S-2	FILL; Sand, medium dense, moist, fine to medium sand, trace silt, orange-brown.	8	12	21	9	AL
						10			
				SAND (SP); Medium dense, wet, fine to medium sand, trace coarse sand, light brown.		11			
						12			
			S-3		8	4	16	18	GS
5						8			
						8			
						10			
			S-4		20	6	18		
						12			
7.5						6			
						7			
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-27
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (3 inches).					
			S-1	FILL; Sand, dense, fine to medium sand, few coarse sand, trace gravel, light brown.	14	16 22 24 18	46	4	GS
2.5			S-2		14	4 8 14 12	22		
				SAND (SP); Medium dense, moist, fine to medium sand, trace coarse sand, brown.					
			S-4		18	9 8 8 7	16		
5			S-4		24	6 5 5 6	10		
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-28
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (3 inches).					
			S-1	FILL; Gravelly sand, very dense, fine to medium sand, little gravel, few coarse sand, few silt, brown.	11	7 23 34 33	57	6	GS
2.5			S-2	FILL; Sand, dense, moist, fine sand, little silt, light brown.	10	20 16 17 14	33	9	GS
	▽			SAND (SP); Dense, wet, fine to coarse sand, trace gravel, trace silt, gray.	0	18 12 50/1"	62+		
5			S-3						
			S-4	SILTY SAND (SP-SM); Dense, wet, fine sand, little silt, gray.	14	12 22 20 17	42	27	GS
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-29
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 3'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (4 inches).	12	15 26 27 23	53	4	GS
				FILL; Gravelly sand, very dense, moist, fine to medium sand, little gravel, few silt, gray-brown.					
2.5			S-2		14	14 16 15 12	31		
				FILL; Sand, dense, moist, fine to medium sand, trace coarse sand, trace silt, brown.					
			S-3	SAND (SP); Dense, wet, fine to medium sand, few coarse sand, trace silt, gray.	12	14 19 16 14	35	14	AL
5									
			S-4		14	5 5 8 7	13		
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-30
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 2.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (4 inches).	13	14 25 25 29	50	5	GS
				FILL; Gravelly sand, dense, to very dense, moist, fine to medium sand, little gravel and coarse sand, few silt, gray to brown.					
2.5			S-2		16	11 16 20 40	36		
				SAND WITH GRAVEL (SP); Dense, wet, fine to coarse sand, trace gravel, gray.					
			S-3	SILTY SAND (SP-SM); Medium dense, wet, fine sand, little silt, gray.	12	8 8 4 8	12	44	GS
5				SAND WITH GRAVEL (SP); Medium dense, wet, fine to coarse sand, trace gravel, gray.					
				ORGANIC SILT (OL); Medium dense, wet, organic odor, wood fragments, some silt, red-brown.					
			S-4	SILTY SAND (SM); Dense, wet, fine sand, little silt, gray.	10	19 25 22 16	47	26	AL
7.5									
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-31
Total Depth (ft): 6
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 4'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (5 inches).					
			S-1	FILL; Gravelly sand with silt, very dense, moist, fine to medium sand, little gravel and coarse sand, trace silt, gray.	14	18 25 32 35	57	8	GS
2.5			S-2		15	14 20 24 20	44		
				SAND (SP); Dense, moist to wet, fine to medium sand, few silt, gray.					
5			S-3		5	5 8 50/4"	58+		
				Bottom of Exploration at 6'; Auger and spoon refusal, possible bedrock.					
7.5									
10									
12.5									
15									

Notes:

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Boring Log: B-32
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 5.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (2.5 inches).	15	7	38	7	GS
				FILL; Sand, dense, moist, fine to medium sand, trace gravel and coarse sand, trace silt, light brown		13 25 20			
2.5			S-2		14	18 20 22 30	42		
			S-3	SAND (SP); Dense, moist, fine sand, trace medium sand, light brown.	18	15 16 17 20	33	8	GS
5	▽			SAND WITH SILT (SM); Dense, wet, fine sand, few to trace silt, trace fine gravel, orange-brown with mottling.					
			S-4		14	10 10 11 7	21	24	GS
7.5				SILTY SAND (SM); Medium dense, wet, fine sand, few silt, light brown.					
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-33
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (3 inches).					
				FILL; Gravelly sand, moist, fine to medium sand, little gravel, trace cobbles, light brown.					
			S-1	FILL; Sand, very dense, moist, fine to medium sand, few gravel, yellow-brown..	13	12 21 50/5"	71+	2	GS
2.5									
			S-2	SILTY SAND (SM); Dense, moist to wet, fine sand, little silt, gray-brown.	9	12 16 25 19	41	23	AL
5 ▽									
			S-3		7	8 8 6 6	14		
7.5				SAND (SP); Medium dense, wet, fine to medium sand, trace silt, gray-brown.					
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-34
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 6'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/14/09
Date Completed: 09/14/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (2.5 inches).	14	7 8 8 6	16	10	GS
				FILL; Silty sand, medium dense, moist, fine to medium sand, trace gravel, little silt, orange-brown.					
2.5			S-2		15	14 22 28 42	50		
			S-3		9	28 35 50/5"	85+	3	GS
5									
			S-4	SAND (SP); Dense, wet, fine sand, few silt, brown.	15	8 15 15 17	30		
7.5				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Geotechnical Engineering • Geohydrology • Materials Testing Services

Boring Log: B-35
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 6'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/14/09
Date Completed: 09/14/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (2 inches).	12	6 12 12 10	24	5	GS
				FILL; Sand, medium dense, moist, fine sand, trace medium sand, trace silt, dark brown.					
				FILL; Sand, medium dense, moist, fine to medium sand, trace coarse sand and gravel, yellow-brown.					
2.5			S-2		16	3 3 14 28	17		
			S-3		13	31 31 30 25	61		
5									
			S-4	SAND (SP-SM); Very dense, moist, fine sand, few to trace silt, yellow-brown.	12	21 18 17 17	35		
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

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Boring Log: B-36
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 7'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/15/09
Date Completed: 09/15/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (2 inches). FILL; Gravelly sand with silt, medium dense, moist, fine to medium sand, few gravel and coarse sand, little silt, dark gray.	12	5 6 9 8	15	9	GS
2.5			S-2	FILL; Silty sand, medium dense, moist, fine sand, little silt, orange and dark brown.	11	5 11 31 33	42	3	AL
5			S-3	FILL; Gravelly sand, dense, moist, fine to medium sand, few gravel, light brown.	14	25 27 19 18	46	2	GS
7.5			S-4	SAND (SP); Medium dense, moist to wet, fine sand, few silt, light brown.	16	16 12 11 11	23		
10				Bottom of Exploration at 8'; Not refusal.					
12.5									
15									

Notes:

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Boring Log: TP-1
Total Depth (ft): 8
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 5.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/21/09
Date Completed: 09/21/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0				ASPHALTIC PAVEMENT (3 inches).					
			S-1	FILL; Sand, medium dense, moist, fine to medium sand, few coarse sand, trace gravel, trace silt, light brown.	4	9 12 18 16	30	5	GS
2.5			S-2		2	4 4 3 1	7		
				ORGANIC SILT (OL); Soft, moist, silt, little sand, trace organics, organic odor, dark brown.					
			S-3	SILTY SAND (SP-SM); Loose then dense, moist then wet, fine to medium sand, little to few silt, few coarse sand, gray-brown.	0	2 2 1 15	3		
5				▽					
			S-4		2	10 14 30 36	44		
7.5									
				Bottom of Exploration at 8'; Not refusal.					
10									
12.5									
15									

Notes:

R.W. Gillespie & Associates, Inc.
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Boring Log: TP-2
Total Depth (ft): 8.5
Sheet 1 of 1

Project Name: Pavement Rehabilitation Strategies for Ramps
RWG&A Project No. 1229-01
Location: New Bedford, MA
Client: Airport Solutions Group, LLC
RWG&A Representative: C. Morrell
Boring Location: As marked
Boring Abandonment Method: Backfilled with cuttings
Observed Water Depth: 2.5'

Drilling Contractor: Great Works Test Boring
Drill Rig: Mobile Acker
Driller Rep.: Jeff & Will
Date Started: 09/16/09
Date Completed: 09/16/09
Surface Elevation: ()
Drilling Method: 2 1/4" HSA
Casing Type: n/a

DEPTH, FT.	SYMBOL	SAMPLES	SAMPLE NUMBER	DESCRIPTION OF MATERIAL	SAMPLE RECOVERY, IN.	BLOWS PER 6"	SPT-N BLOWS PER FT.	MOISTURE CONTENT %	LAB TESTS
0			S-1	ASPHALTIC PAVEMENT (3.5 inches). FILL; Gravelly sand with silt, medium dense, moist, fine to medium sand, few gravel, little silt, dark brown.	16	7 5 10 8	15	11	GS
2.5 ▽			S-2	SAND (SP-SM); Loose, moist, medium to fine sand, few silt, trace coarse sand, yellow-brown.	17	5 5 6 11	11		
5			S-3		21	3 4 4 4	8		
7.5			S-4		20	4 5 4 4	9		
				Bottom of Exploration at 8.5'; Not refusal.					
10									
12.5									
15									

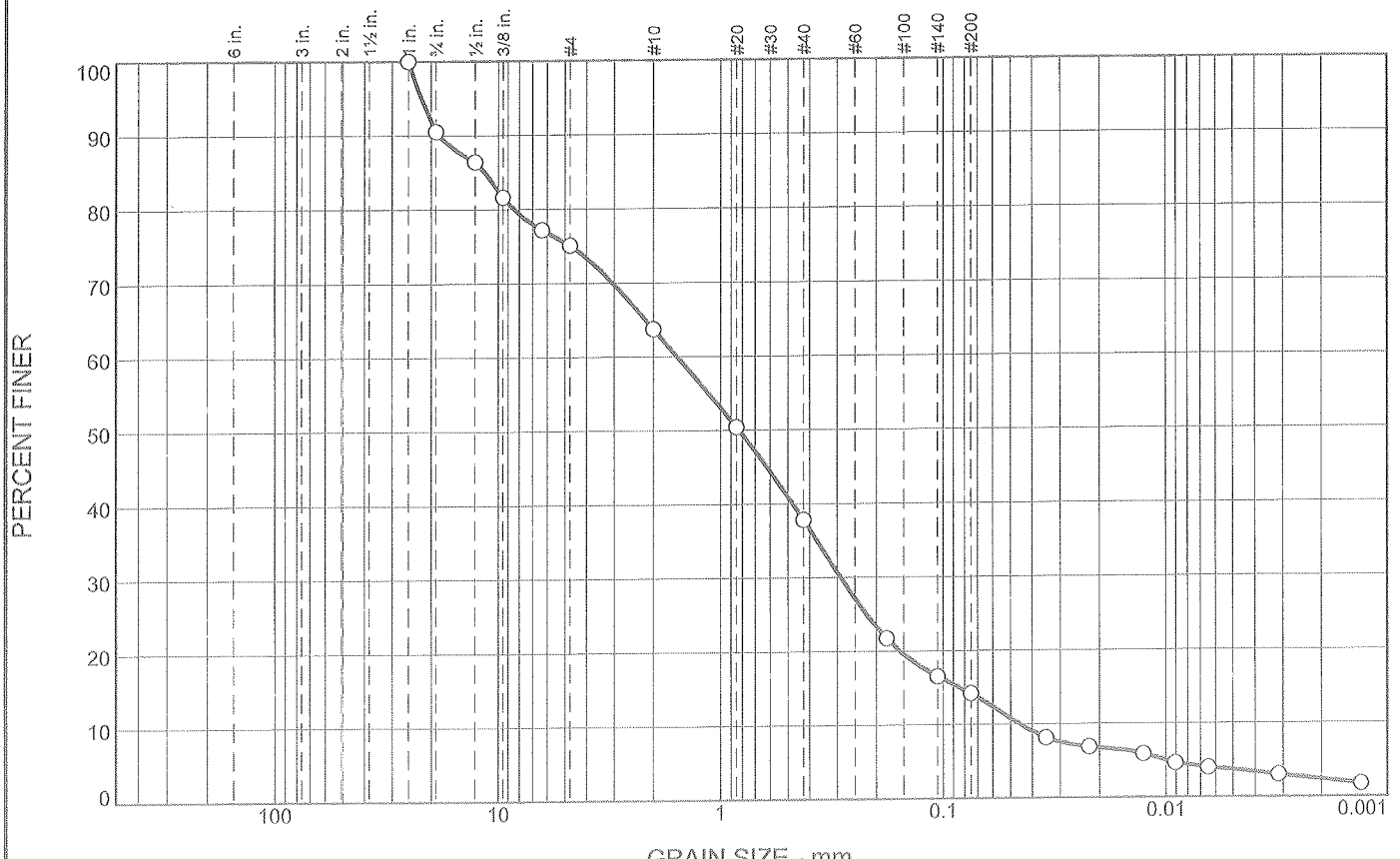
Notes:

APPENDIX B

SIEVE / HYDROMETER TESTS AND ATTERBERG LIMITS

Pavement Rehabilitation Strategies for Ramps
New Bedford Regional Airport
New Bedford, Massachusetts

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.5	15.4	11.4	25.9	23.6	10.5	3.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	90.5		
1/2"	86.4		
3/8"	81.7		
1/4"	77.2		
#4	75.1		
#10	63.7		
#20	50.5		
#40	37.8		
#80	21.7		
#140	16.5		
#200	14.2		
0.0347 mm.	8.1		
0.0222 mm.	6.9		
0.0127 mm.	5.9		
0.0091 mm.	4.7		
0.0065 mm.	4.0		
0.0031 mm.	3.0		
0.0013 mm.	1.8		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 11.4951 D_{60}= 1.5627 D_{50}= 0.8266
D_{30}= 0.2891 D_{15}= 0.0840 D_{10}= 0.0456
C_u= 34.31 C_c= 1.17

Classification

USCS= SM AASHTO=

Remarks

Moisture Content:9.4%

Sample No.: S-1 **Source of Sample:** B-1 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

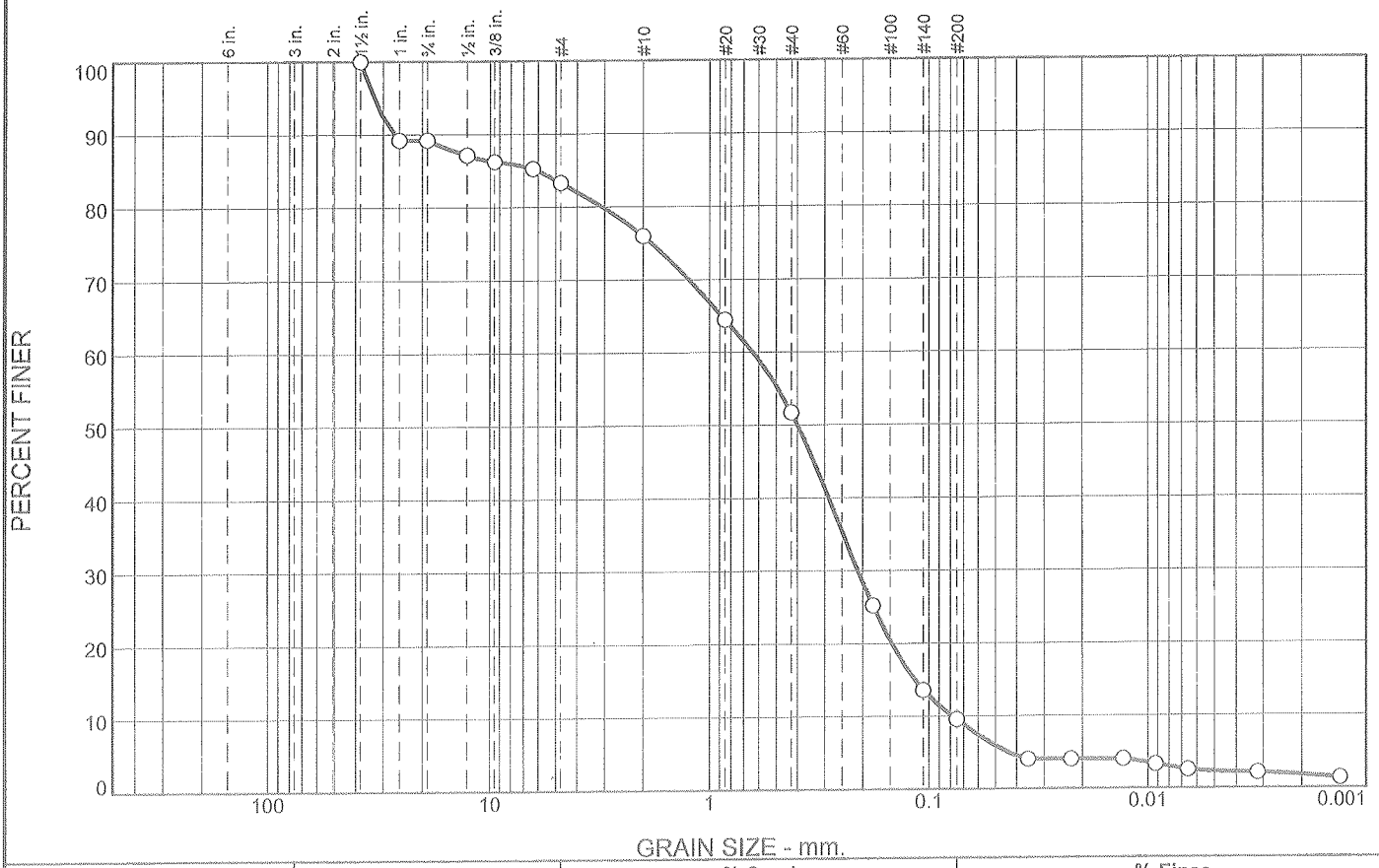
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions group
Project: Pavement Rehabilitation Strategies for ramps

Project No: 1229-01 **Figure** 10972A

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.8	5.9	7.3	24.2	42.2	7.3	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	89.2		
3/4"	89.2		
1/2"	87.1		
3/8"	86.3		
1/4"	85.3		
#4	83.3		
#10	76.0		
#20	64.5		
#40	51.8		
#80	25.2		
#140	13.6		
#200	9.6		
0.0355 mm.	4.1		
0.0224 mm.	4.1		
0.0130 mm.	4.1		
0.0092 mm.	3.3		
0.0066 mm.	2.6		
0.0032 mm.	2.1		
0.0013 mm.	1.4		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.0520 D_{60}= 0.6357 D_{50}= 0.3976
D_{30}= 0.2109 D_{15}= 0.1159 D_{10}= 0.0785
C_u= 8.10 C_c= 0.89

Classification

USCS= SP-SM AASHTO=

Remarks

Moisture Content:10.8%

Sample No.: S-1 **Source of Sample:** B-2 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

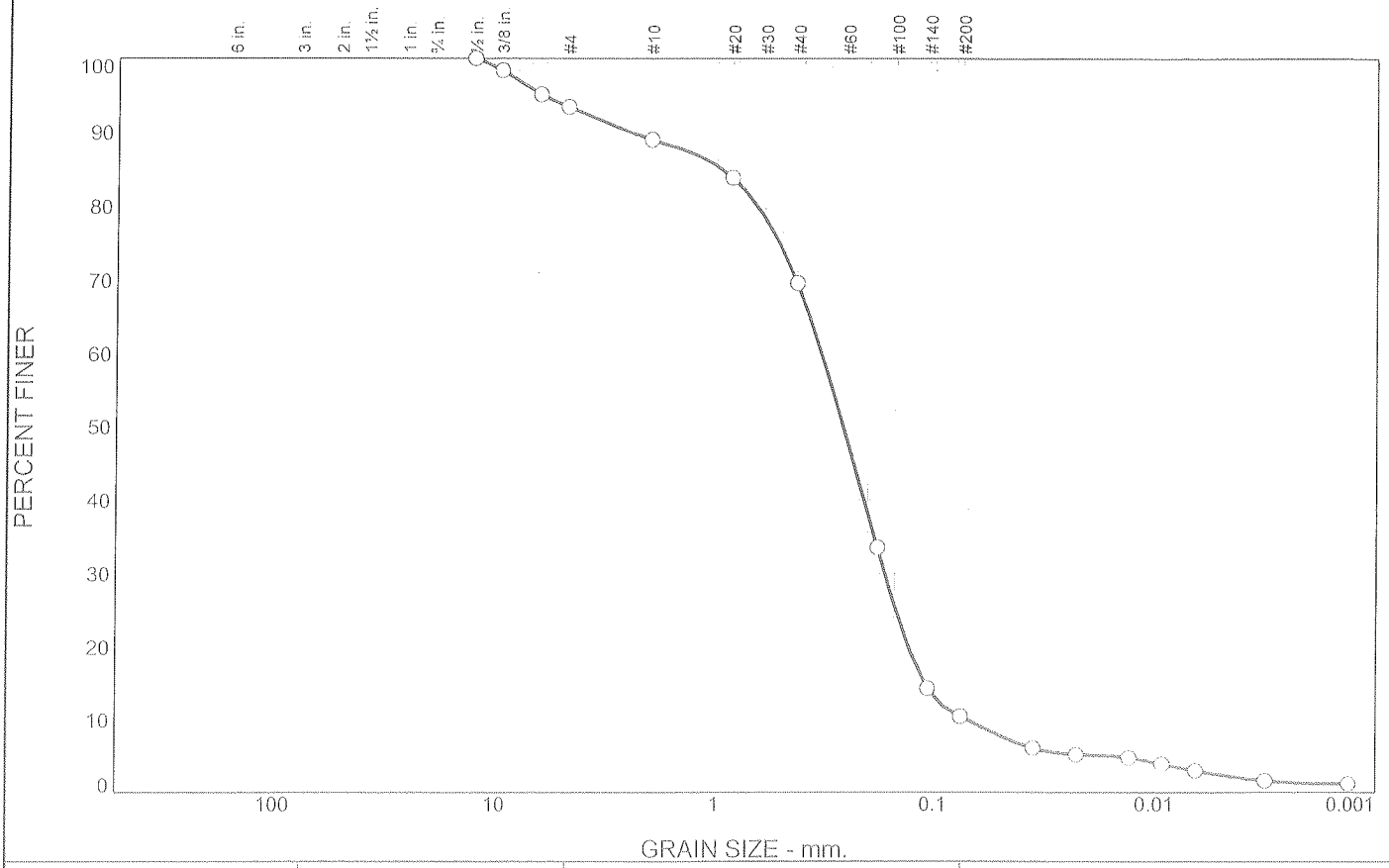
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions group
Project: Pavement Rehabilitation Strategies for ramps

Project No: 1229-01 **Figure** 10972B

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.6	4.4	19.4	59.2	8.0	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	98.4		
1/4"	95.1		
#4	93.4		
#10	89.0		
#20	83.9		
#40	69.6		
#80	33.5		
#140	14.2		
#200	10.4		
0.0352 mm.	6.1		
0.0224 mm.	5.2		
0.0130 mm.	4.8		
0.0092 mm.	3.9		
0.0066 mm.	3.0		
0.0032 mm.	1.6		
0.0013 mm.	1.2		

* (no specification provided)

Soil Description

poorly graded sand with silt

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.9447 D_{60}= 0.3268 D_{50}= 0.2584
D_{30}= 0.1663 D_{15}= 0.1097 D_{10}= 0.0701
C_u= 4.66 C_c= 1.21

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content: 15.8%

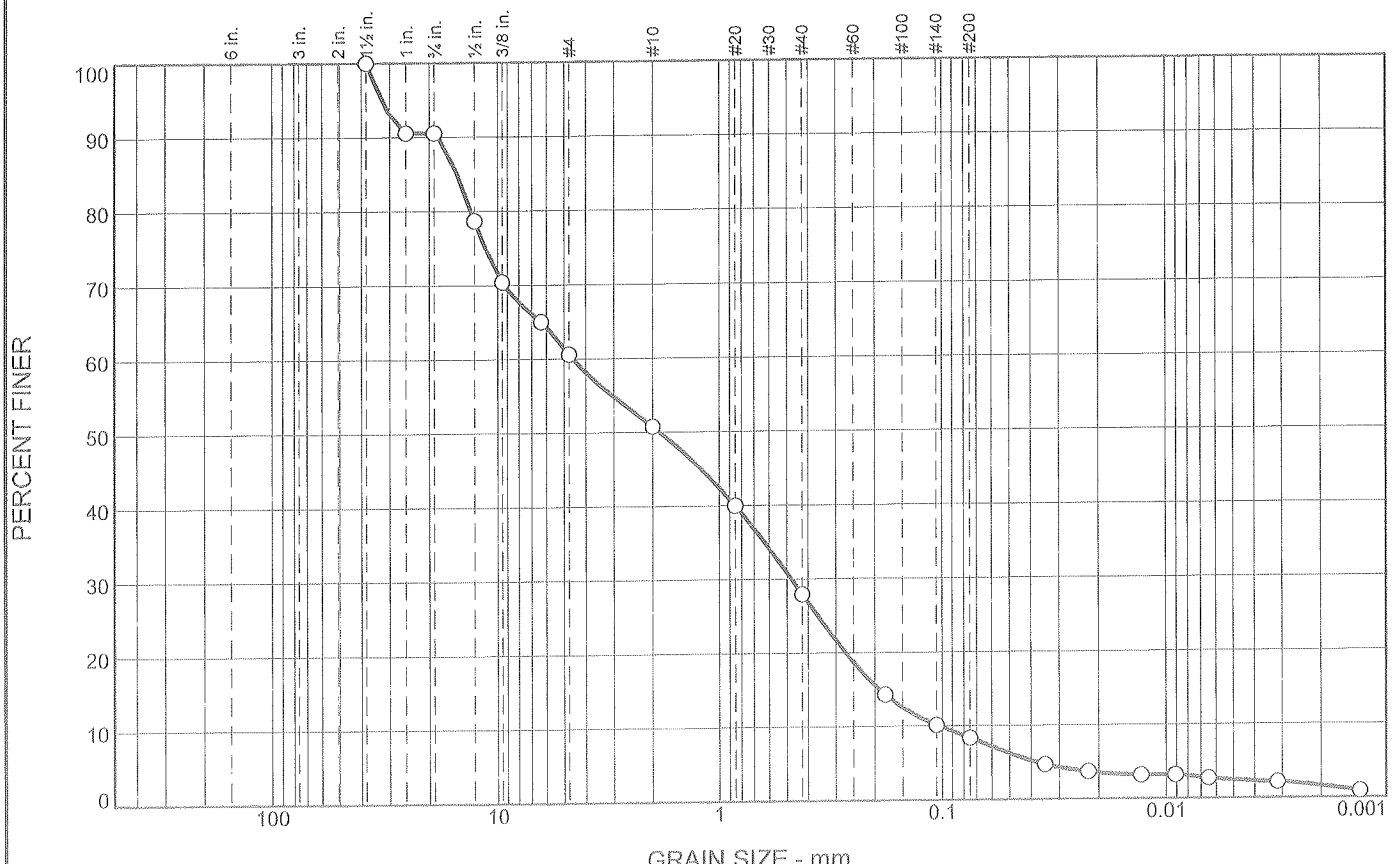
Sample No.: S-3 **Source of Sample:** B-2 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972C

Tested By: JJH **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.4	30.0	9.8	22.8	19.6	6.0	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	90.6		
3/4"	90.6		
1/2"	78.7		
3/8"	70.4		
1/4"	65.1		
#4	60.6		
#10	50.8		
#20	40.0		
#40	28.0		
#80	14.3		
#140	10.1		
#200	8.4		
0.0347 mm.	4.7		
0.0222 mm.	3.7		
0.0129 mm.	3.2		
0.0091 mm.	3.2		
0.0065 mm.	2.7		
0.0031 mm.	2.1		
0.0013 mm.	0.9		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 15.1200 D_{60}= 4.5604 D_{50}= 1.8565
D_{30}= 0.4753 D_{15}= 0.1915 D_{10}= 0.1034
C_u= 44.12 C_c= 0.48

Classification

USCS= SP-SM AASHTO=

Remarks

Moisture Content:6.1%

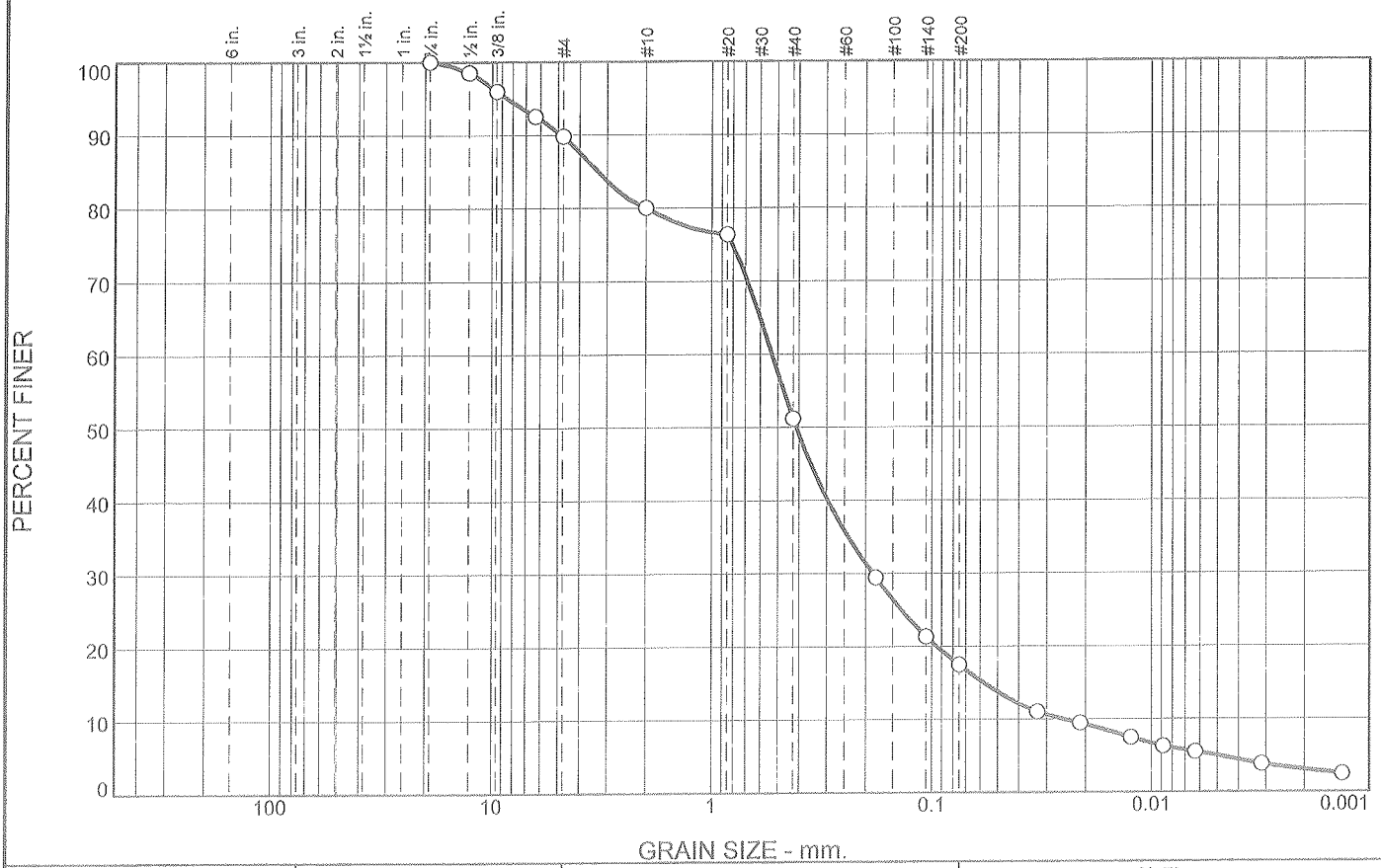
Sample No.: S-1 **Source of Sample:** B-3 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.4'-2.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions group
Project: Pavement Rehabilitation Strategies for ramps
Project No: 1229-01 **Figure** 10972D

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.2	9.7	28.9	33.7	12.5	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.5		
3/8"	96.0		
1/4"	92.6		
#4	89.8		
#10	80.1		
#20	76.4		
#40	51.2		
#80	29.5		
#140	21.4		
#200	17.5		
0.0330 mm.	11.0		
0.0211 mm.	9.5		
0.0124 mm.	7.5		
0.0088 mm.	6.3		
0.0063 mm.	5.5		
0.0031 mm.	3.8		
0.0013 mm.	2.4		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.3037 D_{60}= 0.5300 D_{50}= 0.4112
D_{30}= 0.1855 D_{15}= 0.0579 D_{10}= 0.0251
C_u= 21.12 C_c= 2.59

Classification

USCS= SM AASHTO=

Remarks

Moisture Content:14.4%

Sample No.: S-1 **Source of Sample:** B-4 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

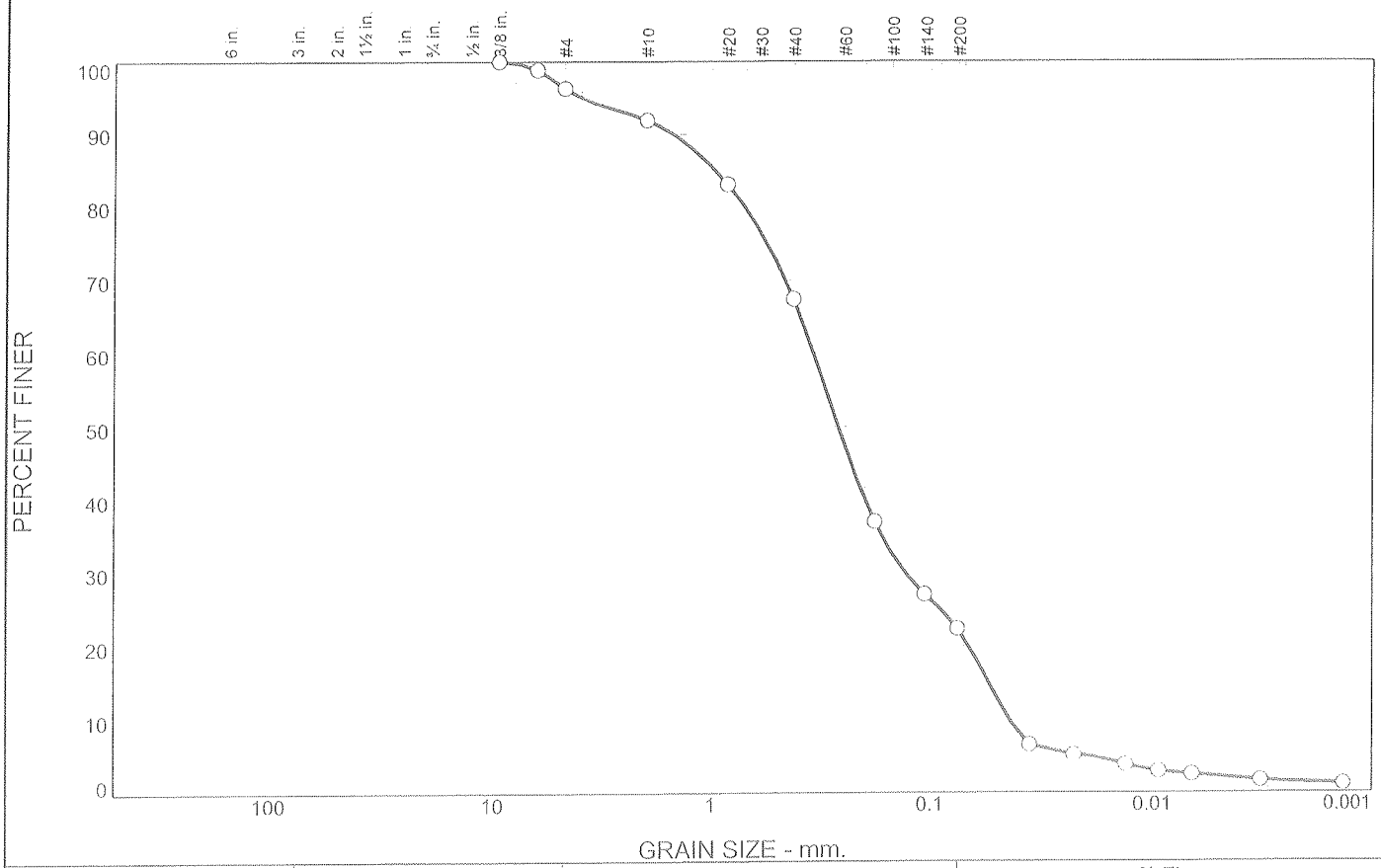
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions group
Project: Pavement Rehabilitation Strategies for ramps

Project No: 1229-01 **Figure** 10972E

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.7	4.3	24.5	45.1	20.2	2.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	98.8		
#4	96.3		
#10	92.0		
#20	83.1		
#40	67.5		
#80	37.1		
#140	27.1		
#200	22.4		
0.0354 mm.	6.5		
0.0226 mm.	5.2		
0.0131 mm.	3.8		
0.0094 mm.	2.9		
0.0066 mm.	2.5		
0.0032 mm.	1.7		
0.0014 mm.	1.2		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.9641 D_{60}= 0.3432 D_{50}= 0.2638
D_{30}= 0.1300 D_{15}= 0.0541 D_{10}= 0.0436
C_u= 7.87 C_c= 1.13

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 27.5%

Sample No.: S-3 **Source of Sample:** B-5 **Date:** 10/22/09
Location: New Bedford, MA **Elev./Depth:** 4.3'-6.3'

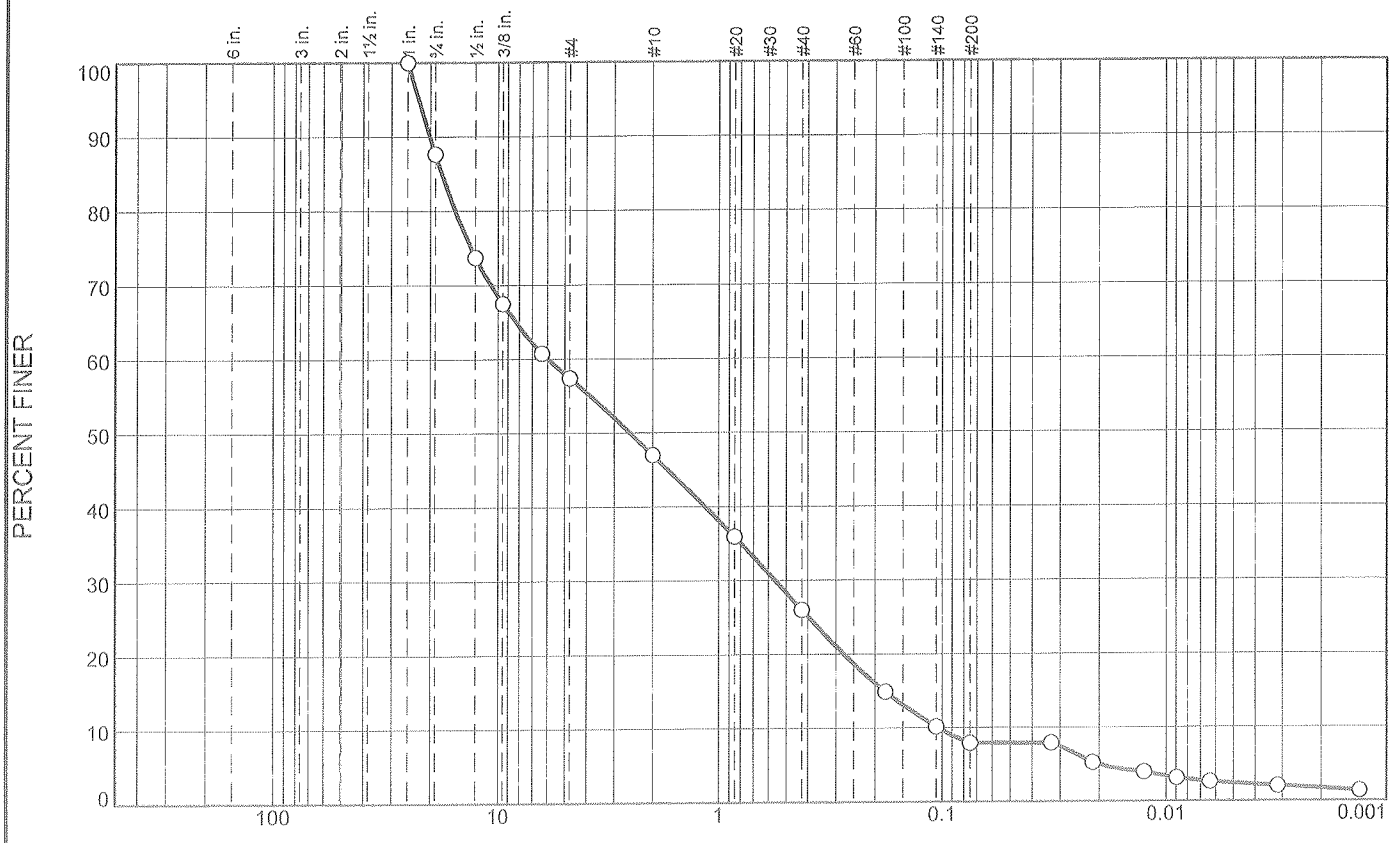
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps

Project No: 1229-01 **Lab No.** 10972F

Tested By: JJH/DCH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.3	30.3	10.4	21.0	18.1	5.5	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	87.7		
1/2"	73.7		
3/8"	67.5		
1/4"	60.8		
#4	57.4		
#10	47.0		
#20	35.9		
#40	26.0		
#80	14.9		
#140	10.2		
#200	7.9		
0.0328 mm.	7.9		
0.0214 mm.	5.3		
0.0125 mm.	3.9		
0.0089 mm.	3.2		
0.0064 mm.	2.6		
0.0031 mm.	2.0		
0.0013 mm.	1.4		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 17.8175 D_{60}= 5.9736 D_{50}= 2.5385
D_{30}= 0.5598 D_{15}= 0.1819 D_{10}= 0.1038
C_u= 57.54 C_c= 0.51

Classification

USCS= SP-SM AASHTO=

Remarks

Moisture Content:5.9%

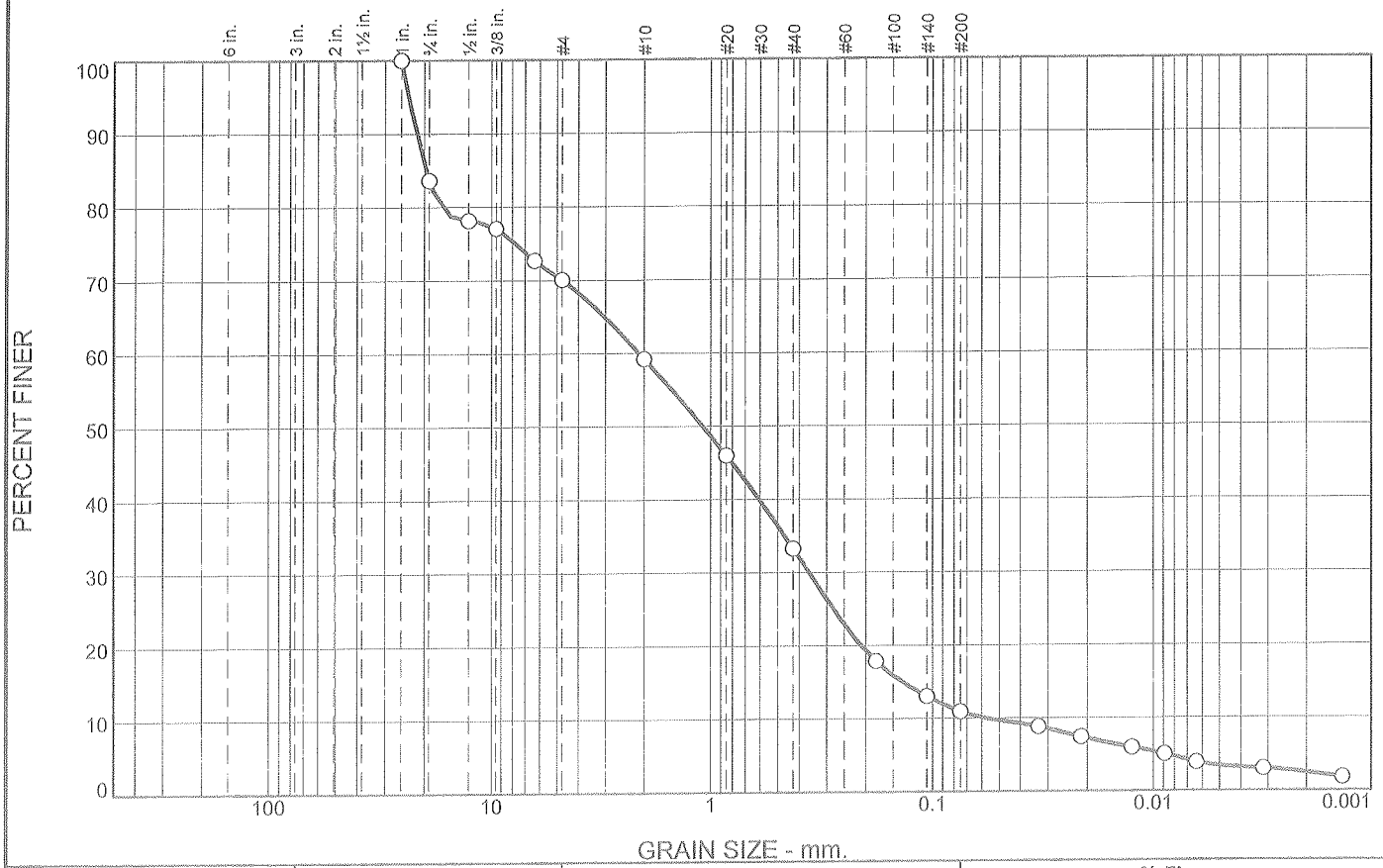
Sample No.: S-1 **Source of Sample:** B-5 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions group
Project: Pavement Rehabilitation Strategies for ramps
Project No: 1229-01 **Figure** 10972G

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.4	13.5	10.9	25.9	22.4	7.5	3.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	83.6		
1/2"	78.2		
3/8"	77.1		
1/4"	72.7		
#4	70.1		
#10	59.2		
#20	46.0		
#40	33.3		
#80	17.9		
#140	13.1		
#200	10.9		
0.0331 mm.	8.8		
0.0213 mm.	7.4		
0.0125 mm.	5.9		
0.0089 mm.	5.1		
0.0064 mm.	3.9		
0.0031 mm.	3.0		
0.0014 mm.	1.8		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 19.6806 D_{60}= 2.1071 D_{50}= 1.0838
D_{30}= 0.3602 D_{15}= 0.1368 D_{10}= 0.0579
C_u= 36.39 C_c= 1.06

Classification

USCS= SP-SM AASHTO=

Remarks

Moisture Content: 11.7%

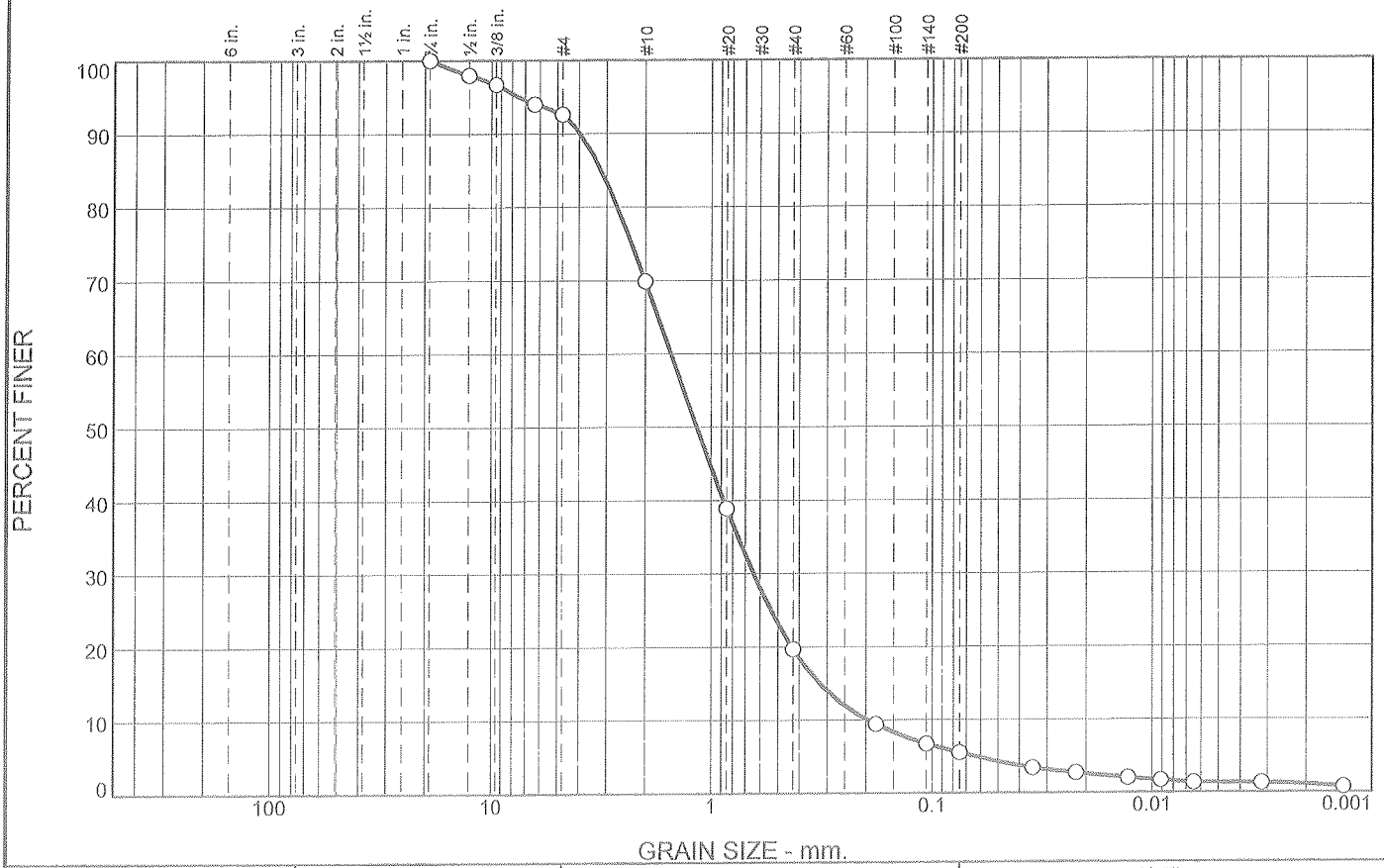
Sample No.: S-1 **Source of Sample:** B-6 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.4'-2.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972H

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.4	22.7	50.2	14.2	4.2	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.0		
3/8"	96.7		
1/4"	94.0		
#4	92.6		
#10	69.9		
#20	38.9		
#40	19.7		
#80	9.4		
#140	6.7		
#200	5.5		
0.0348 mm.	3.4		
0.0222 mm.	2.7		
0.0129 mm.	2.0		
0.0091 mm.	1.7		
0.0065 mm.	1.3		
0.0032 mm.	1.3		
0.0013 mm.	0.7		

* (no specification provided)

Soil Description

well-graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.1736 D_{60}= 1.5282 D_{50}= 1.1647
D_{30}= 0.6408 D_{15}= 0.3228 D_{10}= 0.1962
C_u= 7.79 C_c= 1.37

Classification

USCS= SW-SM AASHTO=

Remarks

Moisture Content:12.0%

Sample No.: S-3 **Source of Sample:** B-6 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 4.5'-6.5'

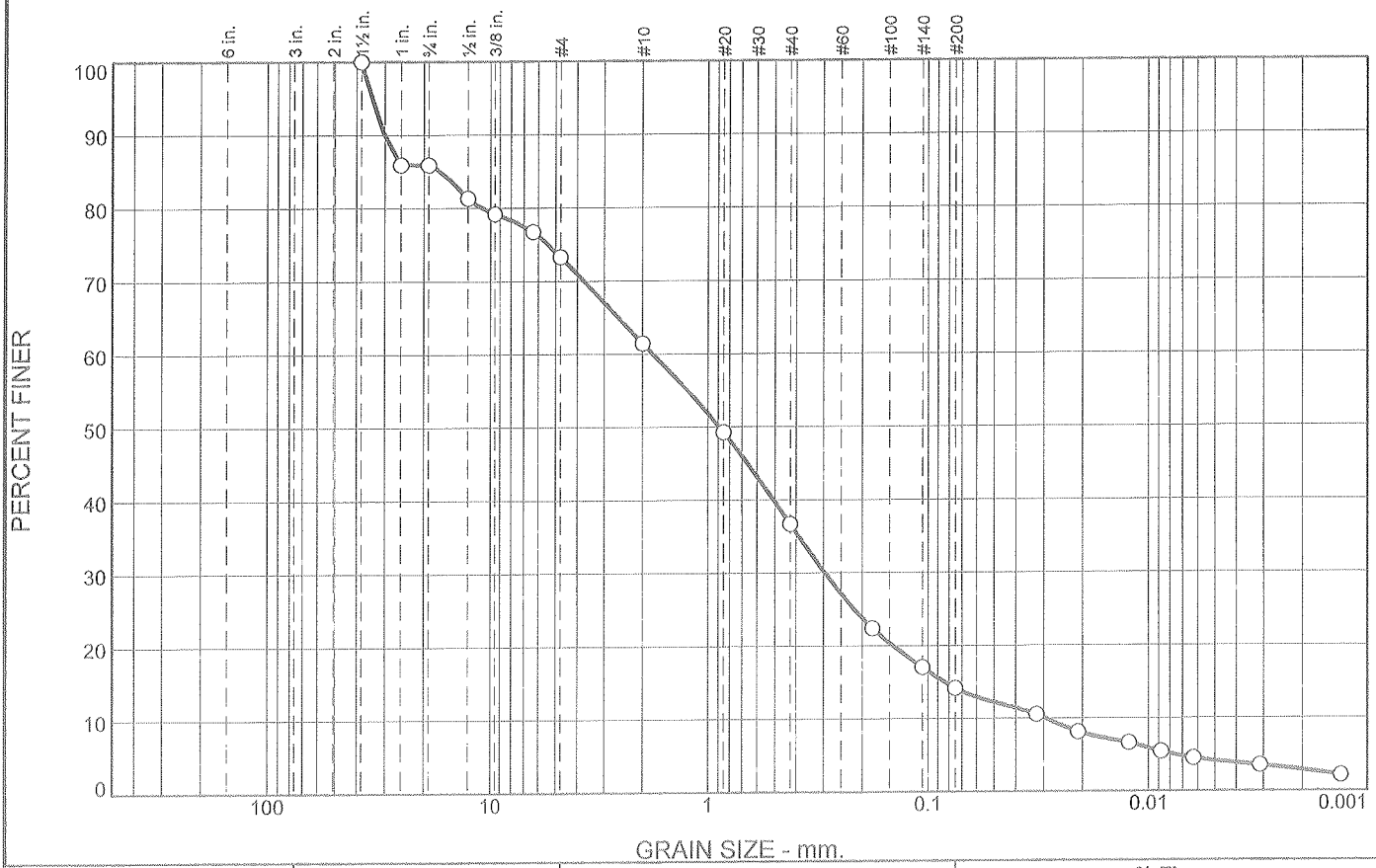
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions group
Project: Pavement Rehabilitation Strategies for ramps

Project No: 1229-01 **Figure** 10972I

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.1	12.6	11.8	24.8	22.6	10.0	4.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	85.9		
3/4"	85.9		
1/2"	81.4		
3/8"	79.2		
1/4"	76.7		
#4	73.3		
#10	61.5		
#20	49.3		
#40	36.7		
#80	22.4		
#140	17.0		
#200	14.1		
0.0323 mm.	10.5		
0.0209 mm.	8.1		
0.0123 mm.	6.6		
0.0088 mm.	5.4		
0.0063 mm.	4.5		
0.0031 mm.	3.5		
0.0013 mm.	2.2		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.6202 D_{60}= 1.7932 D_{50}= 0.8874
D_{30}= 0.2953 D_{15}= 0.0840 D_{10}= 0.0293
C_u= 61.30 C_c= 1.66

Classification

USCS= SM AASHTO=

Remarks

Moisture Content:6.9%

Sample No.: S-1 **Source of Sample:** B-7 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.4'-2.4'

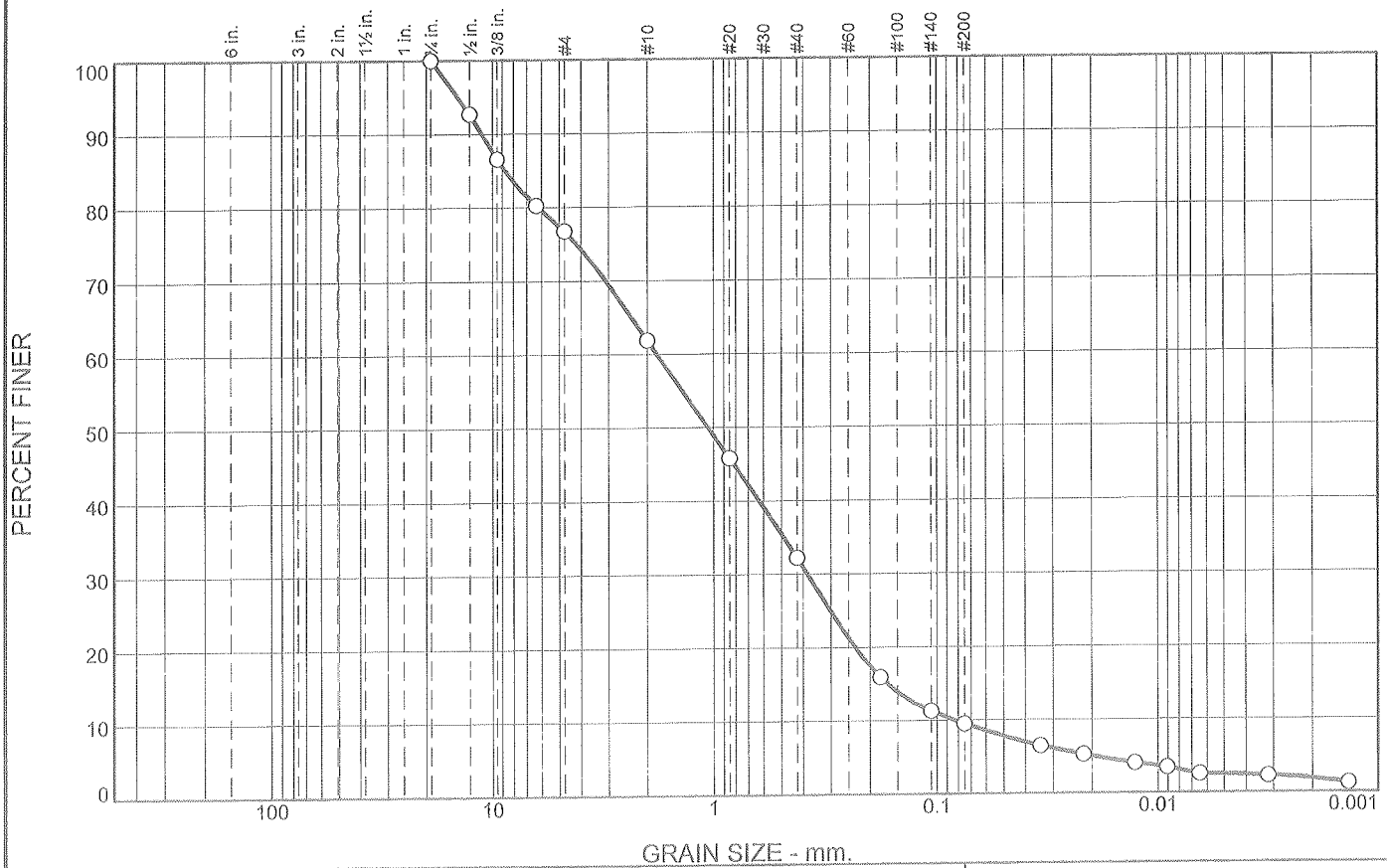
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions group
Project: Pavement Rehabilitation Strategies for ramps

Project No: 1229-01 **Figure** 10972J

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	23.2	14.9	29.6	22.8	7.0	2.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	92.7		
3/8"	86.6		
1/4"	80.3		
#4	76.8		
#10	61.9		
#20	45.9		
#40	32.3		
#80	15.9		
#140	11.3		
#200	9.5		
0.0341 mm.	6.5		
0.0218 mm.	5.3		
0.0127 mm.	4.1		
0.0091 mm.	3.5		
0.0065 mm.	2.5		
0.0032 mm.	2.2		
0.0014 mm.	1.3		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.7407 D_{60}= 1.8106 D_{50}= 1.0604
D_{30}= 0.3817 D_{15}= 0.1672 D_{10}= 0.0828
C_u= 21.86 C_c= 0.97

Classification

USCS= SP-SM AASHTO=

Remarks

Moisture Content:4.6%

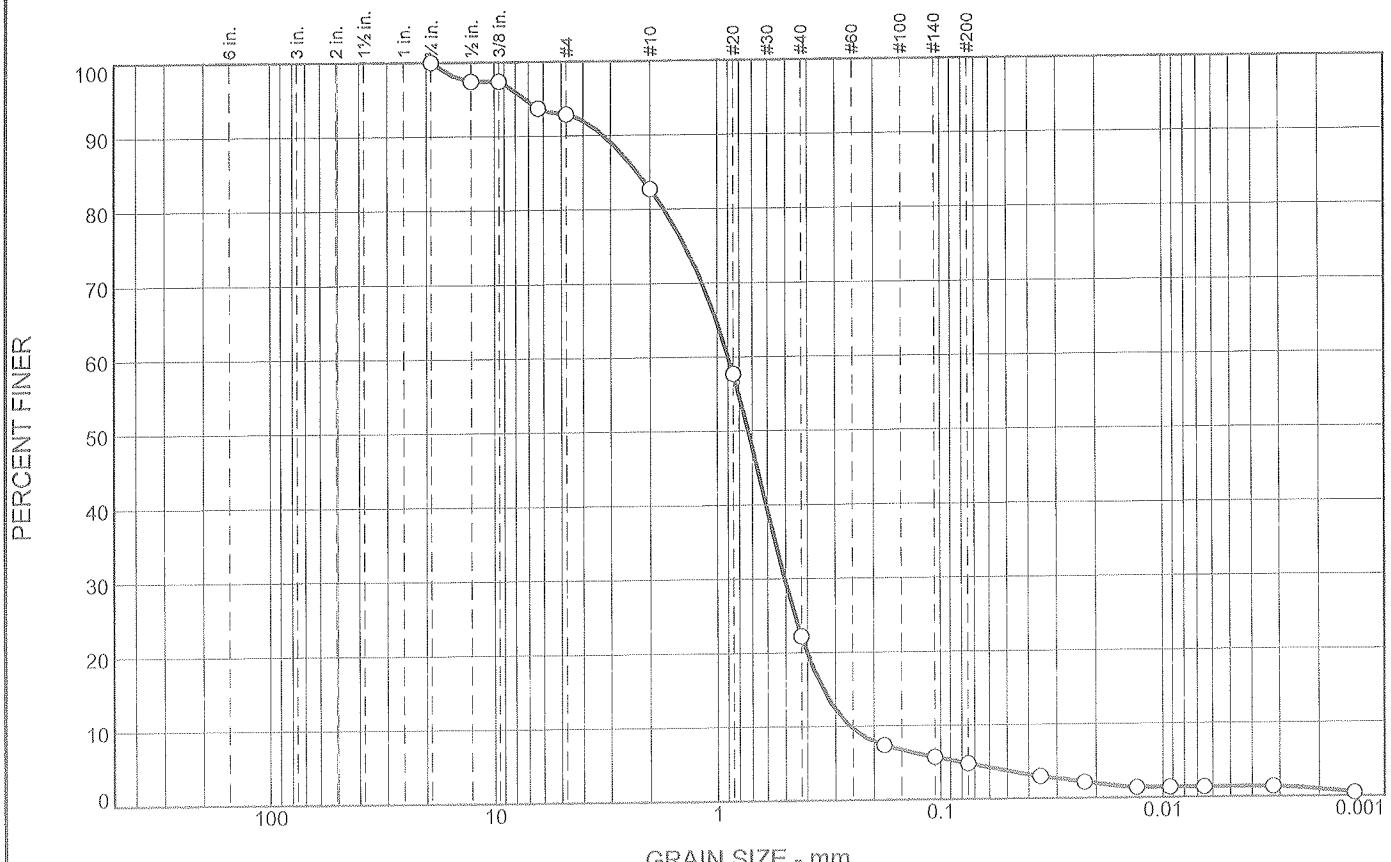
Sample No.: S-1 **Source of Sample:** B-8 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.5'-2.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972K

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.1	10.2	60.5	17.4	3.4	1.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	97.4		
3/8"	97.4		
1/4"	93.7		
#4	92.9		
#10	82.7		
#20	57.7		
#40	22.2		
#80	7.4		
#140	5.7		
#200	4.8		
0.0355 mm.	3.0		
0.0226 mm.	2.2		
0.0131 mm.	1.4		
0.0093 mm.	1.4		
0.0066 mm.	1.4		
0.0032 mm.	1.4		
0.0014 mm.	0.5		

* (no specification provided)

Soil Description

poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.2759 D_{60}= 0.8935 D_{50}= 0.7294
D_{30}= 0.5039 D_{15}= 0.3396 D_{10}= 0.2567
C_u= 3.48 C_c= 1.11

Classification

USCS= SP AASHTO=

Remarks

Moisture Content:15.5%

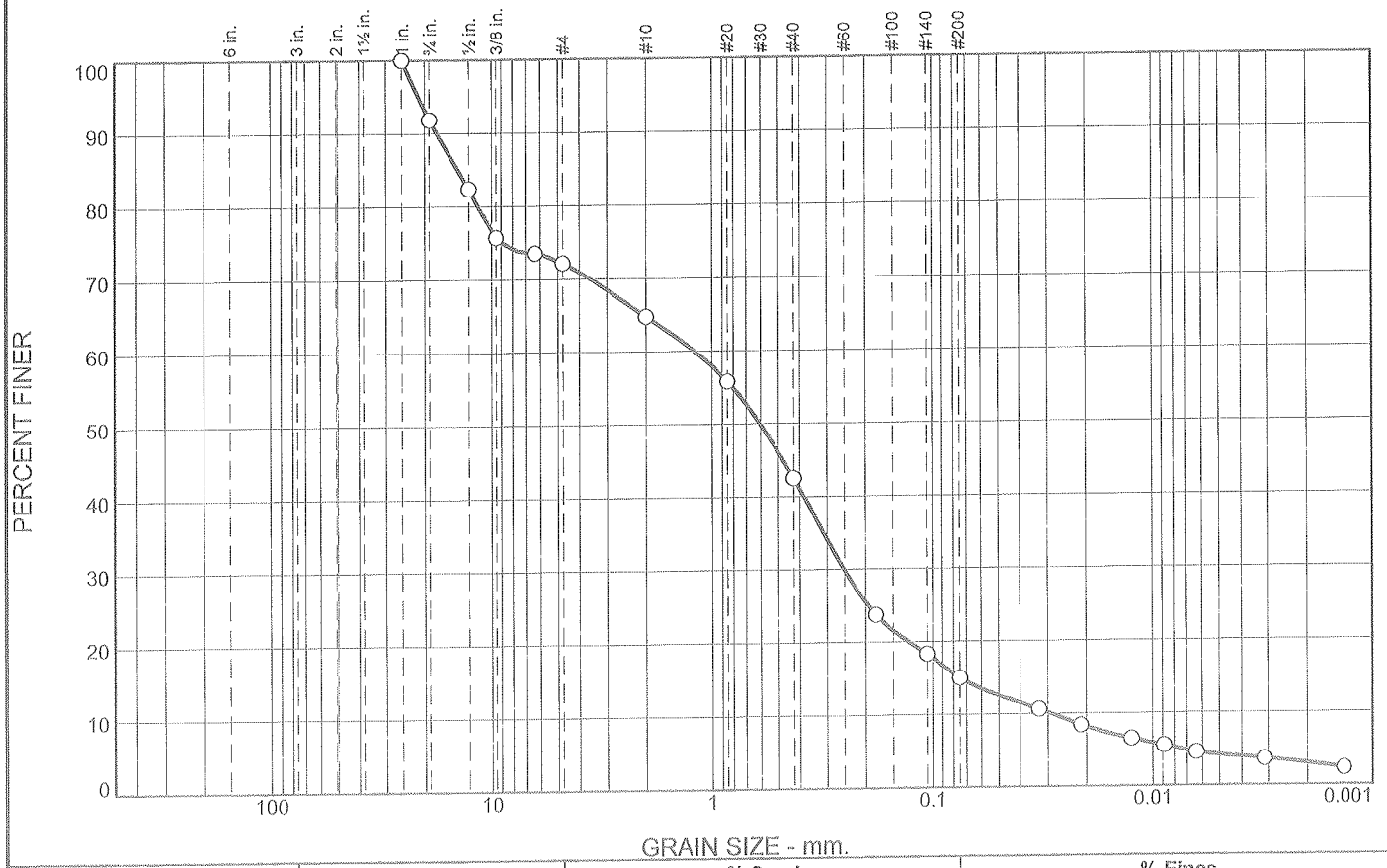
Sample No.: S-3 **Source of Sample:** B-8 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 4.5'-6.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972L

Tested By: JJH **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.2	19.6	7.4	22.3	27.5	10.9	4.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	91.8		
1/2"	82.4		
3/8"	75.8		
1/4"	73.6		
#4	72.2		
#10	64.8		
#20	55.8		
#40	42.5		
#80	23.7		
#140	18.3		
#200	15.0		
0.0328 mm.	10.6		
0.0212 mm.	8.4		
0.0125 mm.	6.5		
0.0089 mm.	5.5		
0.0064 mm.	4.6		
0.0031 mm.	3.6		
0.0014 mm.	2.3		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 14.1490 D_{60}= 1.1942 D_{50}= 0.6028
D_{30}= 0.2510 D_{15}= 0.0749 D_{10}= 0.0289
C_u= 41.35 C_c= 1.83

Classification

USCS= SM AASHTO=

Remarks

Moisture Content:8.7%

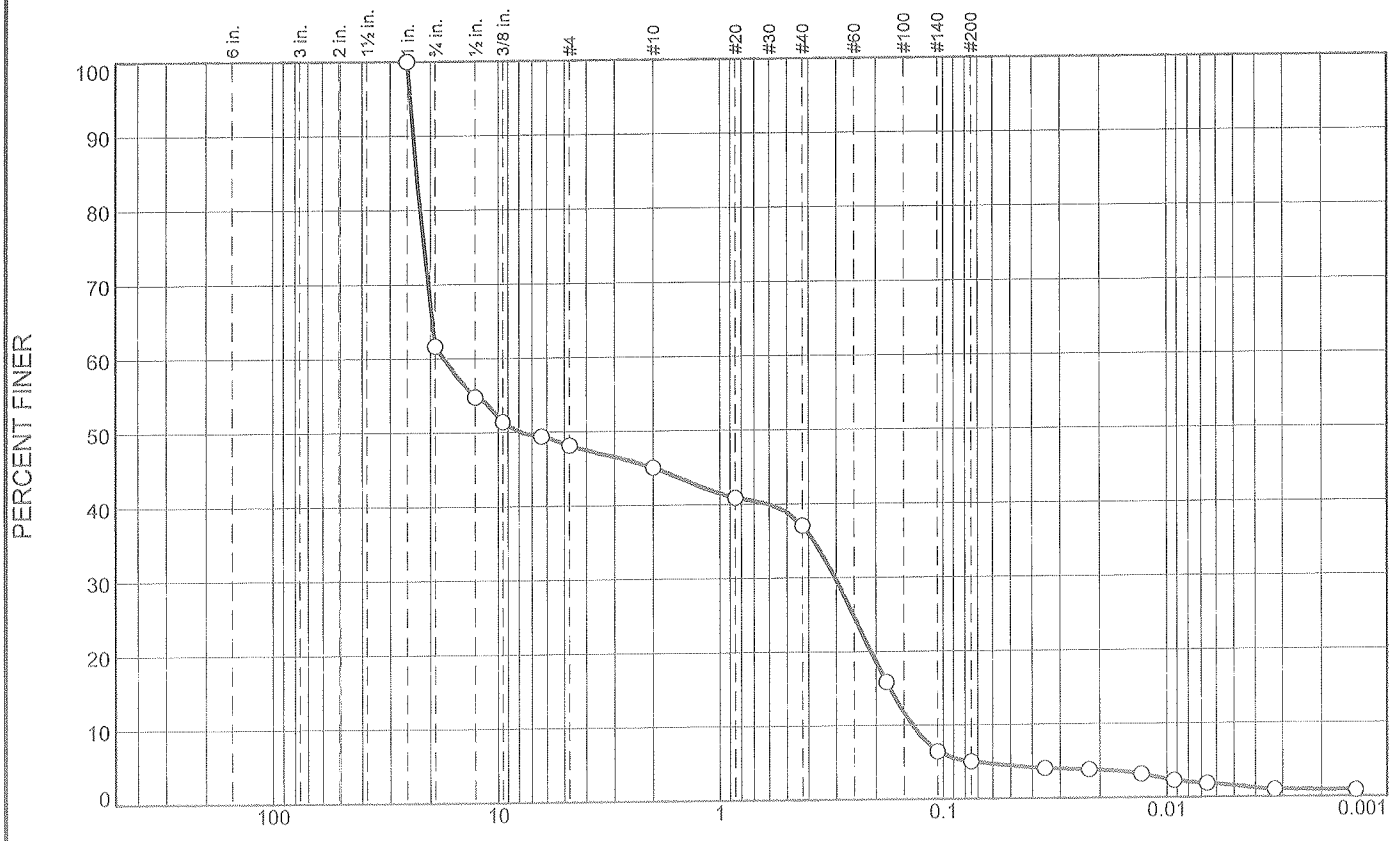
Sample No.: S-1 **Source of Sample:** B-9 **Date:** 10/3/09
Location: New Bedford, MA **Elev./Depth:** 0.5'-2.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972M

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	38.3	13.5	3.1	8.1	32.0	3.5	1.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	61.7		
1/2"	54.8		
3/8"	51.4		
1/4"	49.4		
#4	48.2		
#10	45.1		
#20	40.9		
#40	37.0		
#80	15.8		
#140	6.4		
#200	5.0		
0.0351 mm.	4.1		
0.0223 mm.	3.8		
0.0130 mm.	3.2		
0.0093 mm.	2.3		
0.0066 mm.	1.9		
0.0033 mm.	1.0		
0.0014 mm.	0.9		

* (no specification provided)

Soil Description

poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 23.0798 D_{60}= 17.4692 D_{50}= 7.9178
D_{30}= 0.3034 D_{15}= 0.1739 D_{10}= 0.1377
C_u= 126.83 C_c= 0.04

Classification

USCS= GP-GM AASHTO=

Remarks

Moisture content:4.0%

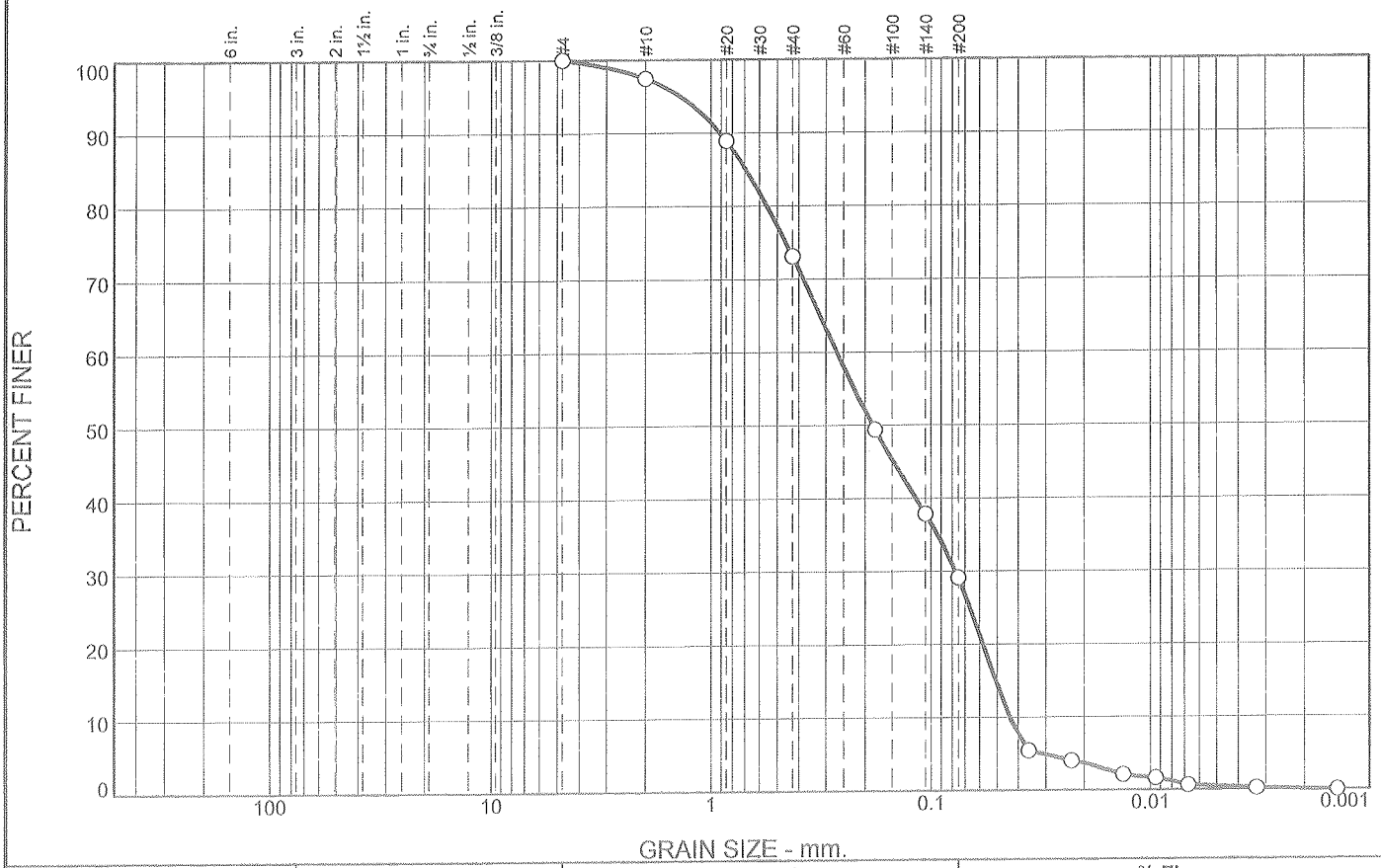
Sample No.: S-1 **Source of Sample:** B-10 **Date:** 10/8/09
Location: New Bedford, MA **Elev./Depth:** 0.4'-2.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972N

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.5	24.4	43.9	28.7	0.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.5		
#20	88.9		
#40	73.1		
#80	49.4		
#140	37.9		
#200	29.2		
0.0358 mm.	5.4		
0.0229 mm.	4.0		
0.0133 mm.	2.1		
0.0095 mm.	1.6		
0.0067 mm.	0.7		
0.0033 mm.	0.2		
0.0014 mm.	0.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.6905 D_{60}= 0.2676 D_{50}= 0.1843
D_{30}= 0.0771 D_{15}= 0.0507 D_{10}= 0.0436
C_u= 6.13 C_c= 0.51

Classification

USCS= SM AASHTO=

Remarks

Moisture content: 17.3%

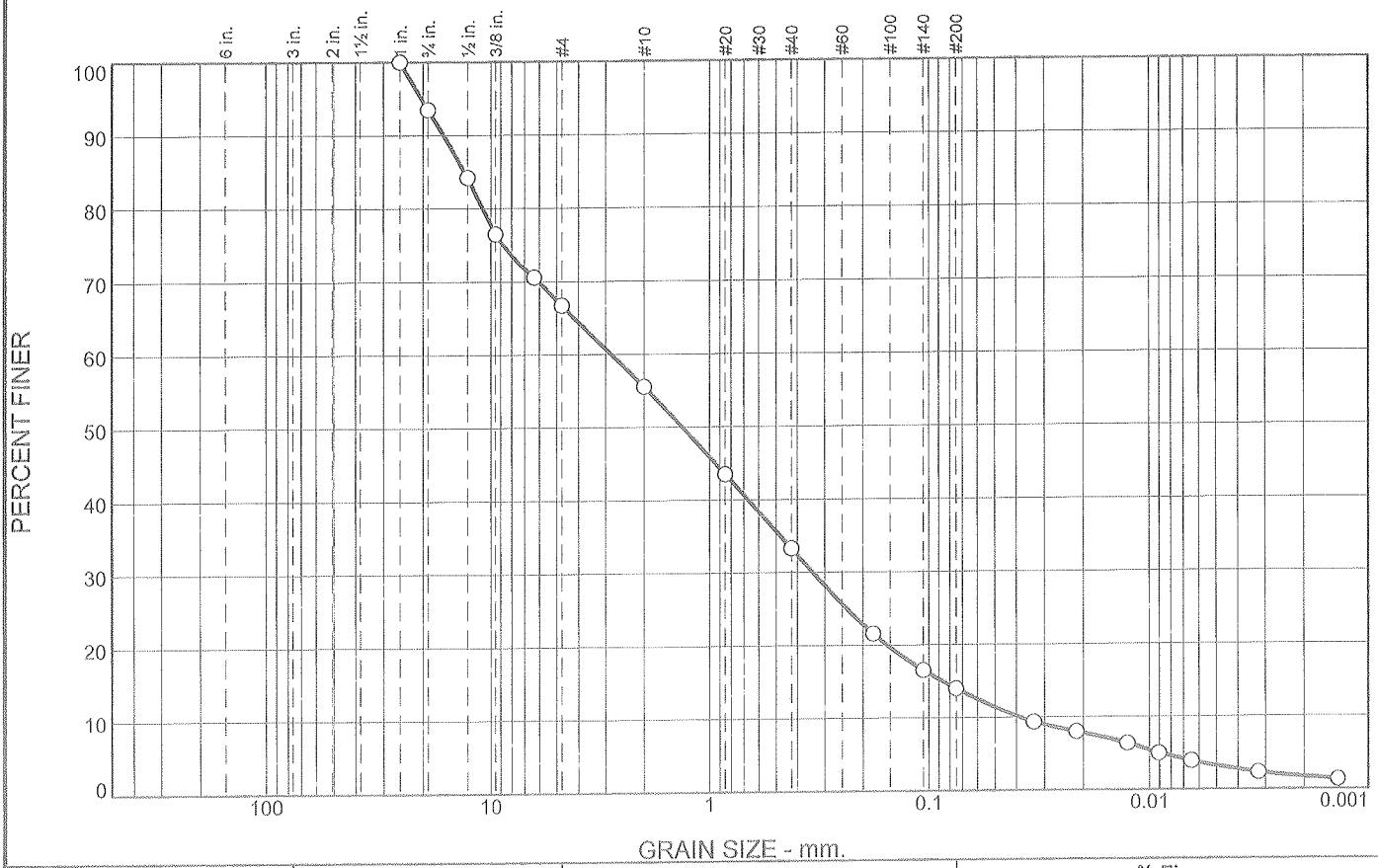
Sample No.: S-3 **Source of Sample:** B-10 **Date:** 10/8/09
Location: New Bedford, MA **Elev./Depth:** 4.4'-6.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972O

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.5	26.8	11.1	22.3	19.3	10.8	3.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	93.5		
1/2"	84.2		
3/8"	76.6		
1/4"	70.6		
#4	66.7		
#10	55.6		
#20	43.5		
#40	33.3		
#80	21.6		
#140	16.5		
#200	14.0		
0.0334 mm.	9.4		
0.0215 mm.	8.0		
0.0126 mm.	6.4		
0.0091 mm.	5.0		
0.0065 mm.	3.9		
0.0032 mm.	2.3		
0.0014 mm.	1.4		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.0727 D_{60}= 2.8246 D_{50}= 1.3329
D_{30}= 0.3391 D_{15}= 0.0865 D_{10}= 0.0386
C_u= 73.22 C_c= 1.06

Classification

USCS= SM AASHTO=

Remarks

Moisture content:5.5%

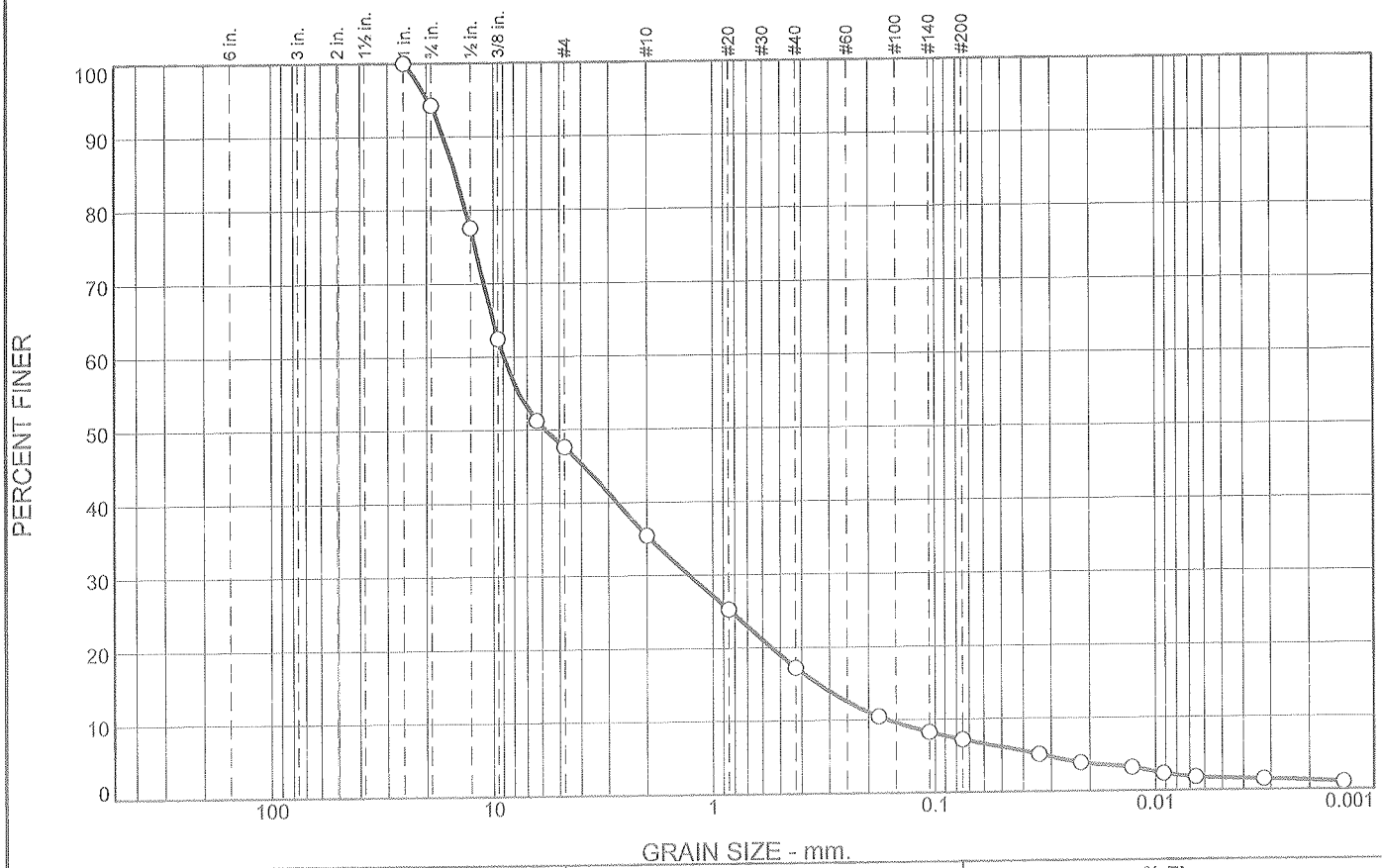
Sample No.: S-1 **Source of Sample:** B-11 **Date:** 10/8/09
Location: New Bedford, MA **Elev./Depth:** 0.4'-2.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972P

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.7	46.7	12.1	18.3	10.0	5.6	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	94.3		
1/2"	77.6		
3/8"	62.5		
1/4"	51.3		
#4	47.6		
#10	35.5		
#20	25.3		
#40	17.2		
#80	10.5		
#140	8.3		
#200	7.2		
0.0339 mm.	5.1		
0.0219 mm.	3.9		
0.0128 mm.	3.2		
0.0092 mm.	2.3		
0.0066 mm.	1.8		
0.0032 mm.	1.5		
0.0014 mm.	1.0		

* (no specification provided)

Soil Description

well-graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 14.7829 D_{60}= 8.9715 D_{50}= 5.7964
D_{30}= 1.2853 D_{15}= 0.3380 D_{10}= 0.1640
C_u= 54.70 C_c= 1.12

Classification

USCS= GW-GM AASHTO=

Remarks

Moisture Content:3.1%

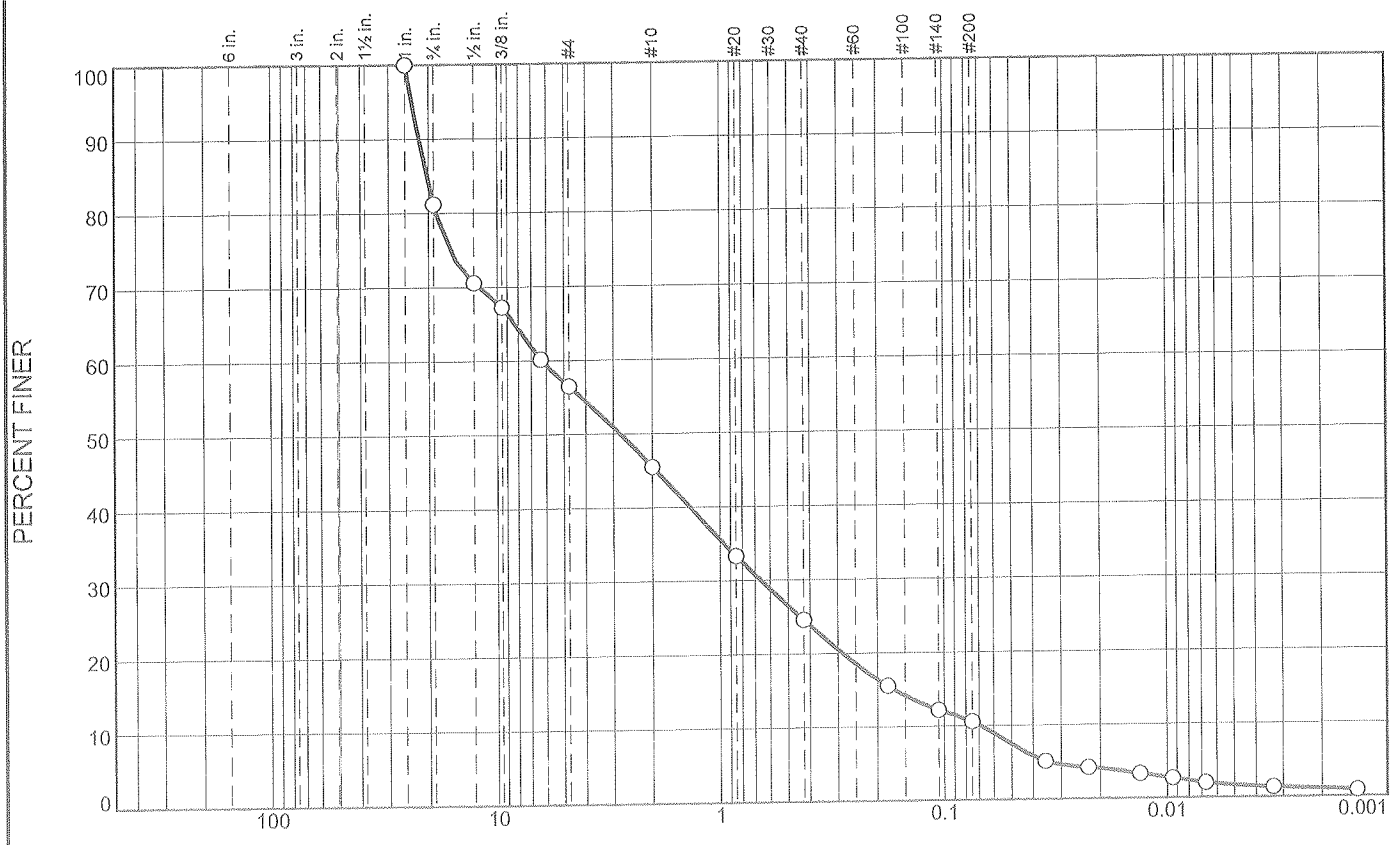
Sample No.: S-1 **Source of Sample:** B-12 **Date:** 10/8/09
Location: New Bedford, MA **Elev./Depth:** 0.4'-2.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972Q

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.8	24.7	11.0	20.9	14.0	9.0	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	81.2		
1/2"	70.6		
3/8"	67.3		
1/4"	60.2		
#4	56.5		
#10	45.5		
#20	33.3		
#40	24.6		
#80	15.5		
#140	12.2		
#200	10.6		
0.0353 mm.	5.1		
0.0226 mm.	4.2		
0.0132 mm.	3.3		
0.0094 mm.	2.7		
0.0067 mm.	2.0		
0.0033 mm.	1.3		
0.0014 mm.	0.9		

* (no specification provided)

Soil Description

well-graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 20.4015 D_{60}= 6.2751 D_{50}= 2.7890
D_{30}= 0.6610 D_{15}= 0.1683 D_{10}= 0.0686
C_u= 91.53 C_c= 1.02

Classification

USCS= SW-SM AASHTO=

Remarks

Moisture content:6.3%

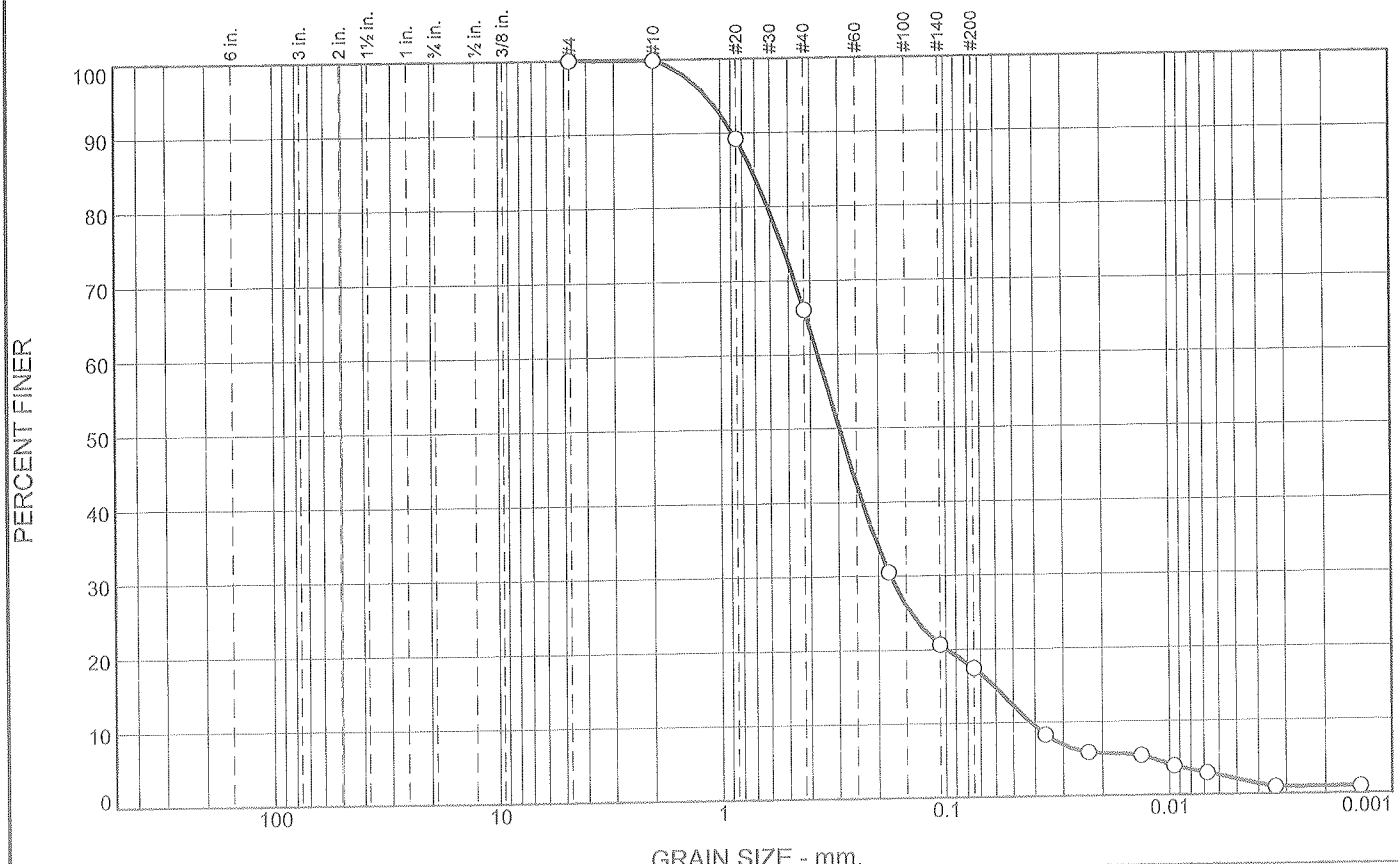
Sample No.: S-3 **Source of Sample:** B-12 **Date:** 10/8/09
Location: New Bedford, MA **Elev./Depth:** 4.4'-6.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972R

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	33.8	48.6	15.5	2.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	89.2		
#40	66.1		
#80	30.5		
#140	20.7		
#200	17.5		
0.0359 mm.	8.3		
0.0231 mm.	5.9		
0.0134 mm.	5.4		
0.0095 mm.	3.9		
0.0068 mm.	2.9		
0.0034 mm.	1.0		
0.0014 mm.	1.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.7226 D_{60}= 0.3696 D_{50}= 0.2962
D_{30}= 0.1768 D_{15}= 0.0610 D_{10}= 0.0419
C_u= 8.82 C_c= 2.02

Classification

USCS= SM AASHTO=

Remarks

Moisture content:17.2%

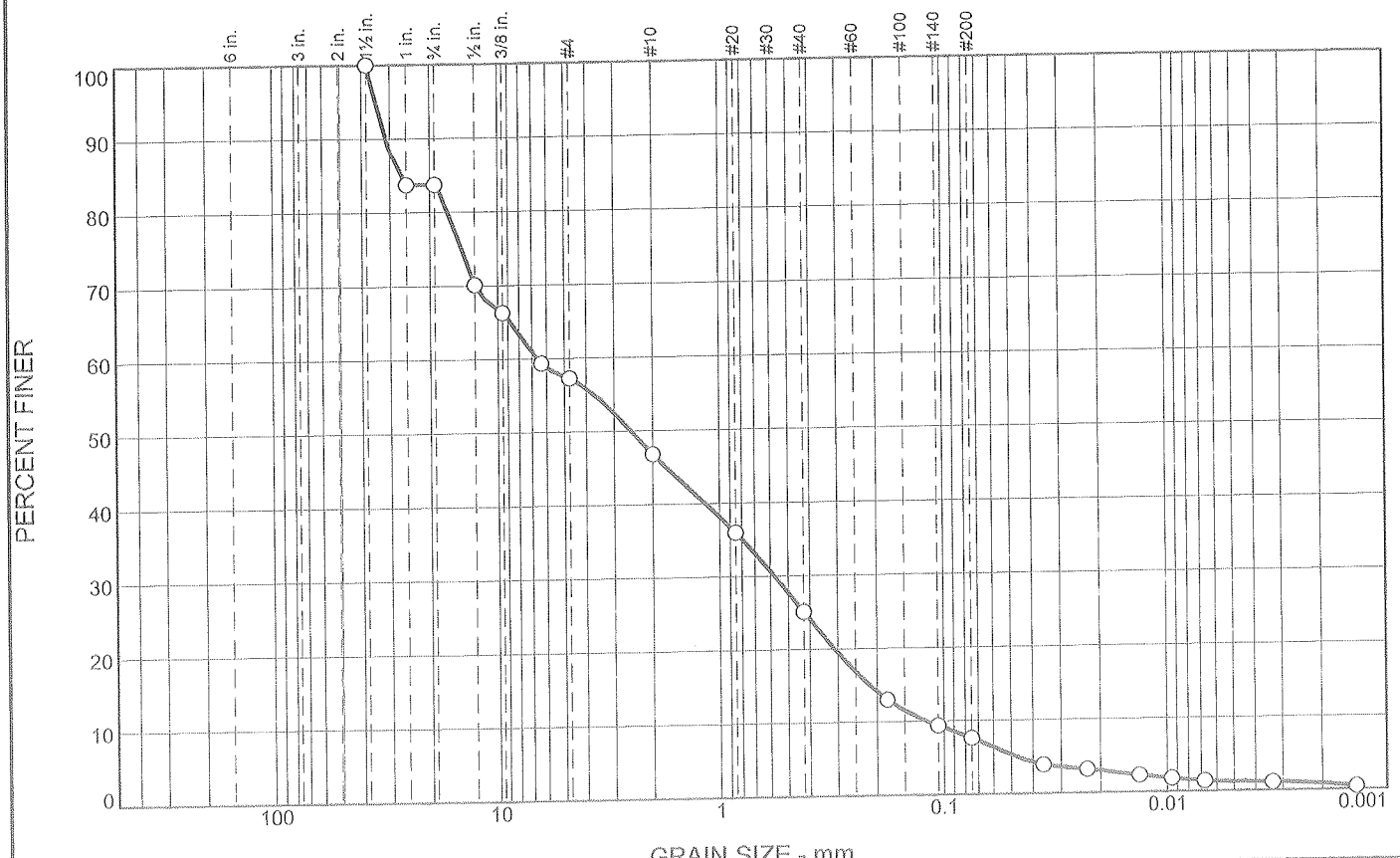
Sample No.: S-4 **Source of Sample:** B-12 **Date:** 10/8/09
Location: New Bedford, MA **Elev./Depth:** 6.4'-8.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972S

Tested By: JJH **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.2	26.5	10.5	21.7	17.5	6.4	1.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	83.8		
3/4"	83.8		
1/2"	70.1		
3/8"	66.3		
1/4"	59.4		
#4	57.3		
#10	46.8		
#20	36.0		
#40	25.1		
#80	13.0		
#140	9.4		
#200	7.6		
0.0359 mm.	3.9		
0.0229 mm.	3.2		
0.0134 mm.	2.3		
0.0095 mm.	1.8		
0.0068 mm.	1.4		
0.0033 mm.	1.1		
0.0014 mm.	0.5		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 27.2747 D_{60}= 6.6391 D_{50}= 2.5082
D_{30}= 0.5735 D_{15}= 0.2156 D_{10}= 0.1187
C_u= 55.91 C_c= 0.42

Classification

USCS= SP-SM AASHTO=

Remarks

Moisture content:5.3%

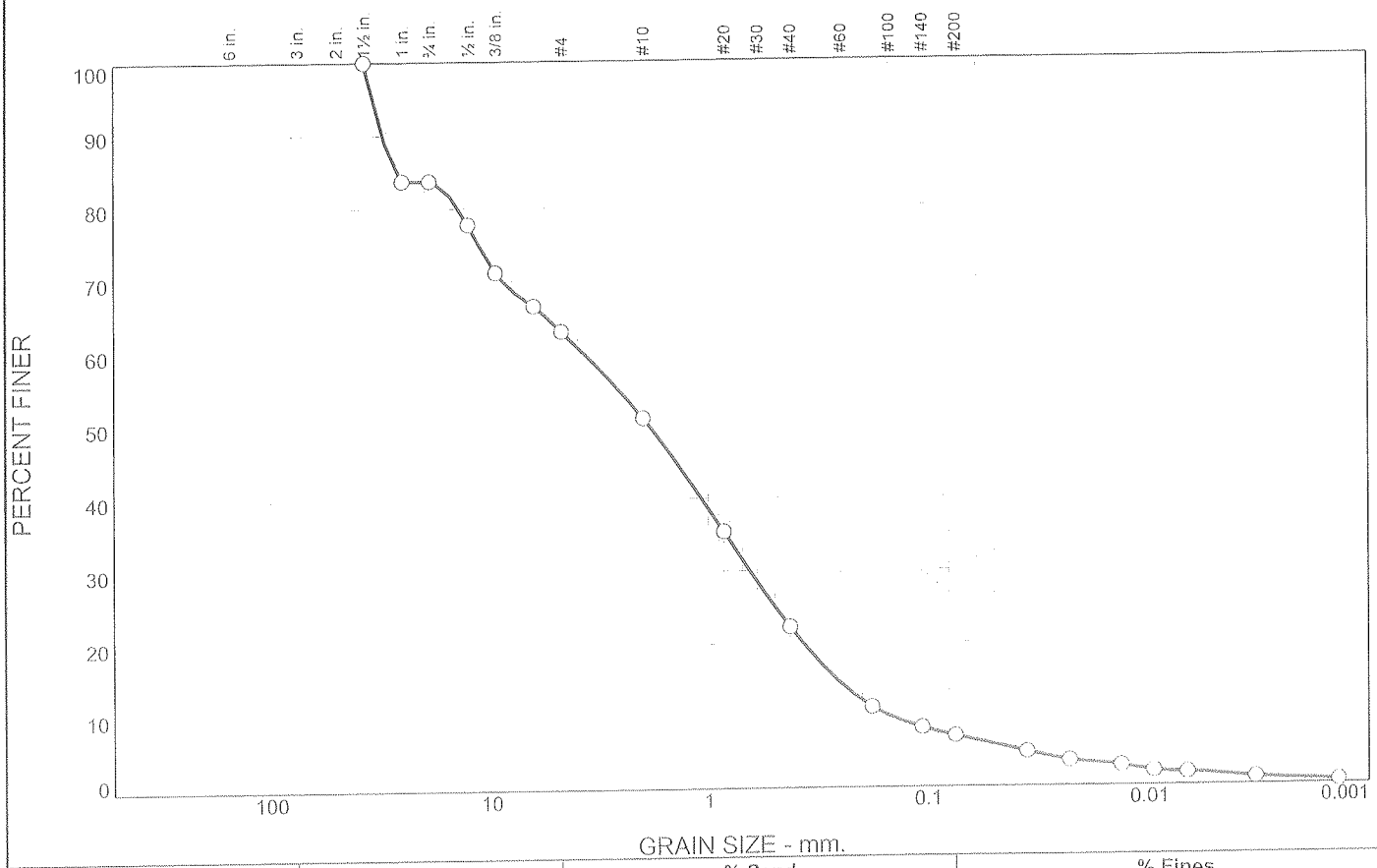
Sample No.: S-1 **Source of Sample:** B-13 **Date:** 10/8/09
Location: New Bedford, MA **Elev./Depth:** 1'-3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Figure** 10972T

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.3	20.6	12.0	28.8	15.3	5.5	1.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	83.7		
3/4"	83.7		
1/2"	77.8		
3/8"	71.2		
1/4"	66.6		
#4	63.1		
#10	51.1		
#20	35.4		
#40	22.3		
#80	11.1		
#140	8.2		
#200	7.0		
0.0357 mm.	4.7		
0.0229 mm.	3.5		
0.0134 mm.	2.7		
0.0095 mm.	2.0		
0.0068 mm.	1.7		
0.0033 mm.	1.0		
0.0014 mm.	0.5		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 27.0818 D_{60}= 3.7487 D_{50}= 1.8692
D_{30}= 0.6461 D_{15}= 0.2622 D_{10}= 0.1548
C_u= 24.22 C_c= 0.72

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture content: 4.7%

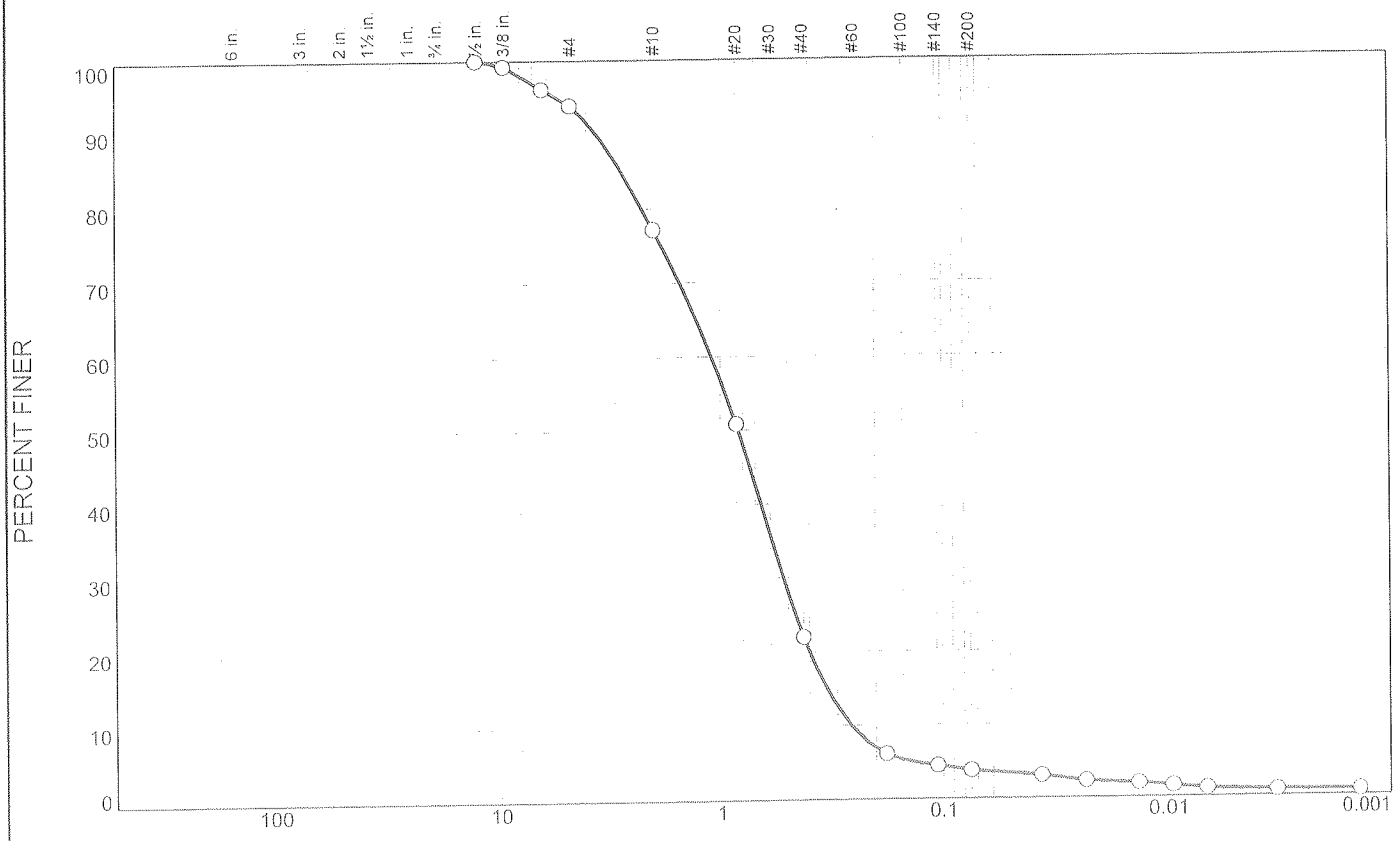
Sample No.: S-1 **Source of Sample:** B-14 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 0.7'-2.7'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972U

Tested By: JJH Checked By: MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.1	16.7	55.1	18.3	2.9	0.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	99.2		
1/4"	96.1		
#4	93.9		
#10	77.2		
#20	50.8		
#40	22.1		
#80	6.1		
#140	4.5		
#200	3.8		
0.0365 mm.	3.0		
0.0232 mm.	2.3		
0.0134 mm.	1.9		
0.0095 mm.	1.5		
0.0068 mm.	1.1		
0.0033 mm.	0.8		
0.0014 mm.	0.8		

* (no specification provided)

Soil Description

poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.7812 D_{60}= 1.0922 D_{50}= 0.8328
D_{30}= 0.5229 D_{15}= 0.3337 D_{10}= 0.2590
C_u= 4.22 C_c= 0.97

Classification

USCS= SP AASHTO=

Remarks

Moisture content: 14.0%

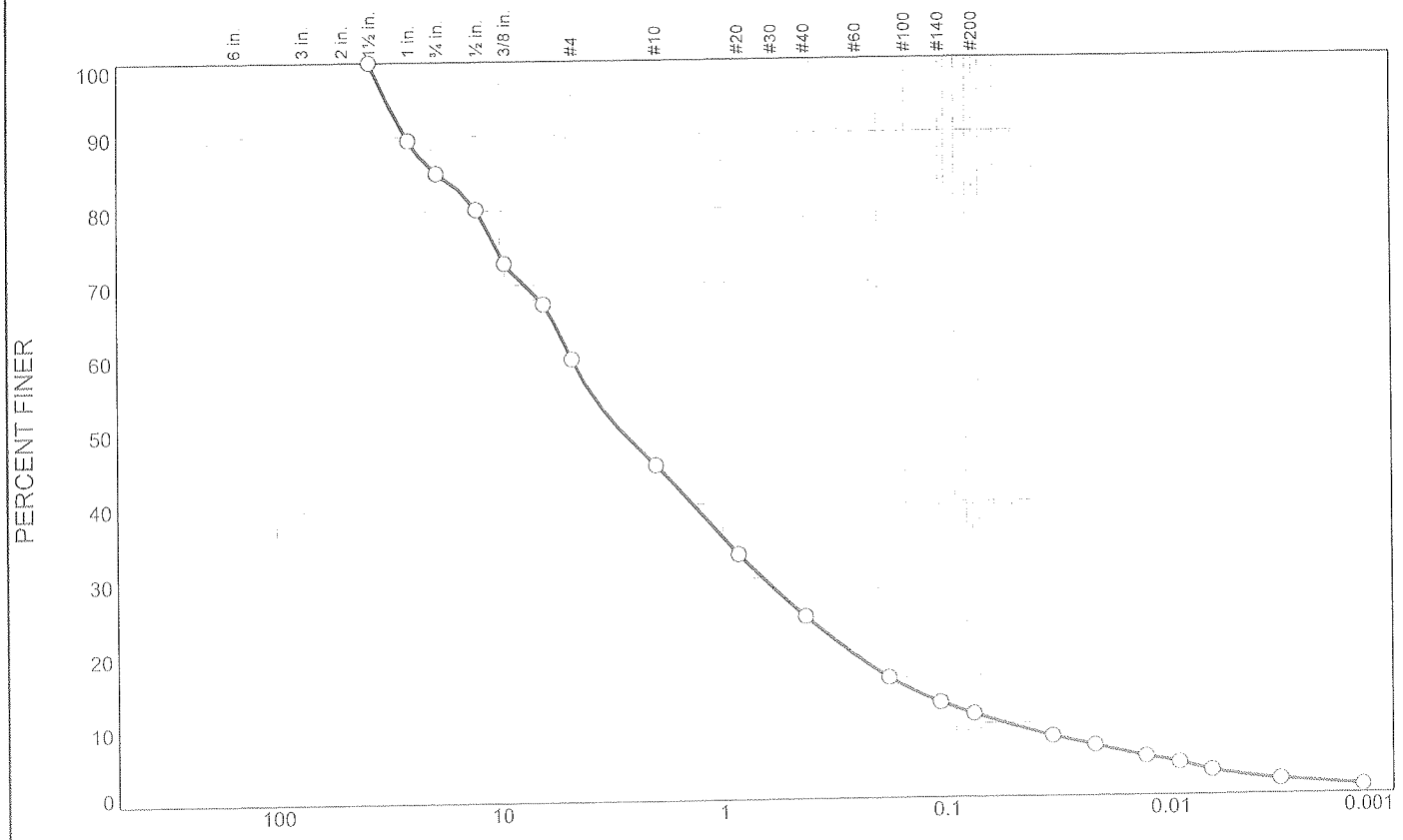
Sample No.: S-3 **Source of Sample:** B-14 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 4.7'-6.7'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972V

Tested By: JJH **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.9	25.3	14.5	20.5	13.5	8.6	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	89.5		
3/4"	85.1		
1/2"	80.2		
3/8"	72.9		
1/4"	67.3		
#4	59.8		
#10	45.3		
#20	33.3		
#40	24.8		
#80	16.4		
#140	12.9		
#200	11.3		
0.0334 mm.	8.2		
0.0215 mm.	6.9		
0.0127 mm.	5.3		
0.0091 mm.	4.4		
0.0065 mm.	3.3		
0.0032 mm.	2.0		
0.0014 mm.	1.1		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 18.9464 D_{60}= 4.7818 D_{50}= 2.8554
D_{30}= 0.6620 D_{15}= 0.1496 D_{10}= 0.0544
C_u= 87.91 C_c= 1.68

Classification

USCS= SW-SM AASHTO= A-1-a

Remarks

Moisture content: 5.0%

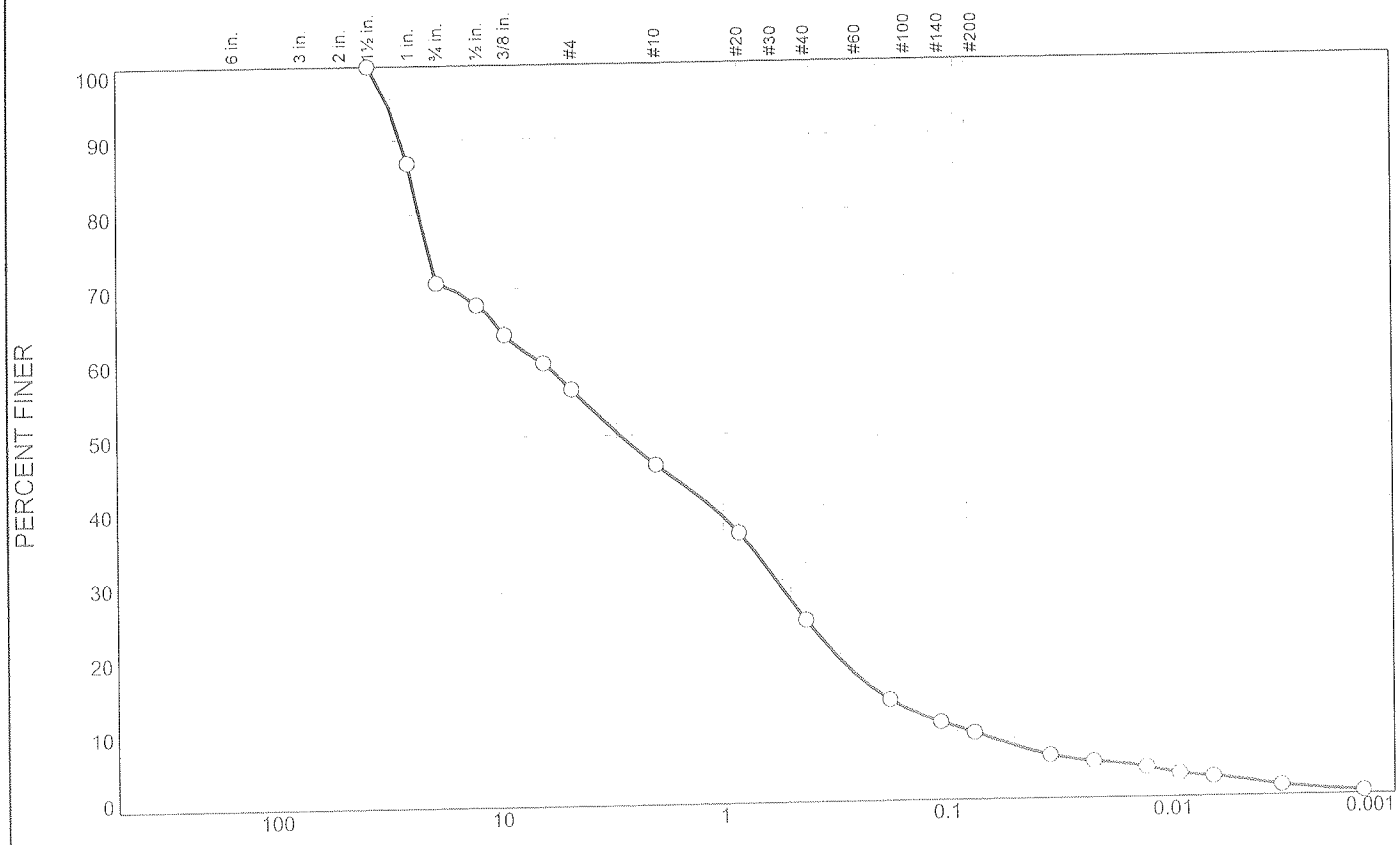
Sample No.: S-1 **Source of Sample:** B-15 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 0.4'-2.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972W

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	29.3	14.4	10.4	21.3	15.6	6.8	2.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	86.9		
3/4"	70.7		
1/2"	67.8		
3/8"	63.7		
1/4"	59.9		
#4	56.3		
#10	45.9		
#20	36.5		
#40	24.6		
#80	13.6		
#140	10.5		
#200	9.0		
0.0346 mm.	5.8		
0.0222 mm.	4.9		
0.0130 mm.	4.0		
0.0093 mm.	3.1		
0.0066 mm.	2.7		
0.0033 mm.	1.4		
0.0014 mm.	0.4		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 24.5771 D_{60}= 6.4375 D_{50}= 2.8920
D_{30}= 0.5770 D_{15}= 0.2093 D_{10}= 0.0941
C_u= 68.37 C_c= 0.55

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Moisture content: 4.2%

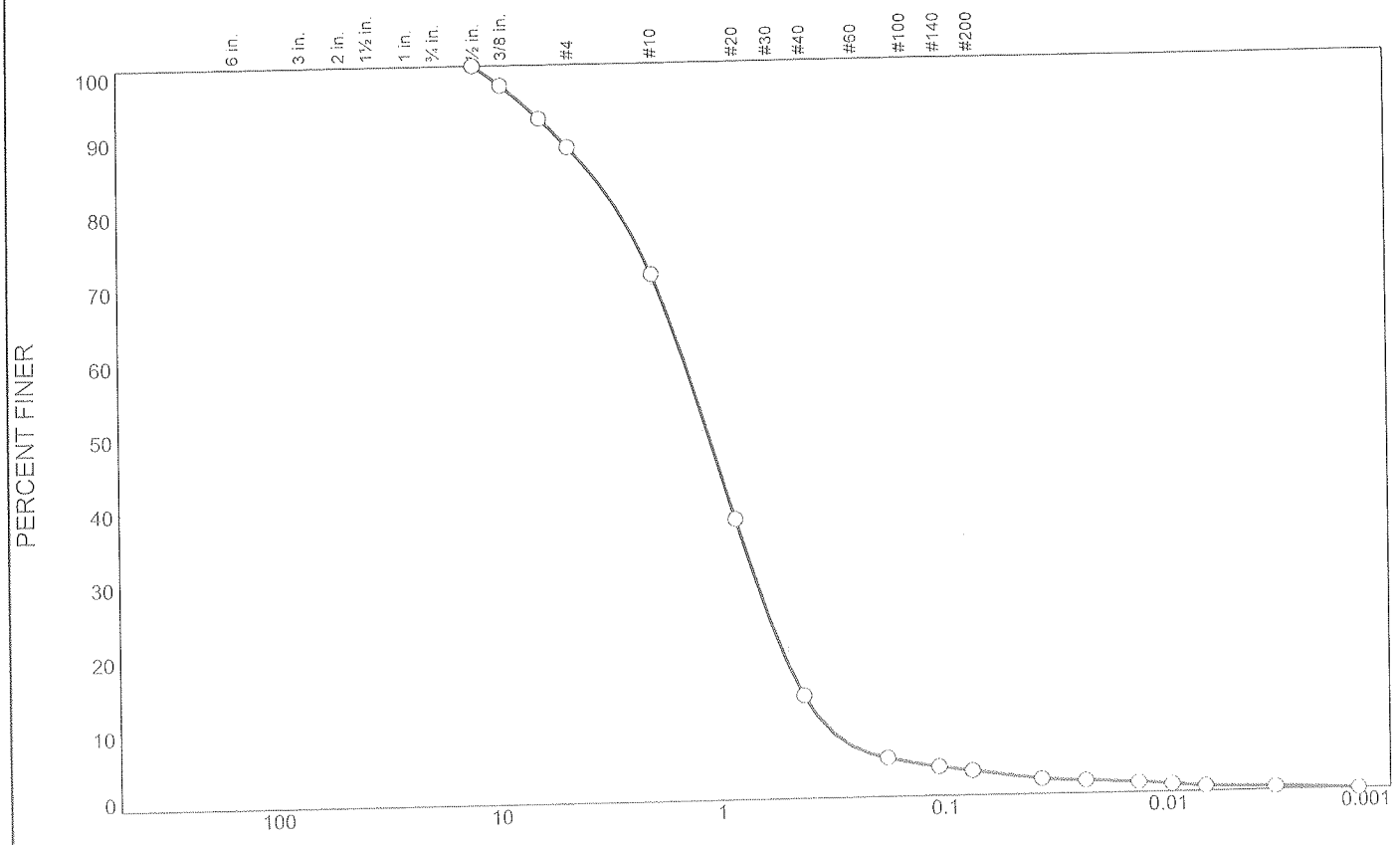
Sample No.: S-1 Source of Sample: B-16 Date: 10/16/09
Location: New Bedford, MA Elev./Depth: 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 Lab No. 10972X

Tested By: JJH/MCS Checked By: MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.3	17.4	57.4	10.6	2.8	0.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	97.3		
1/4"	92.7		
#4	88.7		
#10	71.3		
#20	38.0		
#40	13.9		
#80	5.2		
#140	3.9		
#200	3.3		
0.0367 mm.	2.1		
0.0233 mm.	1.7		
0.0135 mm.	1.4		
0.0096 mm.	1.0		
0.0068 mm.	0.7		
0.0033 mm.	0.4		
0.0014 mm.	0.0		

* (no specification provided)

Soil Description

poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.7065 D_{60}= 1.4469 D_{50}= 1.1312
D_{30}= 0.6985 D_{15}= 0.4439 D_{10}= 0.3454
C_u= 4.19 C_c= 0.98

Classification

USCS= SP AASHTO=

Remarks

Moisture content: 14.3%

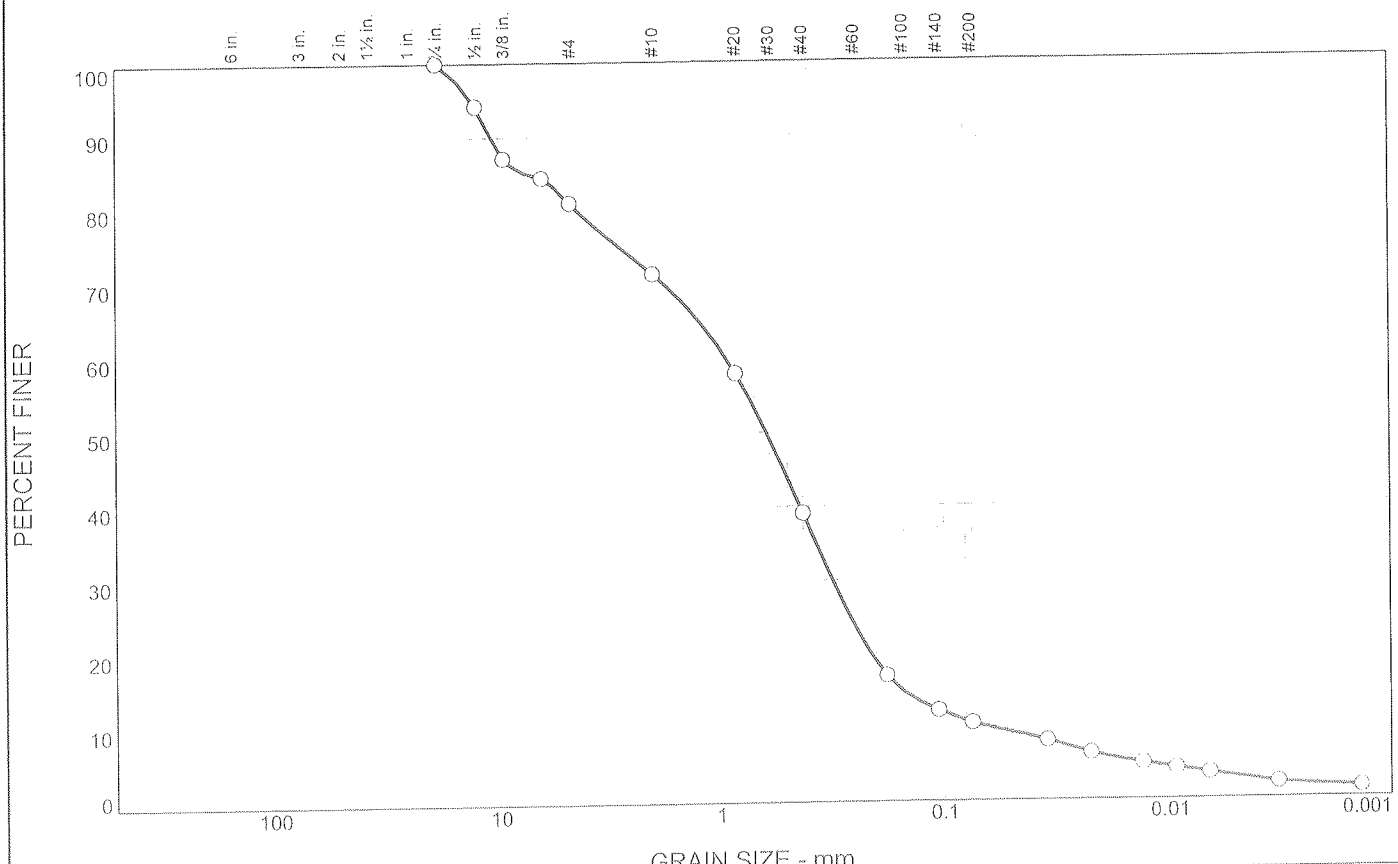
Sample No.: S-3 Source of Sample: B-16 Date: 10/16/09
Location: New Bedford, MA Elev./Depth: 4.3'-6.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 Lab No. 10972Y

Tested By: JJH/MCS Checked By: MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	18.9	9.6	32.4	28.6	7.6	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	94.2		
3/8"	87.2		
1/4"	84.5		
#4	81.1		
#10	71.5		
#20	58.1		
#40	39.1		
#80	17.0		
#140	12.2		
#200	10.5		
0.0350 mm.	8.0		
0.0225 mm.	6.3		
0.0131 mm.	4.9		
0.0093 mm.	4.2		
0.0066 mm.	3.5		
0.0033 mm.	2.1		
0.0014 mm.	1.4		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 7.1439 D_{60}= 0.9298 D_{50}= 0.6172
D_{30}= 0.3135 D_{15}= 0.1542 D_{10}= 0.0658
C_u= 14.13 C_c= 1.61

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Moisture content: 9.0%

Sample No.: S-1 **Source of Sample:** B-17 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 0.5'-2.5'

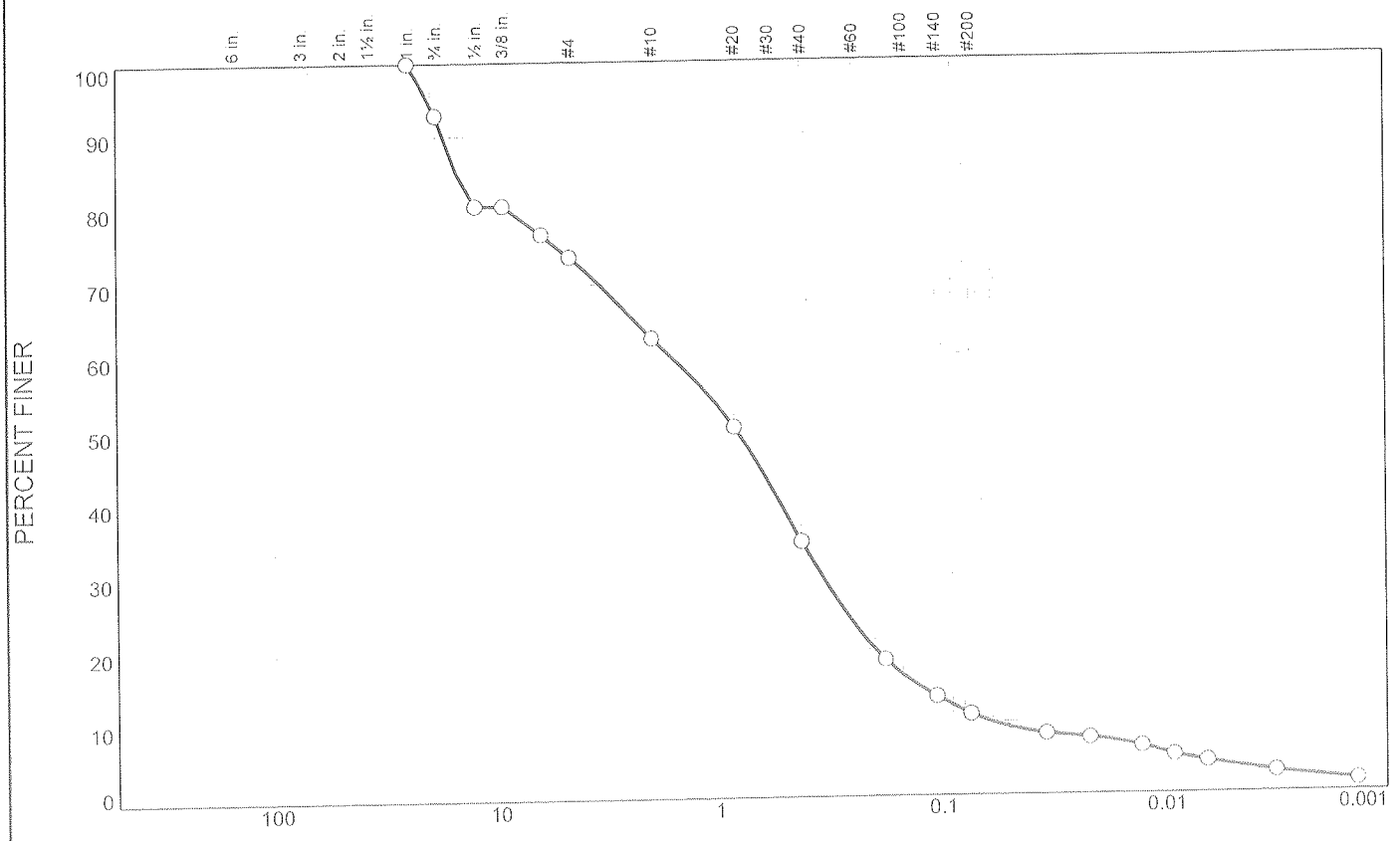
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps

Project No: 1229-01 **Lab No.** 10972Z

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.1	19.2	11.1	27.9	23.7	7.3	3.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	92.9		
1/2"	80.6		
3/8"	80.6		
1/4"	76.8		
#4	73.7		
#10	62.6		
#20	50.5		
#40	34.7		
#80	18.6		
#140	13.5		
#200	11.0		
0.0346 mm.	8.3		
0.0220 mm.	7.7		
0.0129 mm.	6.4		
0.0092 mm.	5.2		
0.0066 mm.	4.3		
0.0032 mm.	2.8		
0.0014 mm.	1.6		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 15.2010 D_{60}= 1.6279 D_{50}= 0.8299
D_{30}= 0.3447 D_{15}= 0.1279 D_{10}= 0.0615
C_u= 26.46 C_c= 1.19

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Moisture content: 8.9%

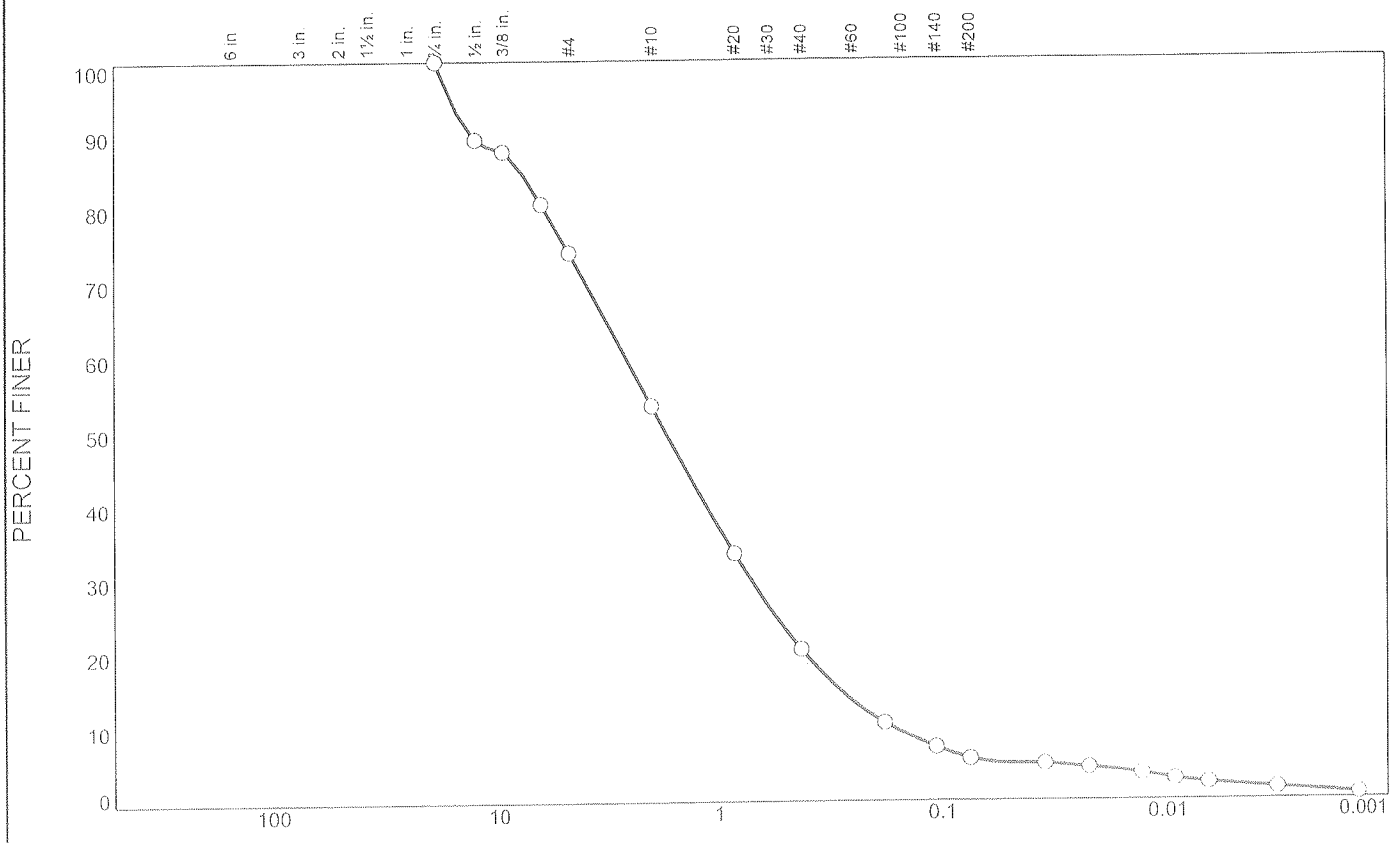
Sample No.: S-1 **Source of Sample:** B-18 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 0.5'-2.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972AA

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	25.9	20.6	33.1	14.8	3.7	1.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	89.4		
3/8"	87.8		
1/4"	80.7		
#4	74.1		
#10	53.5		
#20	33.5		
#40	20.4		
#80	10.4		
#140	7.2		
#200	5.6		
0.0350 mm.	4.9		
0.0223 mm.	4.3		
0.0130 mm.	3.6		
0.0092 mm.	2.8		
0.0066 mm.	2.2		
0.0032 mm.	1.5		
0.0014 mm.	0.7		

* (no specification provided)

Soil Description

well-graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 7.7688 D_{60}= 2.6163 D_{50}= 1.7329
D_{30}= 0.7208 D_{15}= 0.2873 D_{10}= 0.1694
C_u= 15.44 C_c= 1.17

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Moisture content: 14.0%

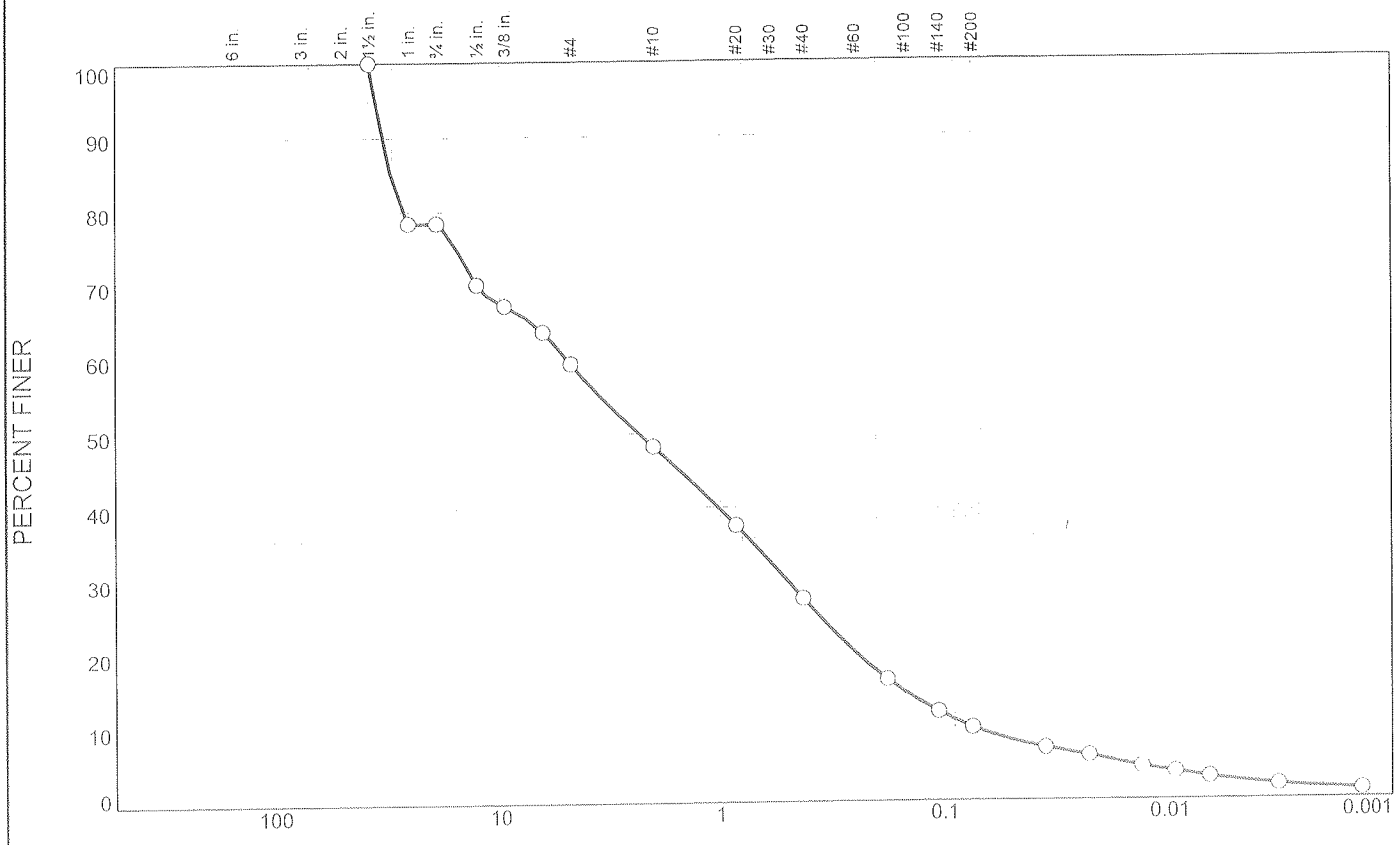
Sample No.: S-3 **Source of Sample:** B-19 **Date:** 10/22/09
Location: New Bedford, MA **Elev./Depth:** 4'-6'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972BB

Tested By: JJH/DCH Checked By: MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.5	19.1	11.2	20.7	17.7	7.4	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	78.5		
3/4"	78.5		
1/2"	70.1		
3/8"	67.2		
1/4"	63.6		
#4	59.4		
#10	48.2		
#20	37.5		
#40	27.5		
#80	16.4		
#140	12.0		
#200	9.8		
0.0355 mm.	7.0		
0.0226 mm.	5.9		
0.0132 mm.	4.4		
0.0094 mm.	3.7		
0.0067 mm.	3.0		
0.0033 mm.	1.9		
0.0014 mm.	1.1		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 30.2845 D_{60}= 4.9506 D_{50}= 2.3203
D_{30}= 0.5033 D_{15}= 0.1555 D_{10}= 0.0773
C_u= 64.07 C_c= 0.66

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Moisture content: 6.5%

Sample No.: S-1 **Source of Sample:** B-19 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 0.2'-2.2'

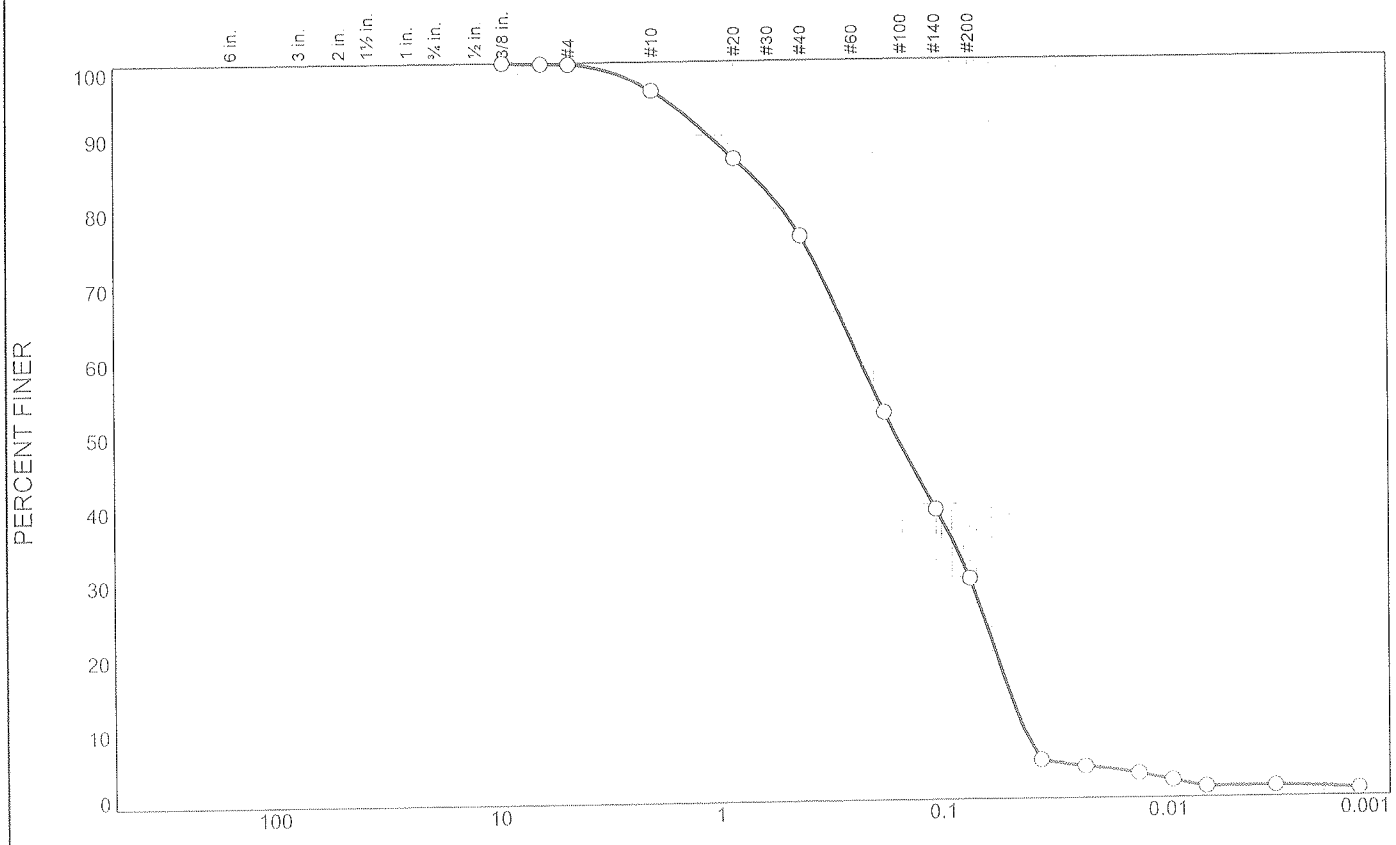
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps

Project No: 1229-01 **Lab No.** 10972CC

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	3.6	19.8	46.5	28.4	1.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	99.8		
#4	99.7		
#10	96.1		
#20	86.8		
#40	76.3		
#80	52.5		
#140	39.3		
#200	29.8		
0.0363 mm.	5.2		
0.0231 mm.	4.2		
0.0134 mm.	3.3		
0.0095 mm.	2.3		
0.0068 mm.	1.4		
0.0033 mm.	1.5		
0.0014 mm.	1.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.7310 D_{60}= 0.2337 D_{50}= 0.1641
D_{30}= 0.0754 D_{15}= 0.0510 D_{10}= 0.0443
C_u= 5.28 C_c= 0.55

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 20.6%

Sample No.: S-4 **Source of Sample:** B-19 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 6'-8'

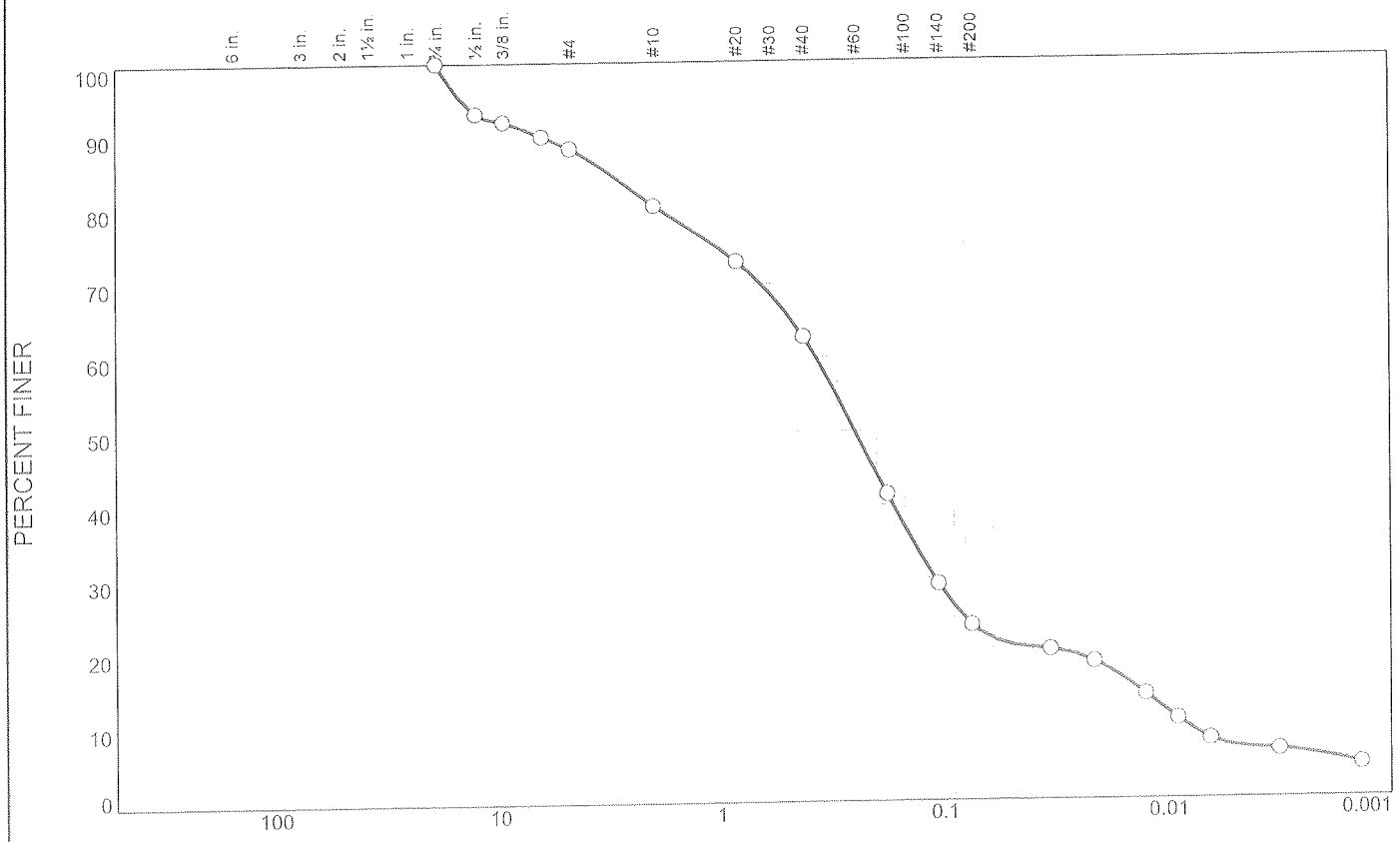
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps

Project No: 1229-01 **Lab No.** 10972DD

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.5	7.9	17.8	39.2	16.7	6.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	93.2		
3/8"	92.1		
1/4"	90.1		
#4	88.5		
#10	80.6		
#20	73.0		
#40	62.8		
#80	41.4		
#140	29.3		
#200	23.6		
0.0332 mm.	20.2		
0.0212 mm.	18.5		
0.0126 mm.	14.1		
0.0091 mm.	10.7		
0.0065 mm.	8.0		
0.0032 mm.	6.4		
0.0014 mm.	4.4		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 3.1364 D_{60}= 0.3737 D_{50}= 0.2499
D_{30}= 0.1100 D_{15}= 0.0138 D_{10}= 0.0084
C_u= 44.52 C_c= 3.86

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 22.0%

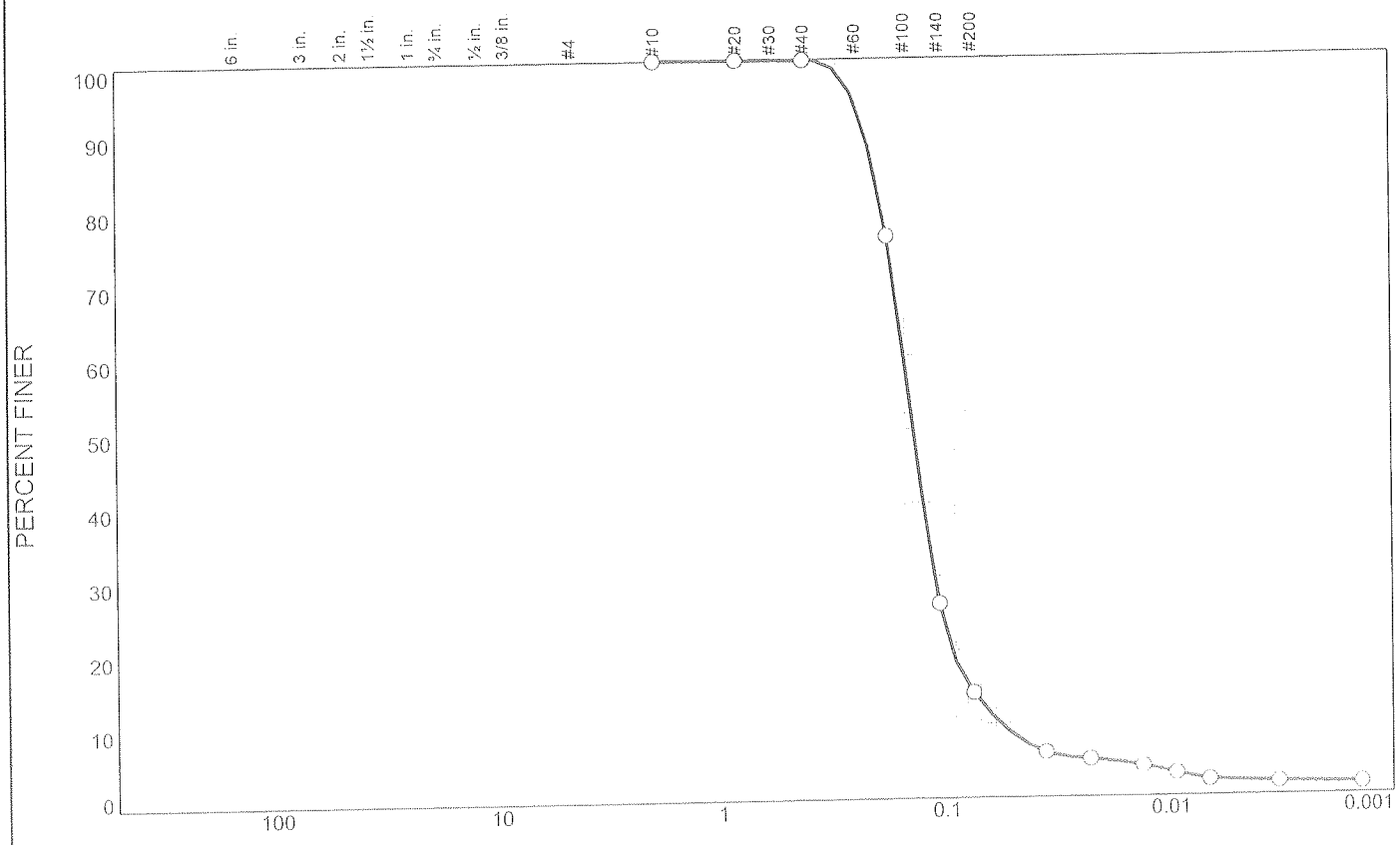
Sample No.: S-1 **Source of Sample:** B-20 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 0.2'-2.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972EE

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	85.7	12.3	1.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.9		
#80	76.2		
#140	26.3		
#200	14.2		
0.0358 mm.	6.0		
0.0228 mm.	5.0		
0.0132 mm.	4.1		
0.0094 mm.	3.1		
0.0067 mm.	2.1		
0.0033 mm.	1.7		
0.0014 mm.	1.5		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.2037 D_{60}= 0.1519 D_{50}= 0.1380
D_{30}= 0.1116 D_{15}= 0.0783 D_{10}= 0.0569
C_u= 2.67 C_c= 1.44

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 24.5%

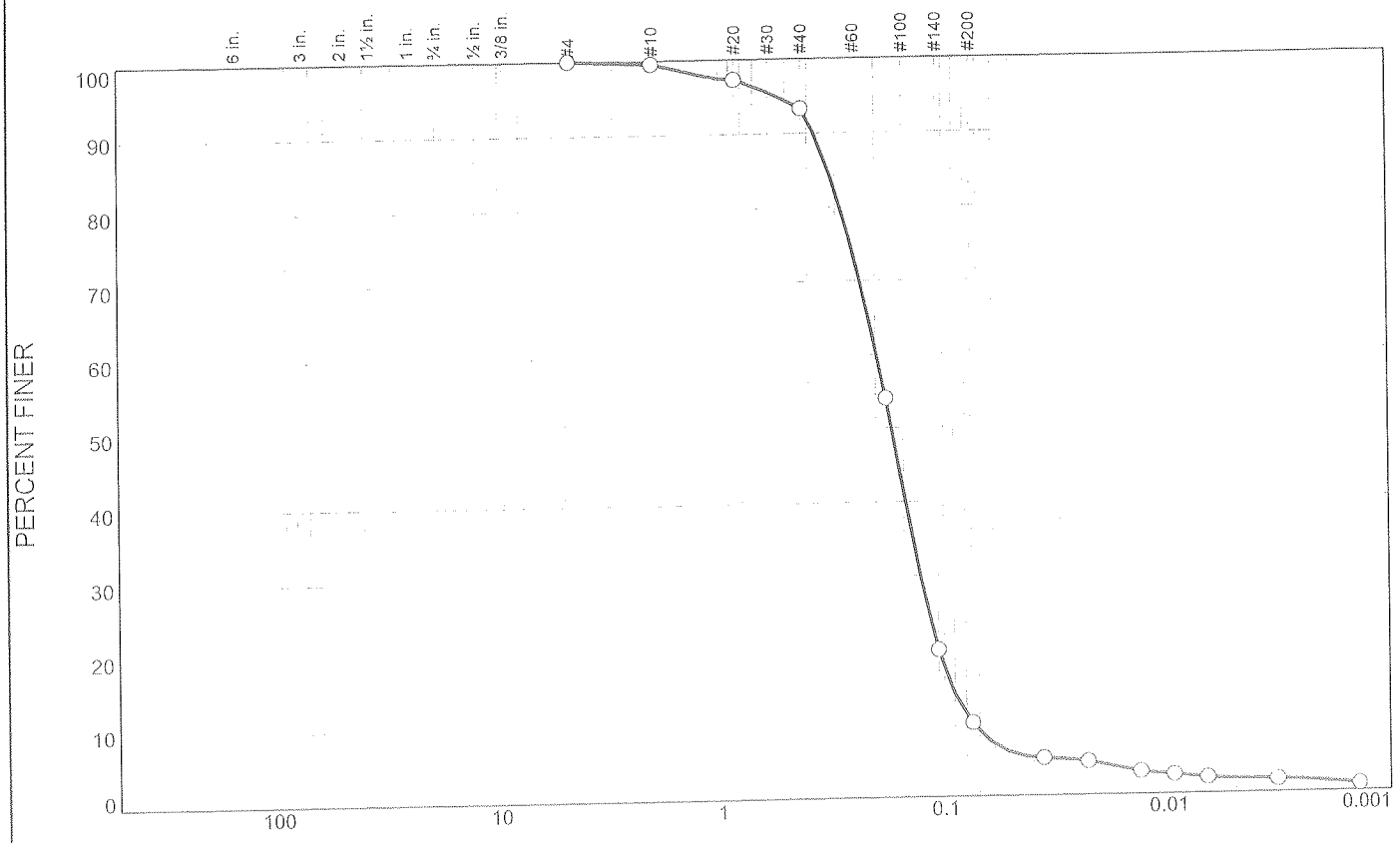
Sample No.: S-3 **Source of Sample:** B-20 **Date:** 10/16/09
Location: New Bedford, MA **Elev./Depth:** 4.2'-6.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972FF

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	6.2	83.4	8.0	1.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	97.3		
#40	93.3		
#80	54.1		
#140	20.0		
#200	9.9		
0.0360 mm.	5.0		
0.0229 mm.	4.5		
0.0133 mm.	3.1		
0.0094 mm.	2.6		
0.0067 mm.	2.1		
0.0033 mm.	1.7		
0.0014 mm.	1.0		

* (no specification provided)

Soil Description

poorly graded sand with silt

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.3201 D_{60}= 0.1970 D_{50}= 0.1697
D_{30}= 0.1269 D_{15}= 0.0931 D_{10}= 0.0753
C_u= 2.62 C_c= 1.09

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture content: 25.6%

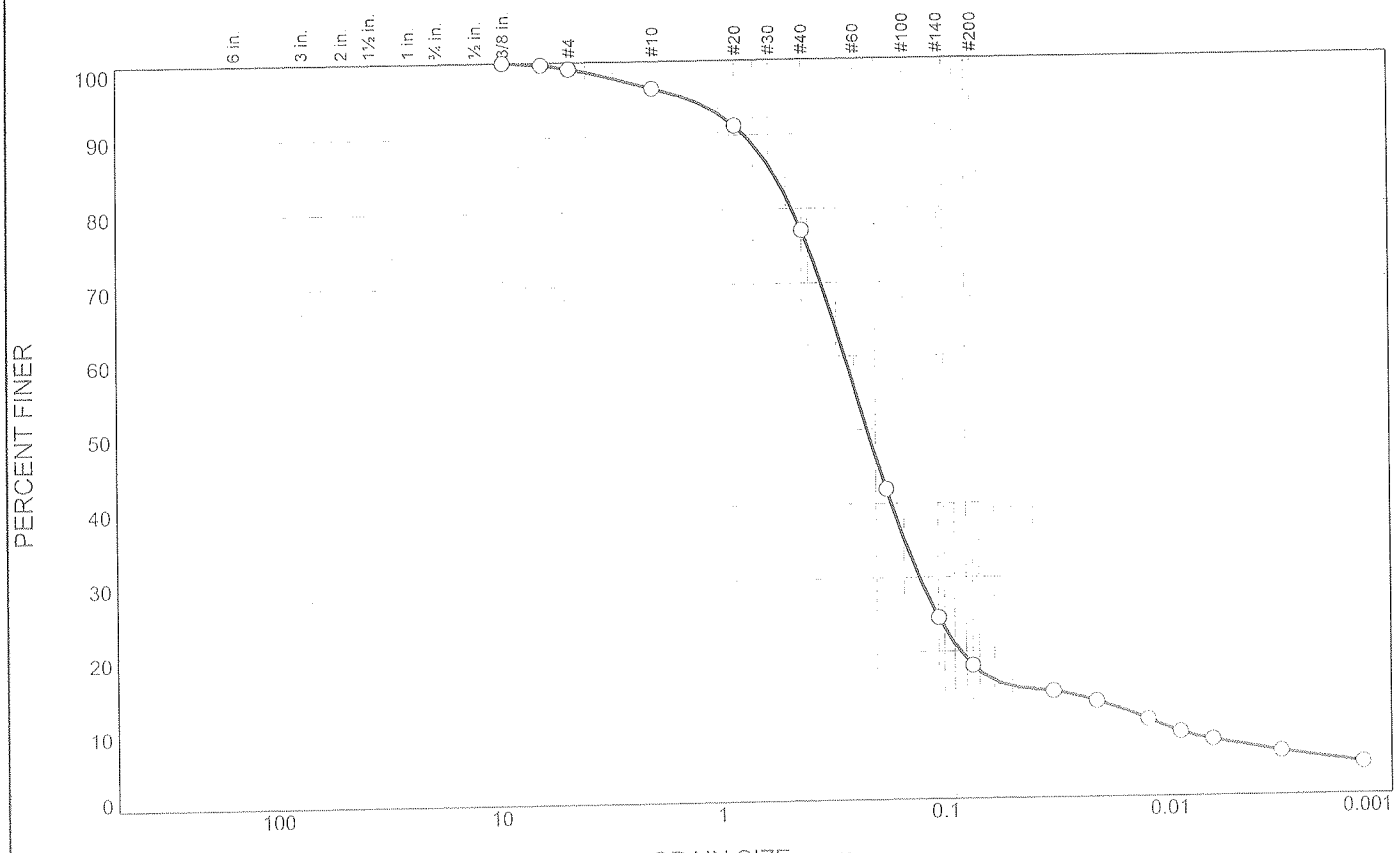
Sample No.: S-4 **Source of Sample:** B-20 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 6'-8'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972GG

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	2.8	19.2	59.0	11.1	7.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	99.6		
#4	99.1		
#10	96.3		
#20	91.3		
#40	77.1		
#80	42.0		
#140	24.6		
#200	18.1		
0.0328 mm.	14.5		
0.0210 mm.	13.0		
0.0124 mm.	10.5		
0.0089 mm.	8.7		
0.0064 mm.	7.7		
0.0031 mm.	6.0		
0.0014 mm.	4.3		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.5714 D_{60}= 0.2740 D_{50}= 0.2180
D_{30}= 0.1288 D_{15}= 0.0469 D_{10}= 0.0113
C_u= 24.17 C_c= 5.34

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 32.3%

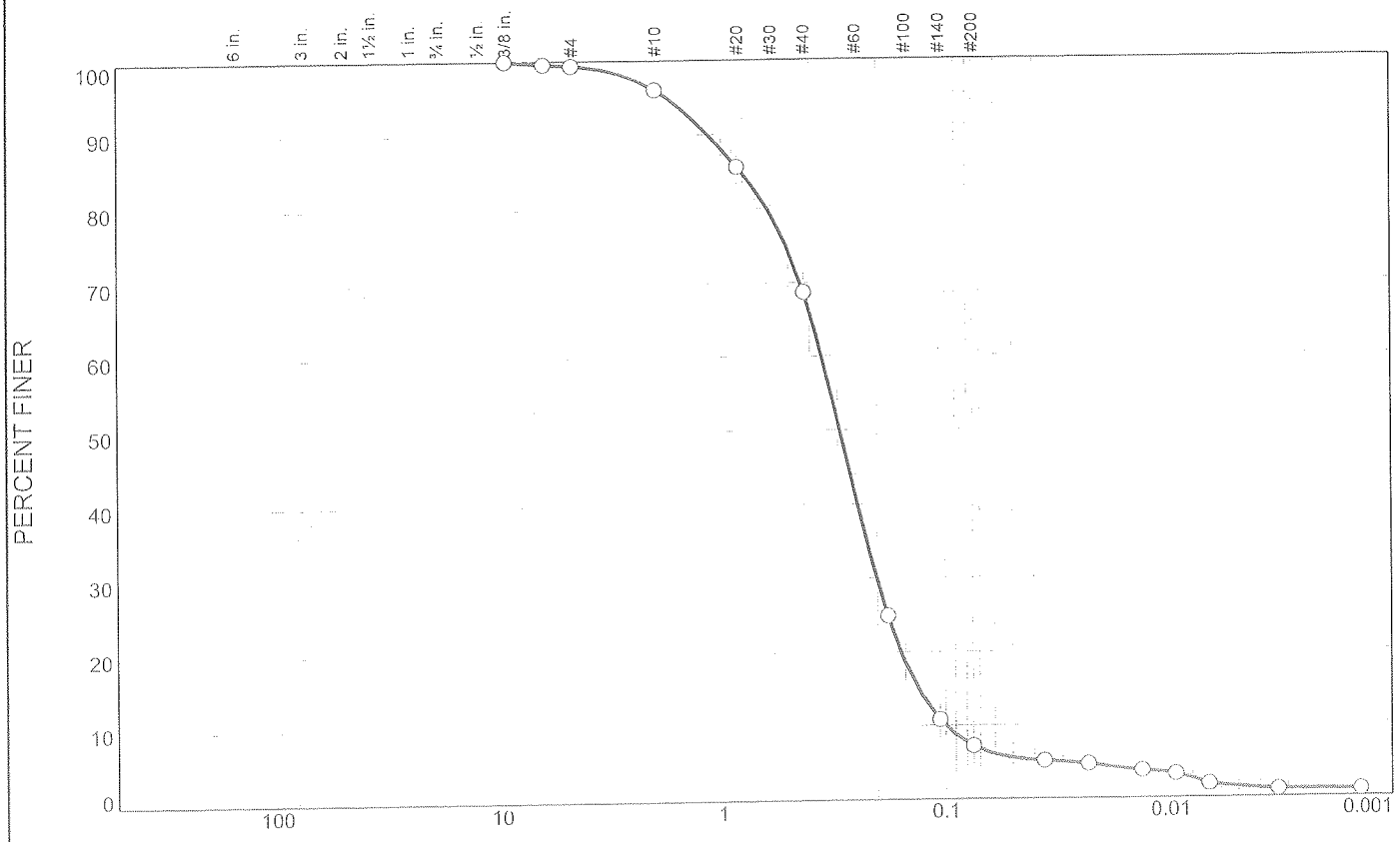
Sample No.: S-1 **Source of Sample:** B-21 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.5'-2.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972HH

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	3.2	27.4	61.4	5.9	1.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	99.5		
#4	99.3		
#10	96.1		
#20	85.6		
#40	68.7		
#80	24.9		
#140	10.8		
#200	7.3		
0.0363 mm.	5.2		
0.0230 mm.	4.7		
0.0134 mm.	3.8		
0.0095 mm.	3.3		
0.0068 mm.	1.9		
0.0033 mm.	1.0		
0.0014 mm.	0.9		

* (no specification provided)

Soil Description

poorly graded sand with silt

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.8160 D_{60}= 0.3525 D_{50}= 0.2926
D_{30}= 0.2015 D_{15}= 0.1321 D_{10}= 0.1000
C_u= 3.52 C_c= 1.15

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture content: 18.8%

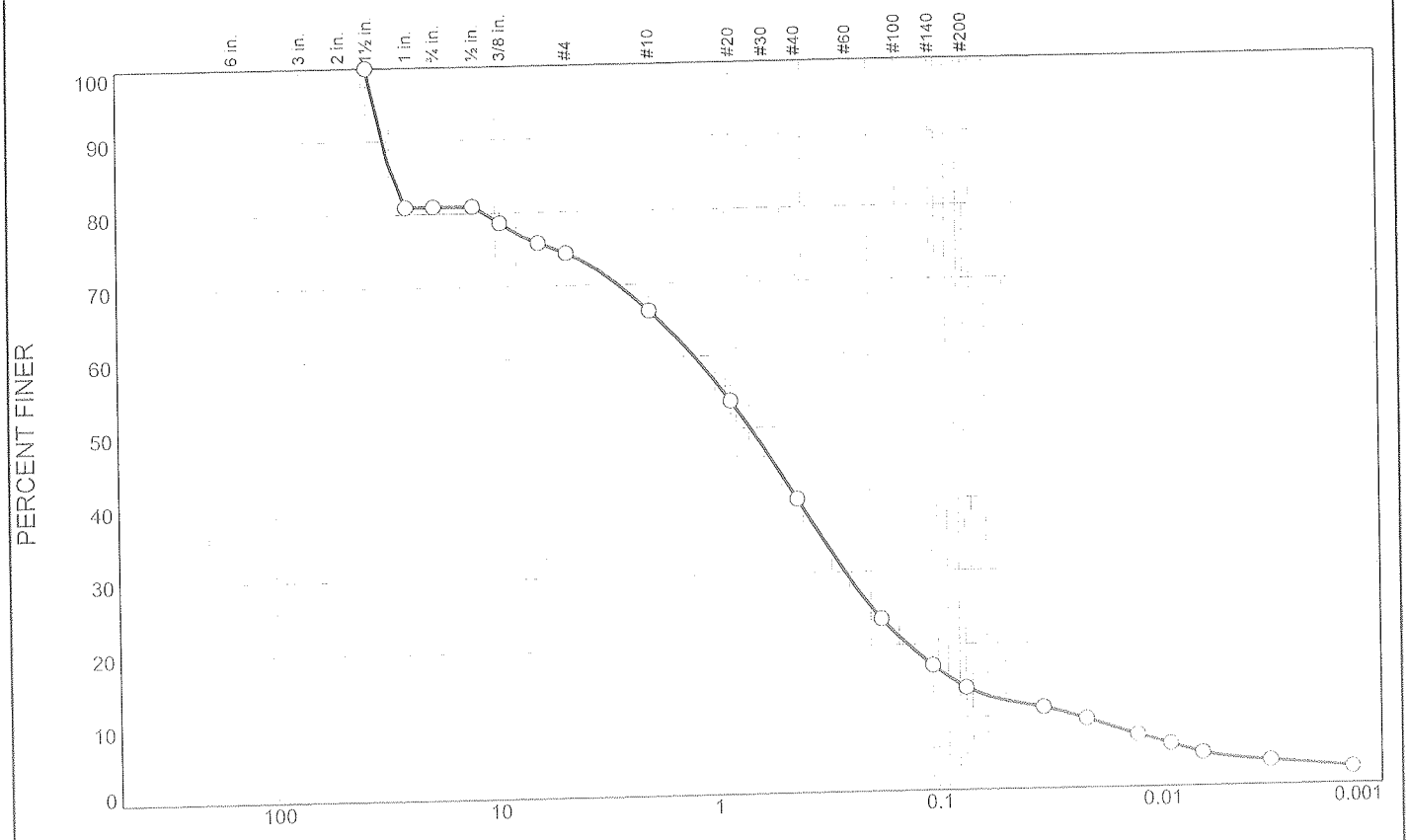
Sample No.: S-4 **Source of Sample:** B-21 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 6.5'-8.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972II

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	19.0	6.6	8.0	26.2	26.2	10.1	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	81.0		
3/4"	81.0		
1/2"	81.0		
3/8"	78.6		
1/4"	75.9		
#4	74.4		
#10	66.4		
#20	53.8		
#40	40.2		
#80	23.6		
#140	17.1		
#200	14.0		
0.0338 mm.	11.1		
0.0217 mm.	9.5		
0.0128 mm.	7.2		
0.0092 mm.	5.9		
0.0066 mm.	4.6		
0.0032 mm.	3.3		
0.0014 mm.	2.3		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 28.9620 D_{60}= 1.2476 D_{50}= 0.6924
D_{30}= 0.2595 D_{15}= 0.0850 D_{10}= 0.0244
C_u= 51.11 C_c= 2.21

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture content: 12.0%

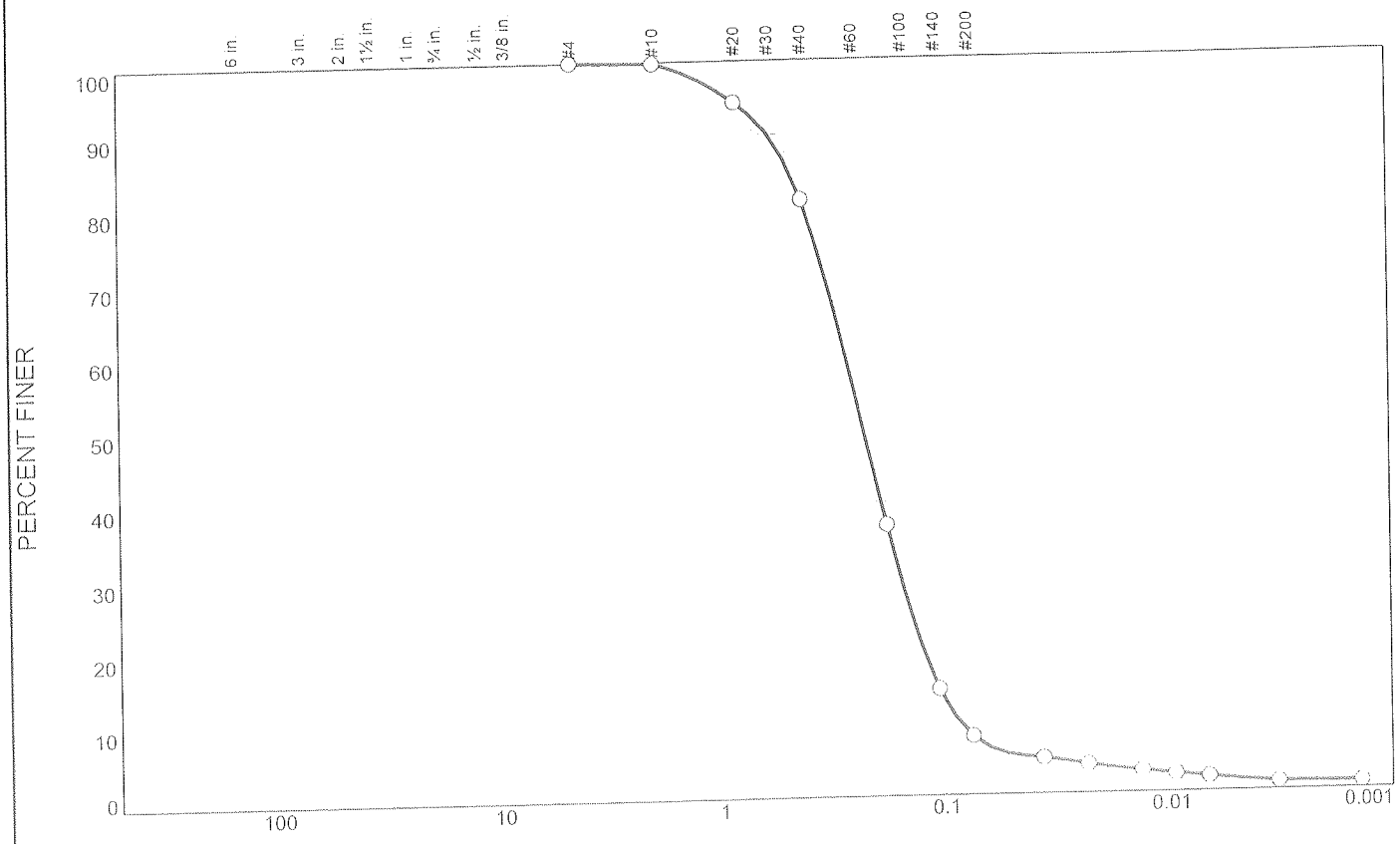
Sample No.: S-1 **Source of Sample:** B-22 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972JJ

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	18.6	73.2	6.5	1.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	94.4		
#40	81.2		
#80	36.9		
#140	14.5		
#200	8.0		
0.0364 mm.	4.9		
0.0231 mm.	3.9		
0.0134 mm.	2.9		
0.0095 mm.	2.4		
0.0068 mm.	1.9		
0.0033 mm.	1.1		
0.0014 mm.	1.0		

* (no specification provided)

Soil Description

poorly graded sand with silt

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.4789 D_{60}= 0.2721 D_{50}= 0.2279
D_{30}= 0.1573 D_{15}= 0.1078 D_{10}= 0.0864
C_u= 3.15 C_c= 1.05

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture content: 21.2%

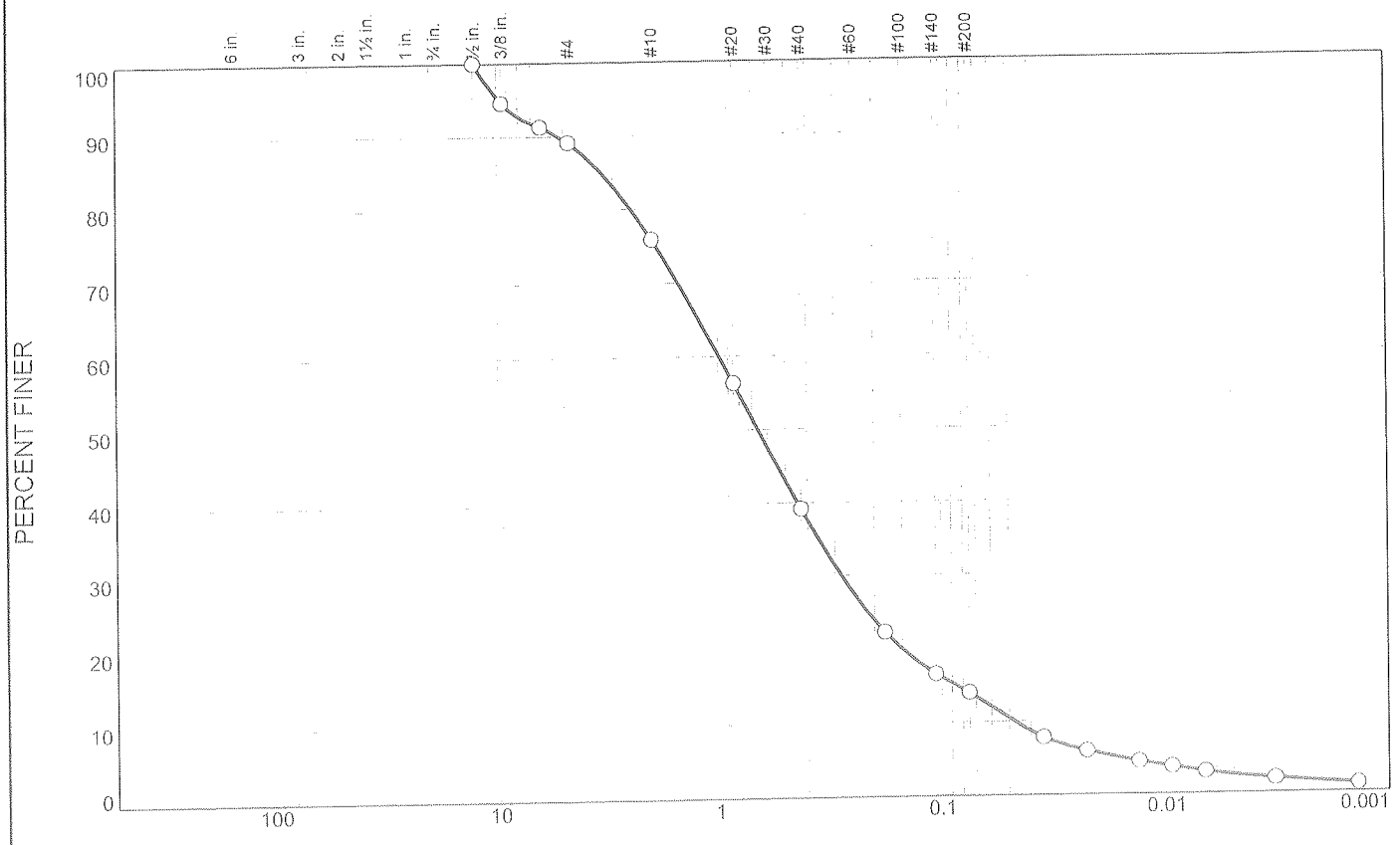
Sample No.: S-3 Source of Sample: B-22 Date: 10/19/09
Location: New Bedford, MA Elev./Depth: 4.3'-6.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 Lab No. 10972KK

Tested By: JJH/MCS Checked By: MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.9	13.2	36.7	25.2	11.5	2.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	94.6		
1/4"	91.3		
#4	89.1		
#10	75.9		
#20	56.4		
#40	39.2		
#80	22.3		
#140	16.6		
#200	14.0		
0.0352 mm.	7.8		
0.0226 mm.	5.9		
0.0132 mm.	4.5		
0.0094 mm.	3.7		
0.0067 mm.	3.0		
0.0033 mm.	1.9		
0.0014 mm.	1.1		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 3.3664 D_{60}= 0.9847 D_{50}= 0.6592
D_{30}= 0.2805 D_{15}= 0.0858 D_{10}= 0.0472
C_u= 20.85 C_c= 1.69

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture content: 6.4%

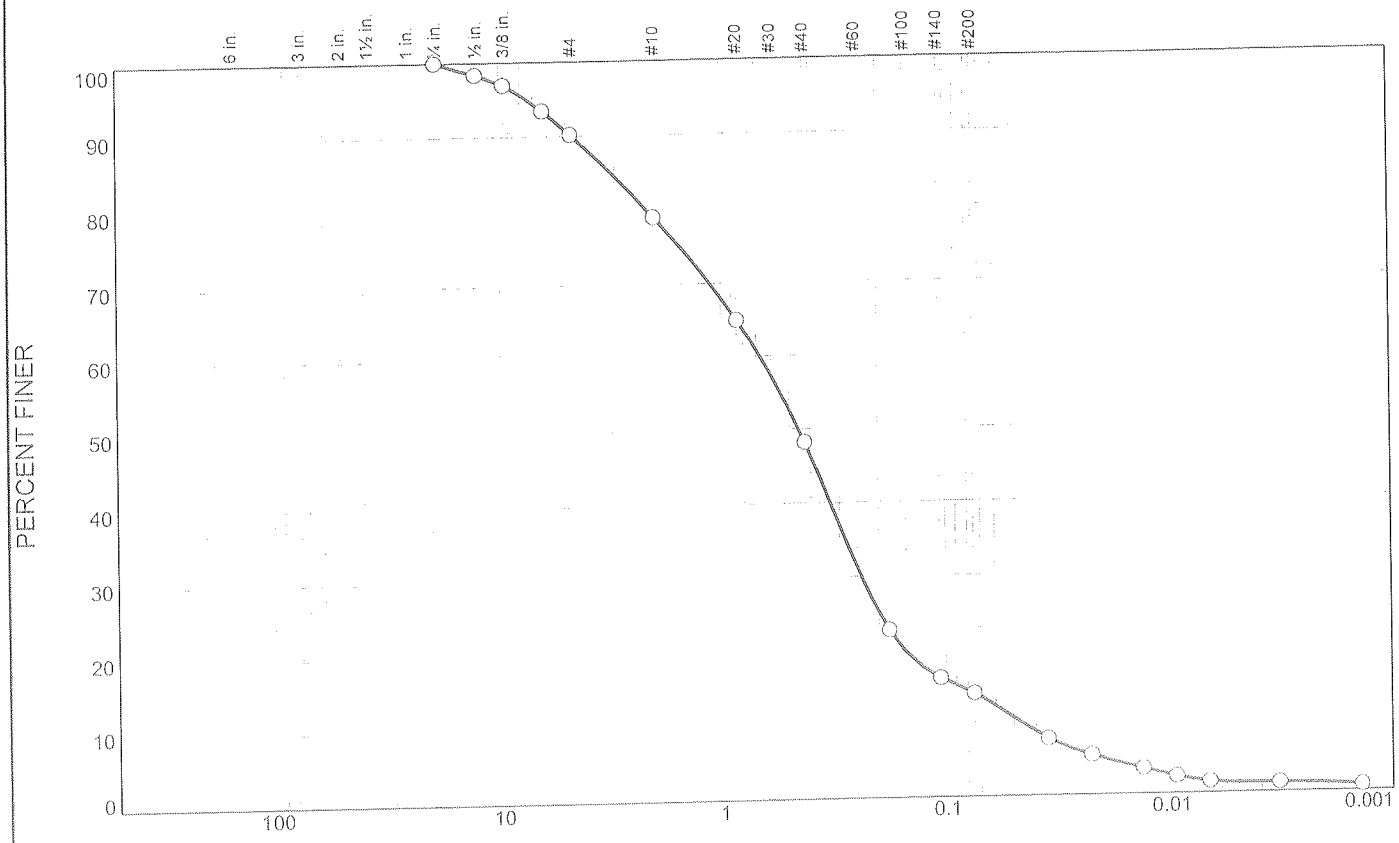
Sample No.: S-1 **Source of Sample:** B-23 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972LL

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.8	11.2	30.8	34.2	12.7	1.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.3		
3/8"	96.9		
1/4"	93.4		
#4	90.2		
#10	79.0		
#20	65.0		
#40	48.2		
#80	22.8		
#140	16.2		
#200	14.0		
0.0353 mm.	7.7		
0.0227 mm.	5.4		
0.0133 mm.	3.5		
0.0095 mm.	2.3		
0.0068 mm.	1.5		
0.0033 mm.	1.2		
0.0014 mm.	0.8		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 3.0971 D_{60}= 0.6709 D_{50}= 0.4520
D_{30}= 0.2388 D_{15}= 0.0879 D_{10}= 0.0467
C_u= 14.38 C_c= 1.82

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture content: 6.4%

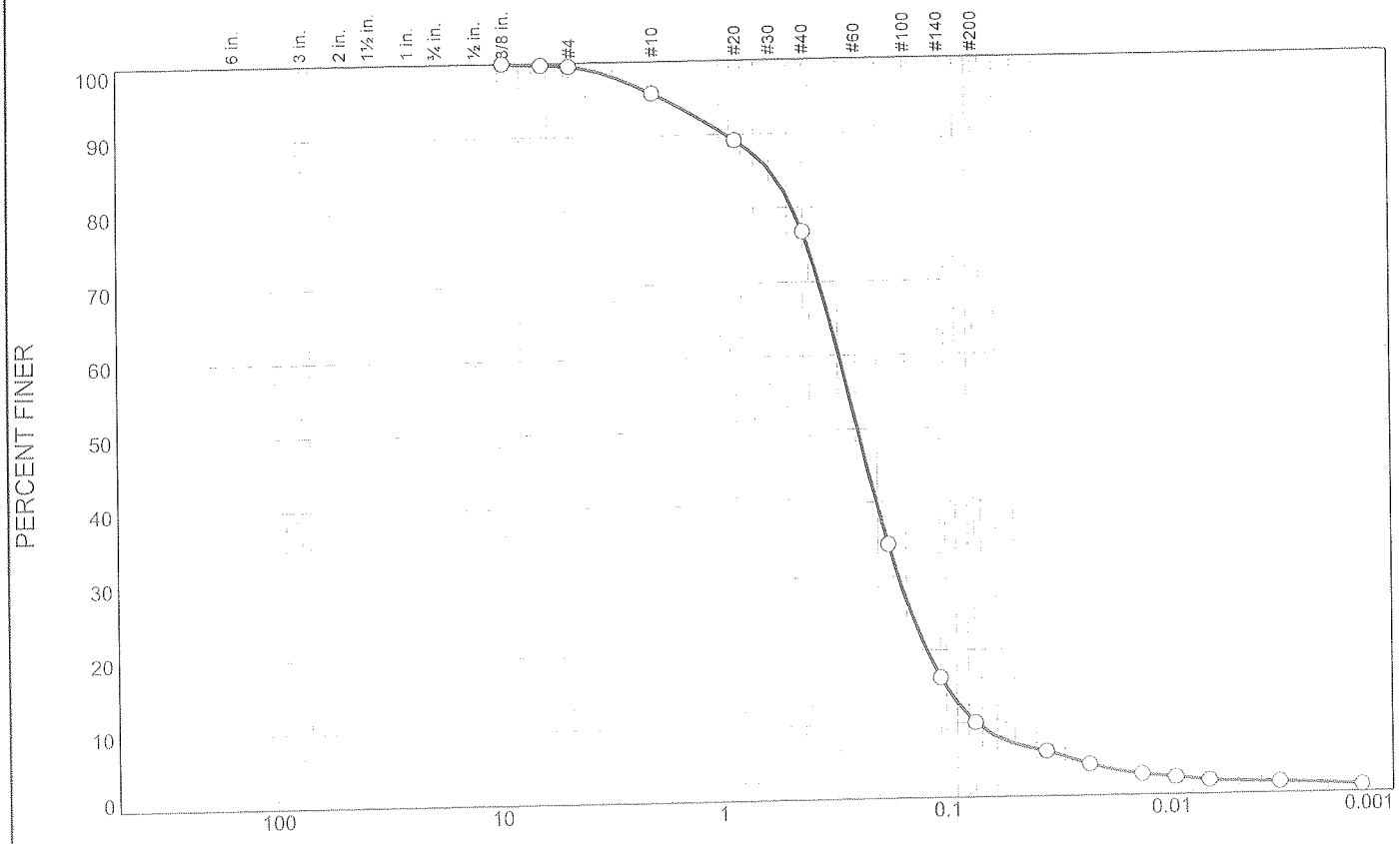
Sample No.: S-1 **Source of Sample:** B-24 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.4'-2.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972MM

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	3.8	18.9	66.7	8.5	1.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	99.7		
#4	99.5		
#10	95.7		
#20	89.2		
#40	76.8		
#80	34.3		
#140	16.3		
#200	10.1		
0.0360 mm.	6.1		
0.0231 mm.	4.2		
0.0134 mm.	2.8		
0.0095 mm.	2.3		
0.0068 mm.	1.9		
0.0033 mm.	1.5		
0.0014 mm.	0.9		

* (no specification provided)

Soil Description

poorly graded sand with silt

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.5903 D_{60}= 0.2943 D_{50}= 0.2445
D_{30}= 0.1629 D_{15}= 0.1001 D_{10}= 0.0741
C_u= 3.97 C_c= 1.22

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture content: 20.5%

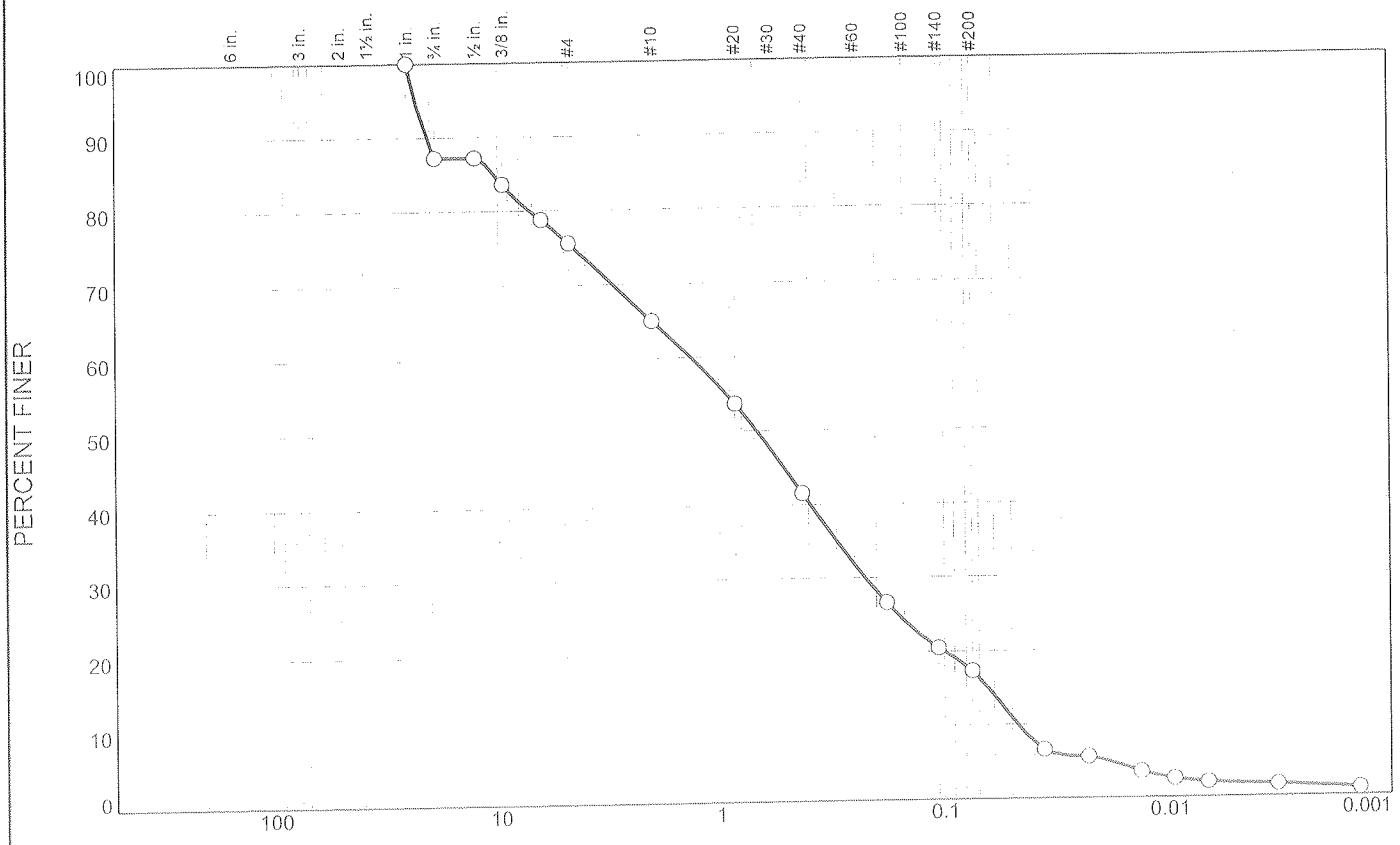
Sample No.: S-3 **Source of Sample:** B-24 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 4.4'-6.4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972NN

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.8	11.6	10.6	23.5	24.1	15.6	1.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	87.2		
1/2"	87.2		
3/8"	83.6		
1/4"	78.8		
#4	75.6		
#10	65.0		
#20	53.7		
#40	41.5		
#80	26.6		
#140	20.5		
#200	17.4		
0.0360 mm.	6.6		
0.0229 mm.	5.6		
0.0134 mm.	3.6		
0.0095 mm.	2.5		
0.0068 mm.	2.0		
0.0033 mm.	1.6		
0.0014 mm.	1.0		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 10.3865 D_{60}= 1.3320 D_{50}= 0.6775
D_{30}= 0.2236 D_{15}= 0.0636 D_{10}= 0.0473
C_u= 28.18 C_c= 0.79

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture content: 10.7%

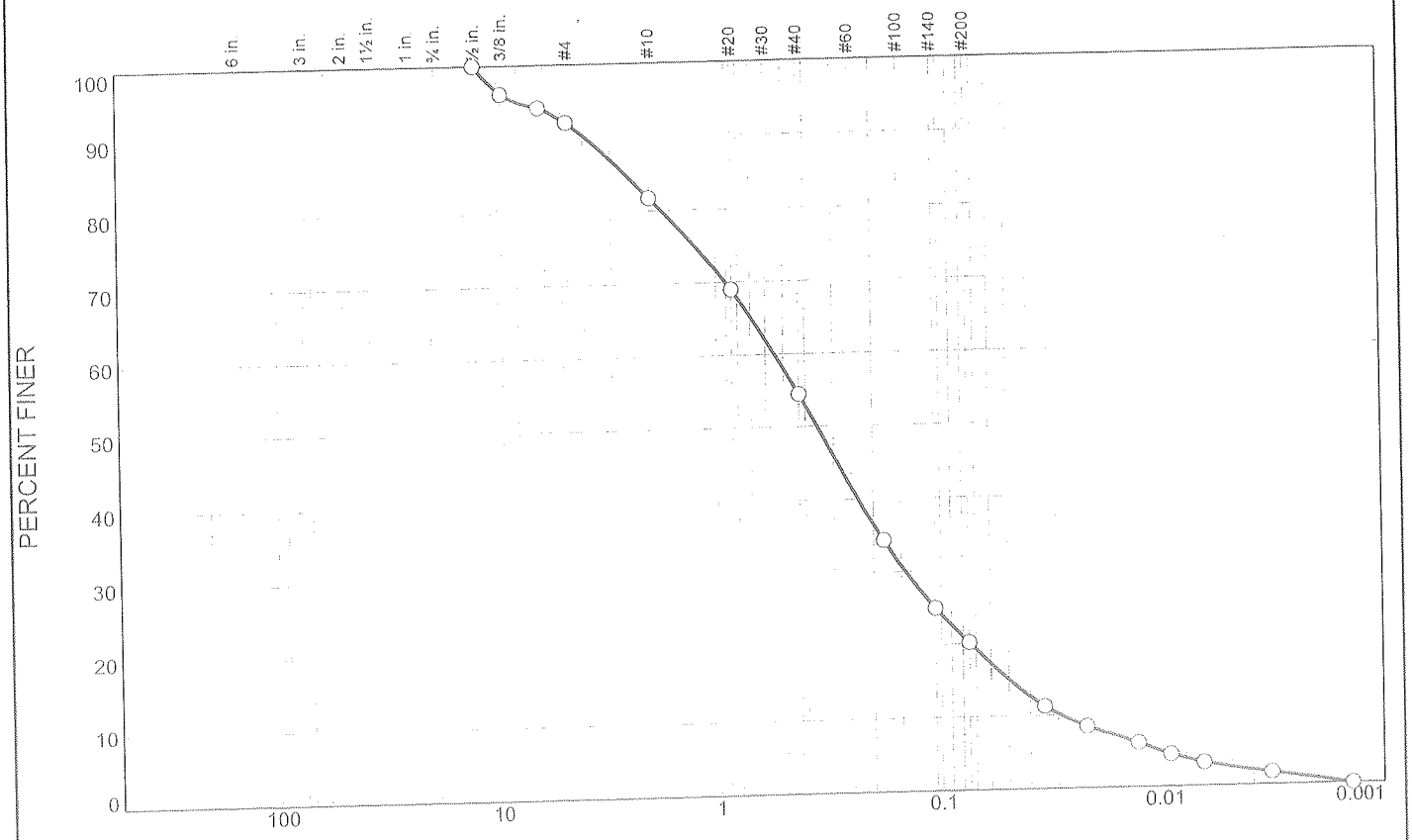
Sample No.: S-1 **Source of Sample:** B-25 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972QQ

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.9	10.3	27.4	34.2	17.7	2.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	96.1		
1/4"	94.2		
#4	92.1		
#10	81.8		
#20	69.0		
#40	54.4		
#80	34.4		
#140	25.0		
#200	20.2		
0.0344 mm.	11.2		
0.0223 mm.	8.4		
0.0131 mm.	6.0		
0.0094 mm.	4.4		
0.0067 mm.	3.2		
0.0033 mm.	1.7		
0.0014 mm.	0.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 2.5521 D_{60}= 0.5428 D_{50}= 0.3528
D_{30}= 0.1438 D_{15}= 0.0498 D_{10}= 0.0293
C_u= 18.54 C_c= 1.30

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 16.8%

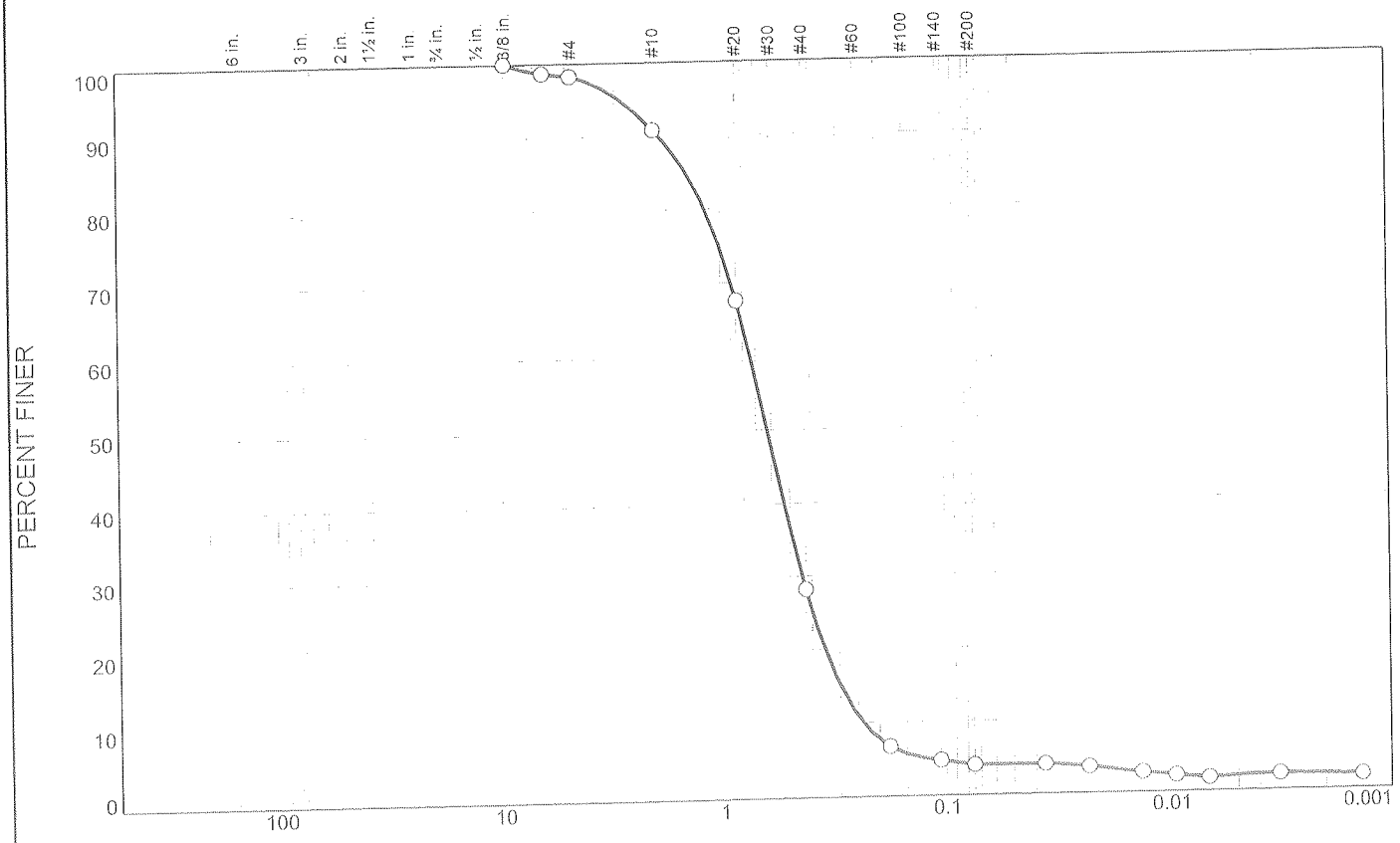
Sample No.: S-1 **Source of Sample:** B-26 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.2'-2.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972PP

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.7	7.4	62.7	24.1	2.1	2.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	98.7		
#4	98.3		
#10	90.9		
#20	67.5		
#40	28.2		
#80	6.7		
#140	4.7		
#200	4.1		
0.0365 mm.	4.0		
0.0231 mm.	3.6		
0.0134 mm.	2.7		
0.0095 mm.	2.2		
0.0068 mm.	1.8		
0.0032 mm.	2.1		
0.0014 mm.	1.9		

* (no specification provided)

Soil Description

poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.4240 D_{60}= 0.7373 D_{50}= 0.6226
D_{30}= 0.4405 D_{15}= 0.2982 D_{10}= 0.2366
C_u= 3.12 C_c= 1.11

Classification

USCS= SP AASHTO=

Remarks

Moisture content: 17.9%

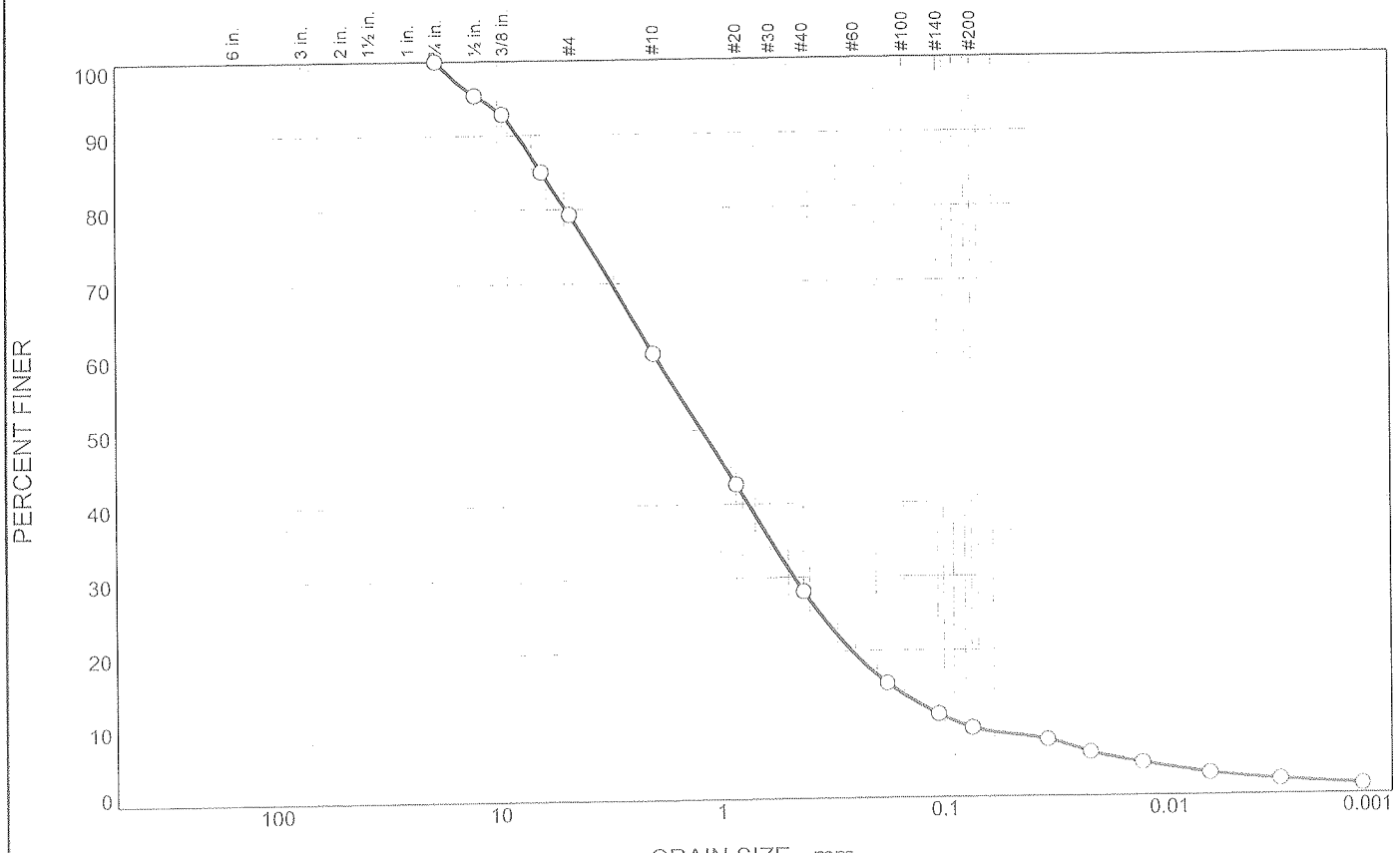
Sample No.: S-3 **Source of Sample:** B-26 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 4.2'-6.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972QQ

Tested By: JJH/MCS Checked By: MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	20.7	18.8	32.4	18.8	6.8	2.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	95.4		
3/8"	92.9		
1/4"	85.0		
#4	79.3		
#10	60.5		
#20	42.7		
#40	28.1		
#80	15.6		
#140	11.3		
#200	9.3		
0.0347 mm.	7.7		
0.0223 mm.	5.9		
0.0131 mm.	4.4		
0.0066 mm.	3.0		
0.0032 mm.	2.0		
0.0014 mm.	1.3		

* (no specification provided)

Soil Description

well-graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 6.3523 D_{60}= 1.9553 D_{50}= 1.2099
D_{30}= 0.4678 D_{15}= 0.1699 D_{10}= 0.0861
C_u= 22.72 C_c= 1.30

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Moisture content: 3.8%

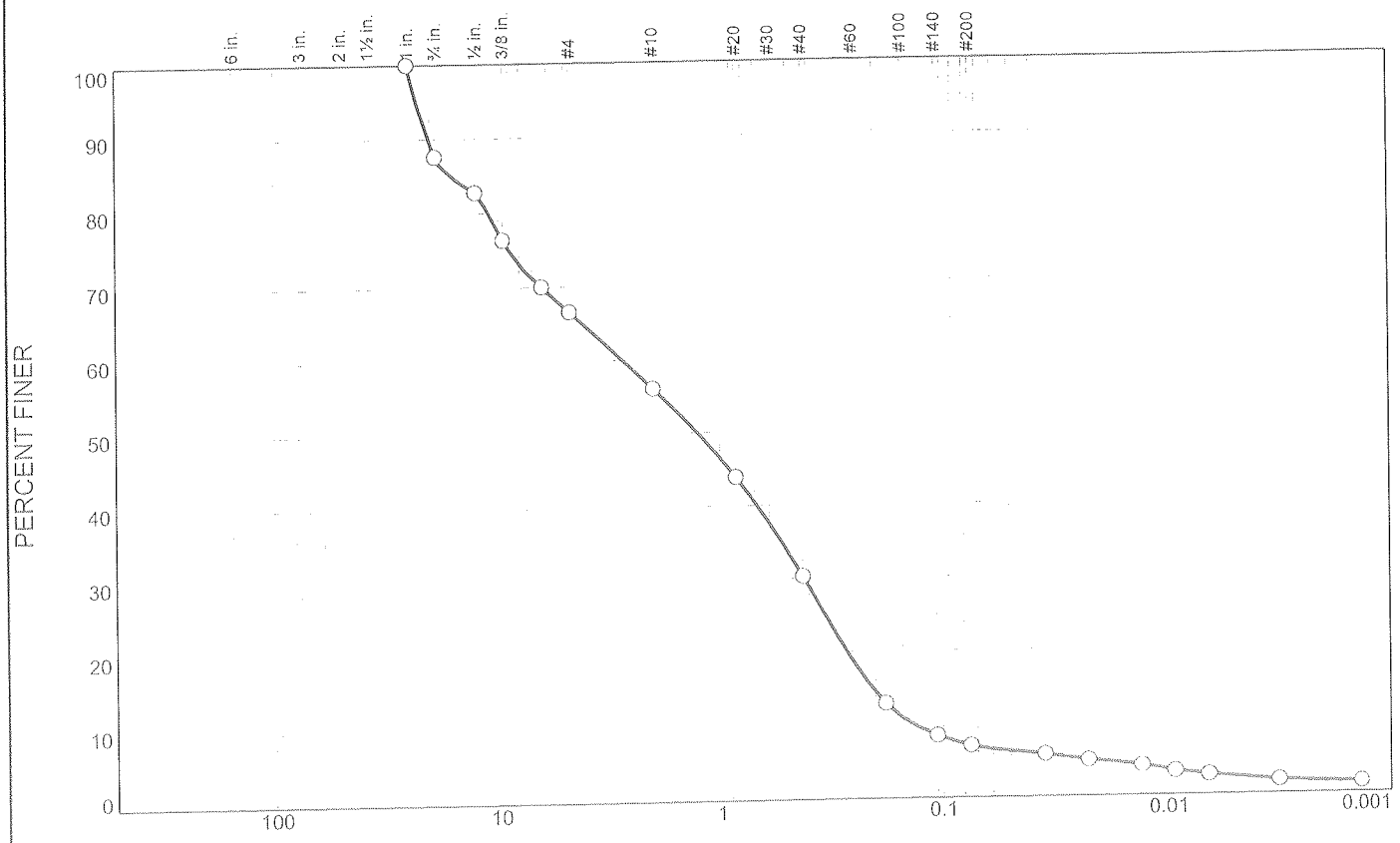
Sample No.: S-1 **Source of Sample:** B-27 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972RR

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.4	21.0	10.5	25.7	23.3	4.7	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	87.6		
1/2"	82.8		
3/8"	76.4		
1/4"	70.0		
#4	66.6		
#10	56.1		
#20	43.9		
#40	30.4		
#80	12.9		
#140	8.5		
#200	7.1		
0.0352 mm.	5.8		
0.0225 mm.	4.9		
0.0131 mm.	4.1		
0.0093 mm.	3.3		
0.0066 mm.	2.7		
0.0032 mm.	1.9		
0.0014 mm.	1.5		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 16.3717 D_{60}= 2.7405 D_{50}= 1.2633
D_{30}= 0.4182 D_{15}= 0.2065 D_{10}= 0.1357
C_u= 20.19 C_c= 0.47

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture content: 6.0%

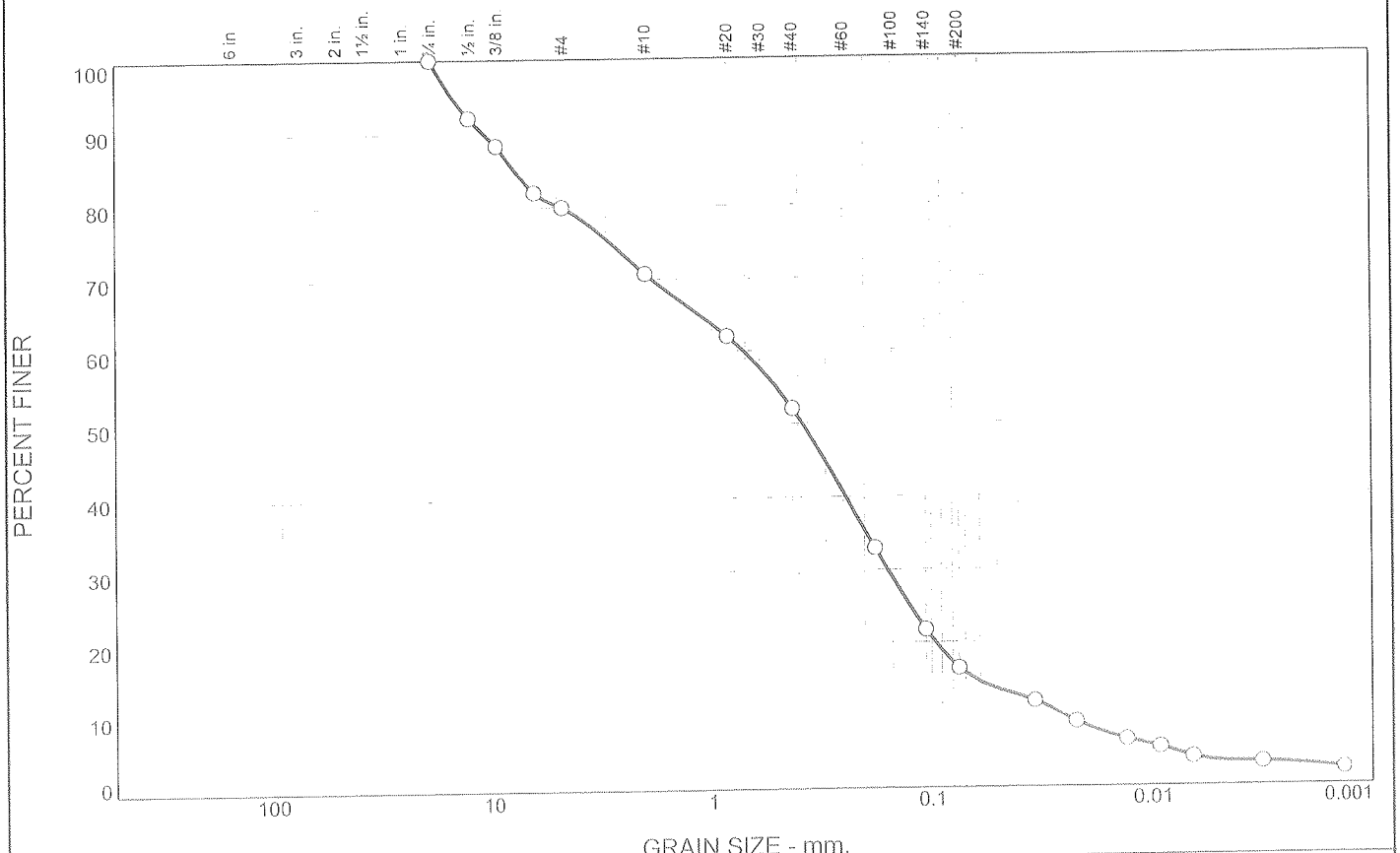
Sample No.: S-1 **Source of Sample:** B-28 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.5'-2.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972SS

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	20.1	9.1	18.7	35.7	13.1	3.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	92.2		
3/8"	88.4		
1/4"	81.9		
#4	79.9		
#10	70.8		
#20	62.1		
#40	52.1		
#80	33.0		
#140	21.7		
#200	16.4		
0.0339 mm.	11.8		
0.0220 mm.	8.9		
0.0130 mm.	6.4		
0.0093 mm.	5.4		
0.0066 mm.	3.9		
0.0032 mm.	3.2		
0.0014 mm.	2.3		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 7.7878 D_{60}= 0.7127 D_{50}= 0.3813
D_{30}= 0.1580 D_{15}= 0.0648 D_{10}= 0.0257
C_u= 27.71 C_c= 1.36

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 8.8%

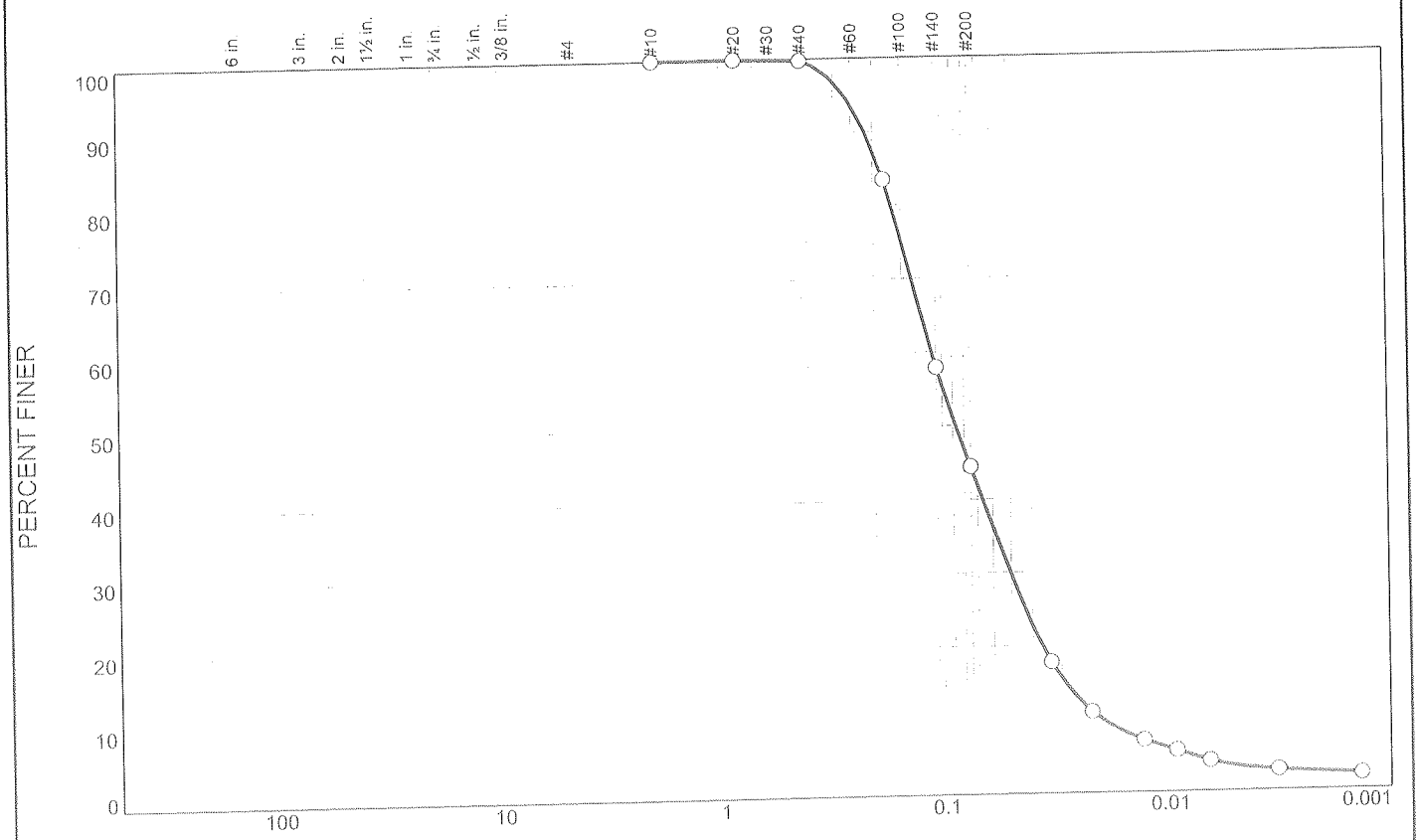
Sample No.: S-2 **Source of Sample:** B-28 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 2.5'-4.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972TT

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	55.2	41.2	3.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.7		
#80	83.5		
#140	57.9		
#200	44.5		
0.0332 mm.	17.8		
0.0220 mm.	10.9		
0.0130 mm.	7.0		
0.0093 mm.	5.5		
0.0066 mm.	4.1		
0.0032 mm.	2.7		
0.0014 mm.	2.1		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.1868 D_{60}= 0.1108 D_{50}= 0.0872
D_{30}= 0.0502 D_{15}= 0.0291 D_{10}= 0.0201
C_u= 5.51 C_c= 1.13

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Moisture content: 26.5%

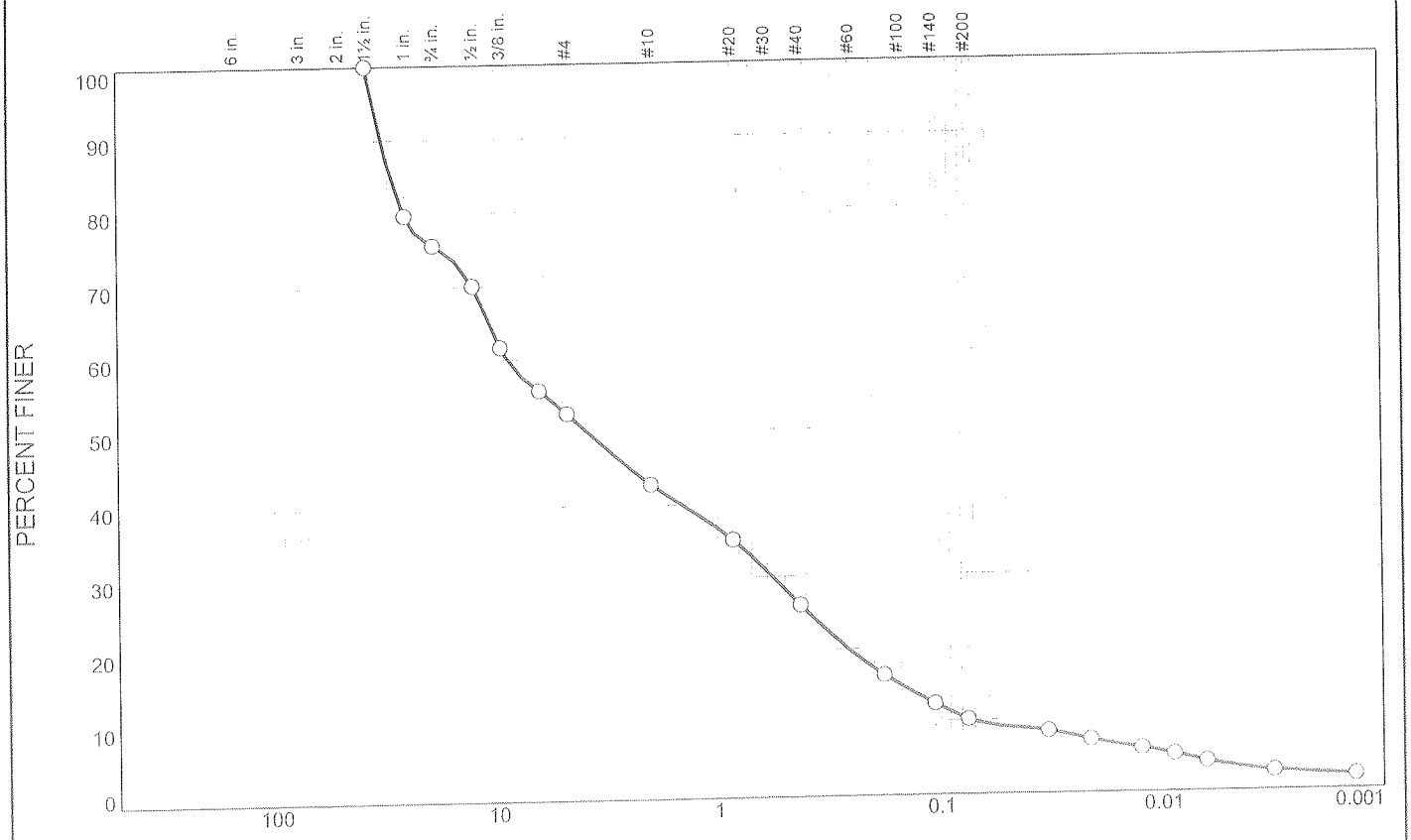
Sample No.: S-4 **Source of Sample:** B-28 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 6'-8'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972UU

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	24.3	23.1	9.8	16.7	15.9	6.8	3.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	79.8		
3/4"	75.7		
1/2"	70.1		
3/8"	61.7		
1/4"	55.7		
#4	52.6		
#10	42.8		
#20	35.1		
#40	26.1		
#80	16.4		
#140	12.4		
#200	10.2		
0.0328 mm.	8.4		
0.0211 mm.	7.2		
0.0124 mm.	5.9		
0.0089 mm.	5.1		
0.0064 mm.	4.0		
0.0032 mm.	2.6		
0.0013 mm.	1.9		

* (no specification provided)

Soil Description

poorly graded gravel with silt and sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 29.1211 D_{60}= 8.8347 D_{50}= 3.8267
D_{30}= 0.5661 D_{15}= 0.1525 D_{10}= 0.0724
C_u= 122.11 C_c= 0.50

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

Moisture content: 4.1%

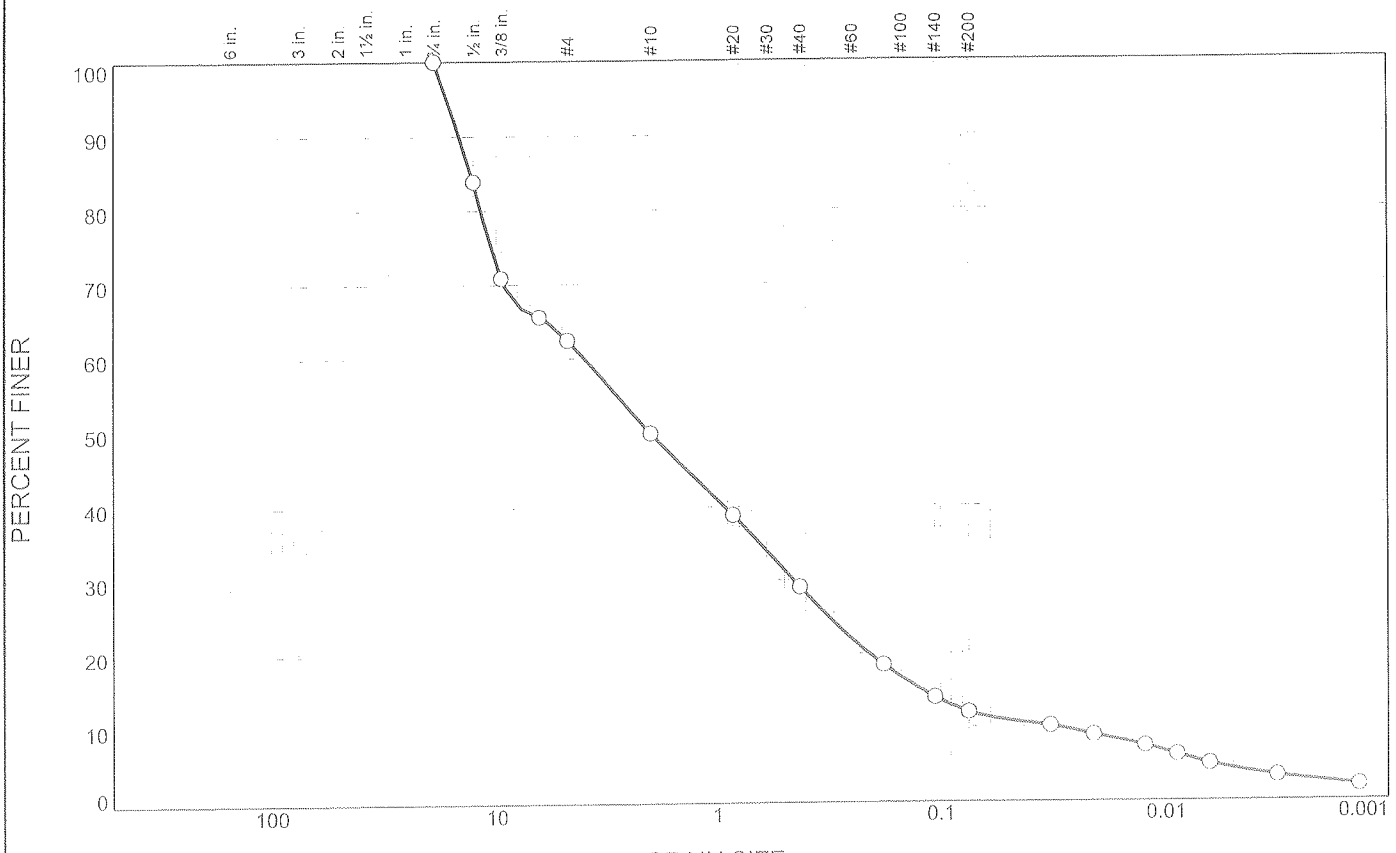
Sample No.: S-1 Source of Sample: B-29 Date: 10/19/09
Location: New Bedford, MA Elev./Depth: 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 Lab No. 10972VV

Tested By: JJH/MCS Checked By: MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	37.5	12.6	20.8	17.1	7.7	4.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	83.9		
3/8"	70.9		
1/4"	65.6		
#4	62.5		
#10	49.9		
#20	38.9		
#40	29.1		
#80	18.5		
#140	14.0		
#200	12.0		
0.0326 mm.	10.1		
0.0210 mm.	8.9		
0.0124 mm.	7.4		
0.0089 mm.	6.2		
0.0064 mm.	5.0		
0.0032 mm.	3.3		
0.0014 mm.	2.0		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 12.9947 D_{60}= 3.9714 D_{50}= 2.0073
D_{30}= 0.4542 D_{15}= 0.1209 D_{10}= 0.0312
C_u= 127.29 C_c= 1.67

Classification

USCS= SW-SM AASHTO= A-1-a

Remarks

Moisture content: 4.5%

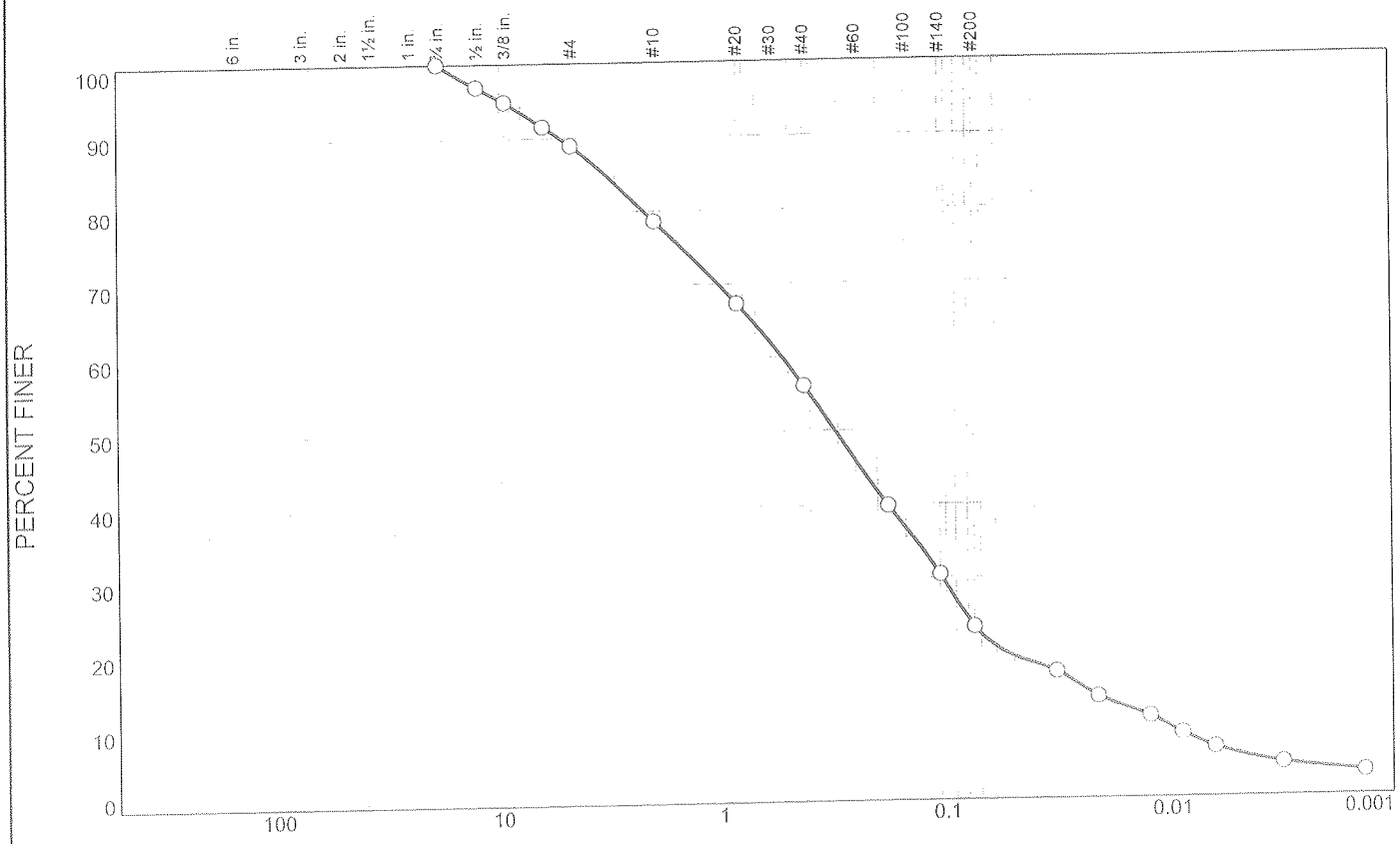
Sample No.: S-1 **Source of Sample:** B-30 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972WW

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.0	10.4	22.5	32.8	17.6	5.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	96.9		
3/8"	94.9		
1/4"	91.6		
#4	89.0		
#10	78.6		
#20	67.3		
#40	56.1		
#80	39.8		
#140	30.5		
#200	23.3		
0.0323 mm.	17.1		
0.0211 mm.	13.6		
0.0124 mm.	10.9		
0.0090 mm.	8.6		
0.0064 mm.	6.7		
0.0032 mm.	4.5		
0.0014 mm.	3.2		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 3.3033 D_{60}= 0.5299 D_{50}= 0.3081
D_{30}= 0.1037 D_{15}= 0.0250 D_{10}= 0.0108
C_u= 48.92 C_c= 1.87

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 44.2%

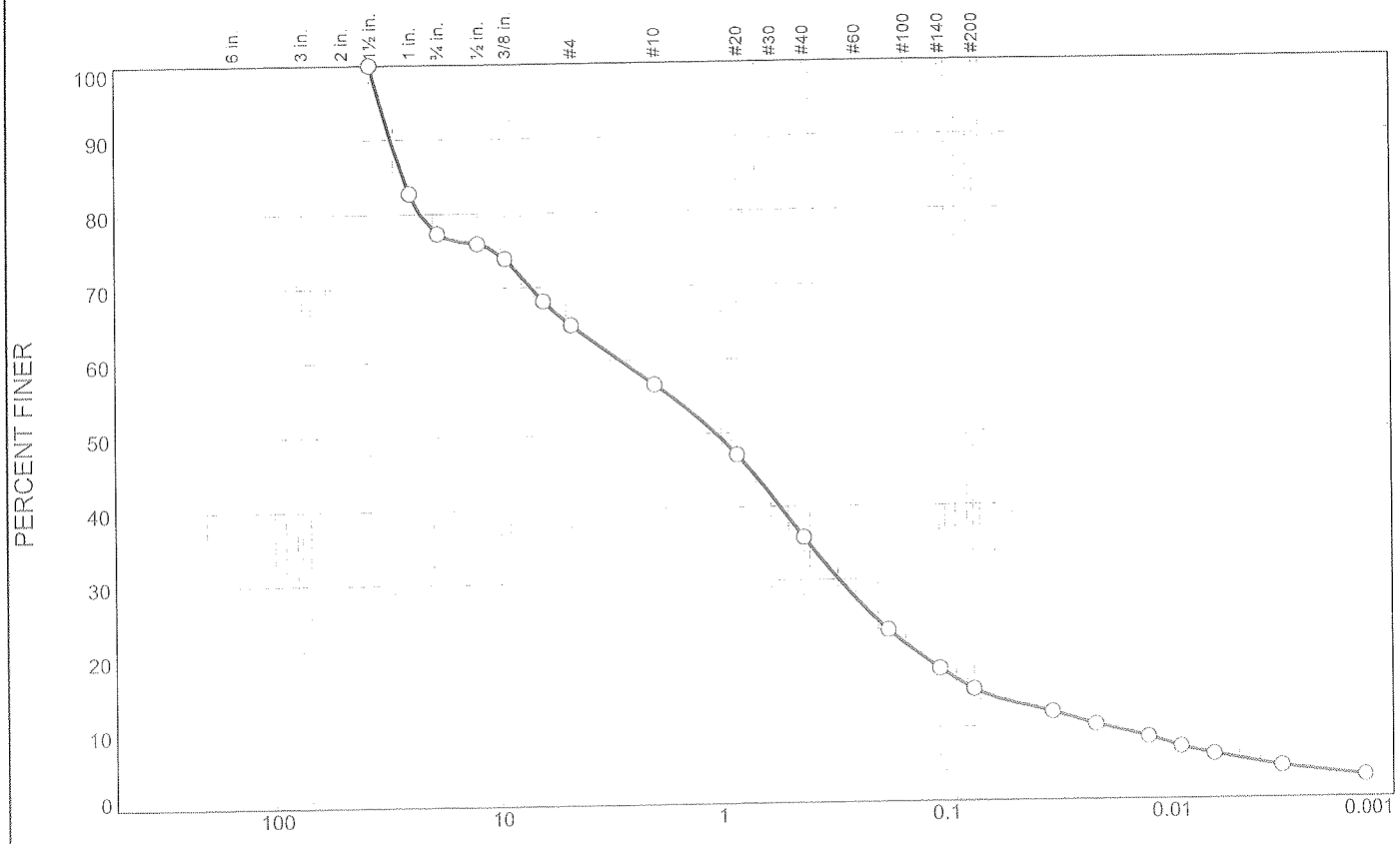
Sample No.: S-3 **Source of Sample:** B-30 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 4.5'-6.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972XX

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	22.7	12.5	8.1	20.9	20.7	9.8	5.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	82.8		
3/4"	77.3		
1/2"	76.0		
3/8"	73.9		
1/4"	68.1		
#4	64.8		
#10	56.7		
#20	47.1		
#40	35.8		
#80	23.1		
#140	17.9		
#200	15.1		
0.0335 mm.	11.9		
0.0215 mm.	10.1		
0.0126 mm.	8.4		
0.0090 mm.	7.0		
0.0064 mm.	6.0		
0.0032 mm.	4.3		
0.0013 mm.	2.9		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 27.1497 D_{60}= 2.8521 D_{50}= 1.0570
D_{30}= 0.2970 D_{15}= 0.0741 D_{10}= 0.0207
C_u= 138.05 C_c= 1.50

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture content: 7.7%

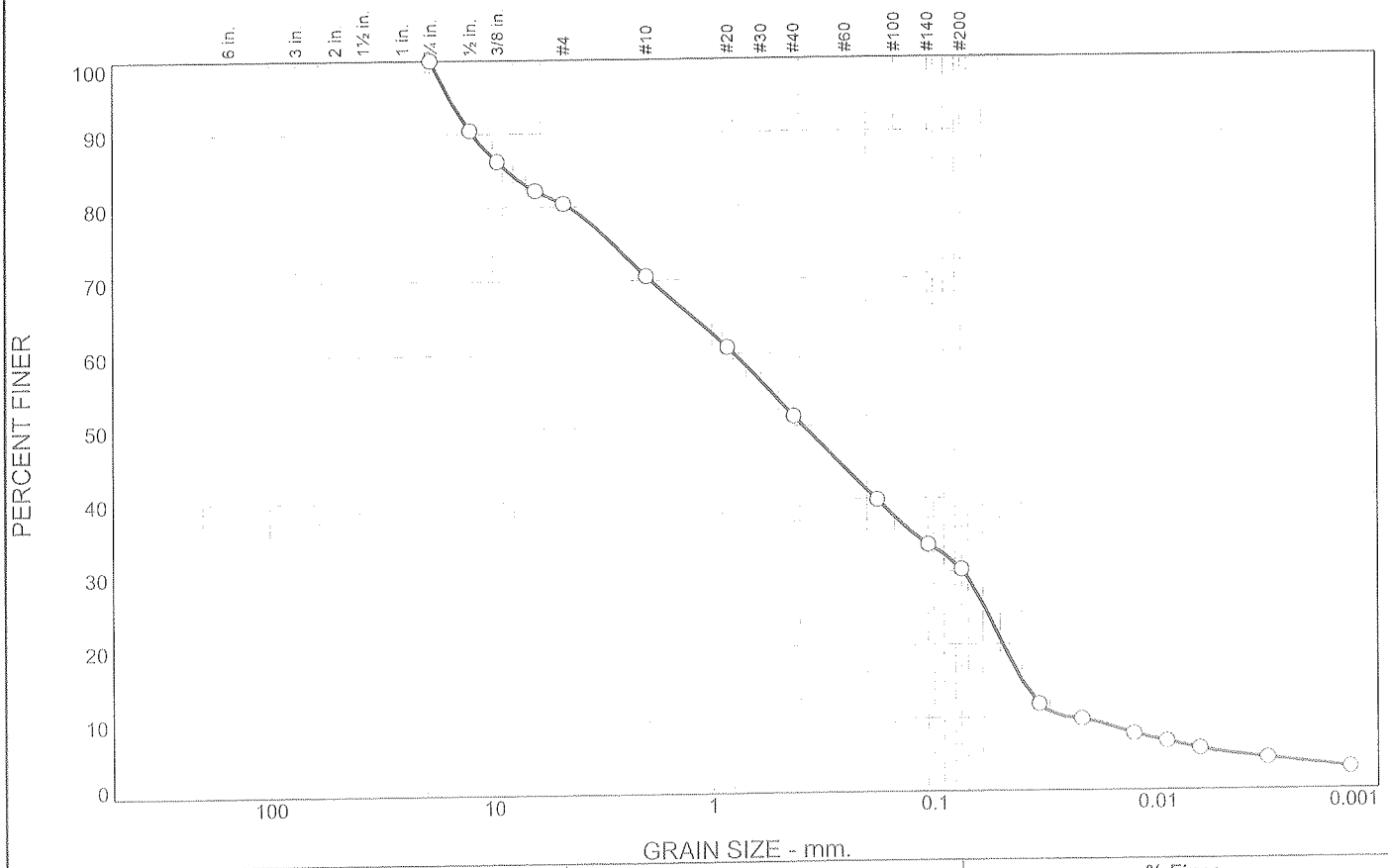
Sample No.: S-1 **Source of Sample:** B-31 **Date:** 10/09/09
Location: New Bedford, MA **Elev./Depth:** 0.5'-2.5'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972YY

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	19.6	9.9	19.1	21.1	25.3	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	90.5		
3/8"	86.2		
1/4"	82.2		
#4	80.4		
#10	70.5		
#20	60.9		
#40	51.4		
#80	39.9		
#140	33.7		
#200	30.3		
0.0335 mm.	11.8		
0.0216 mm.	9.8		
0.0127 mm.	7.7		
0.0091 mm.	6.7		
0.0065 mm.	5.6		
0.0032 mm.	4.3		
0.0013 mm.	2.9		

* (no specification provided)

Soil Description

silty sand with gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 8.5950 D_{60}= 0.7927 D_{50}= 0.3843
D_{30}= 0.0738 D_{15}= 0.0398 D_{10}= 0.0249
C_u= 31.80 C_c= 0.28

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 7.2%

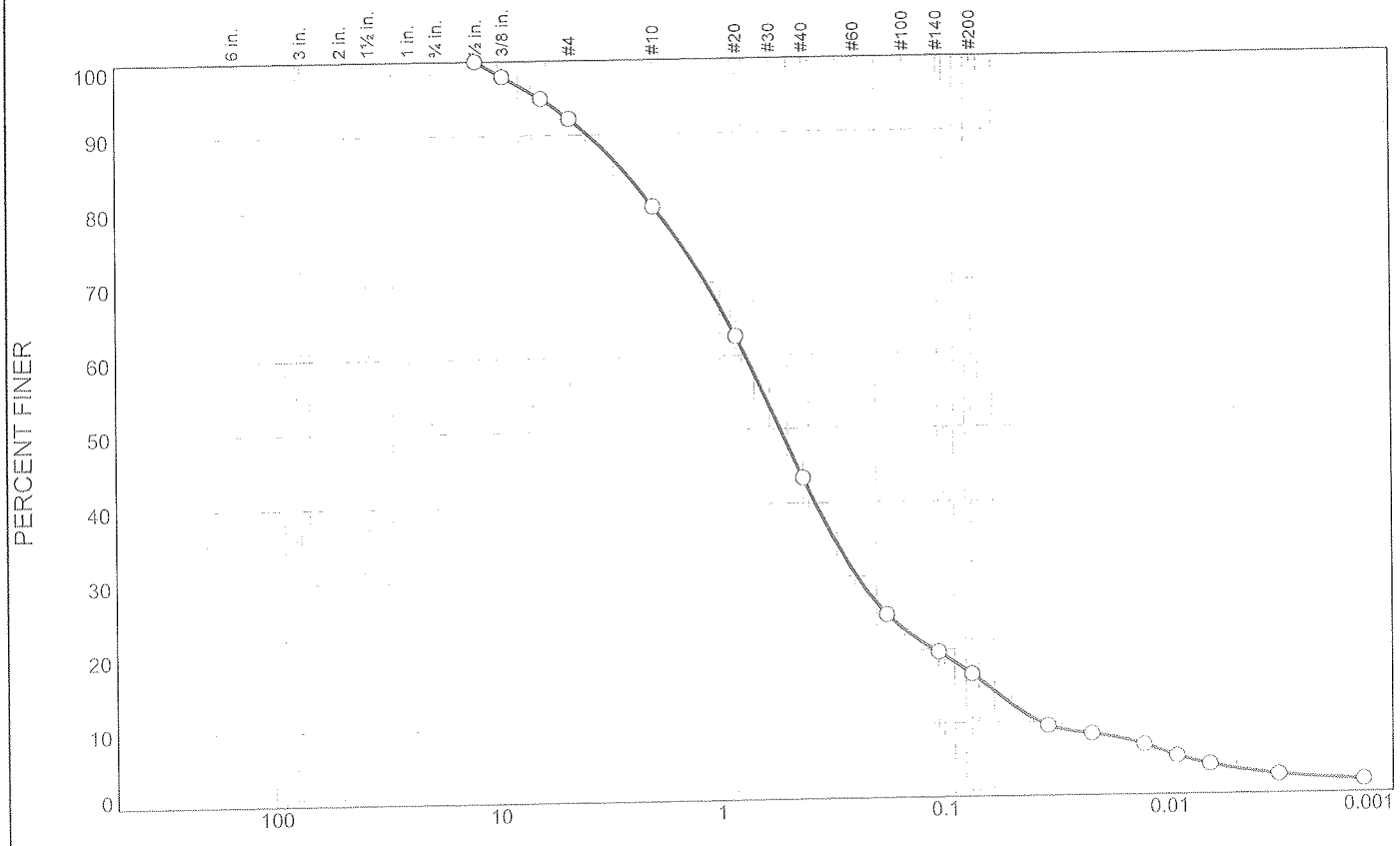
Sample No.: S-1 **Source of Sample:** B-32 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 0.2'-2.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972ZZ

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.8	11.9	36.9	26.8	13.3	3.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	97.9		
1/4"	94.9		
#4	92.2		
#10	80.3		
#20	62.7		
#40	43.4		
#80	24.9		
#140	19.7		
#200	16.6		
0.0346 mm.	9.5		
0.0221 mm.	8.4		
0.0129 mm.	6.8		
0.0092 mm.	5.2		
0.0066 mm.	4.0		
0.0032 mm.	2.5		
0.0014 mm.	1.8		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 2.6875 D_{60}= 0.7672 D_{50}= 0.5374
D_{30}= 0.2439 D_{15}= 0.0638 D_{10}= 0.0374
C_u= 20.54 C_c= 2.07

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture content: 7.6%

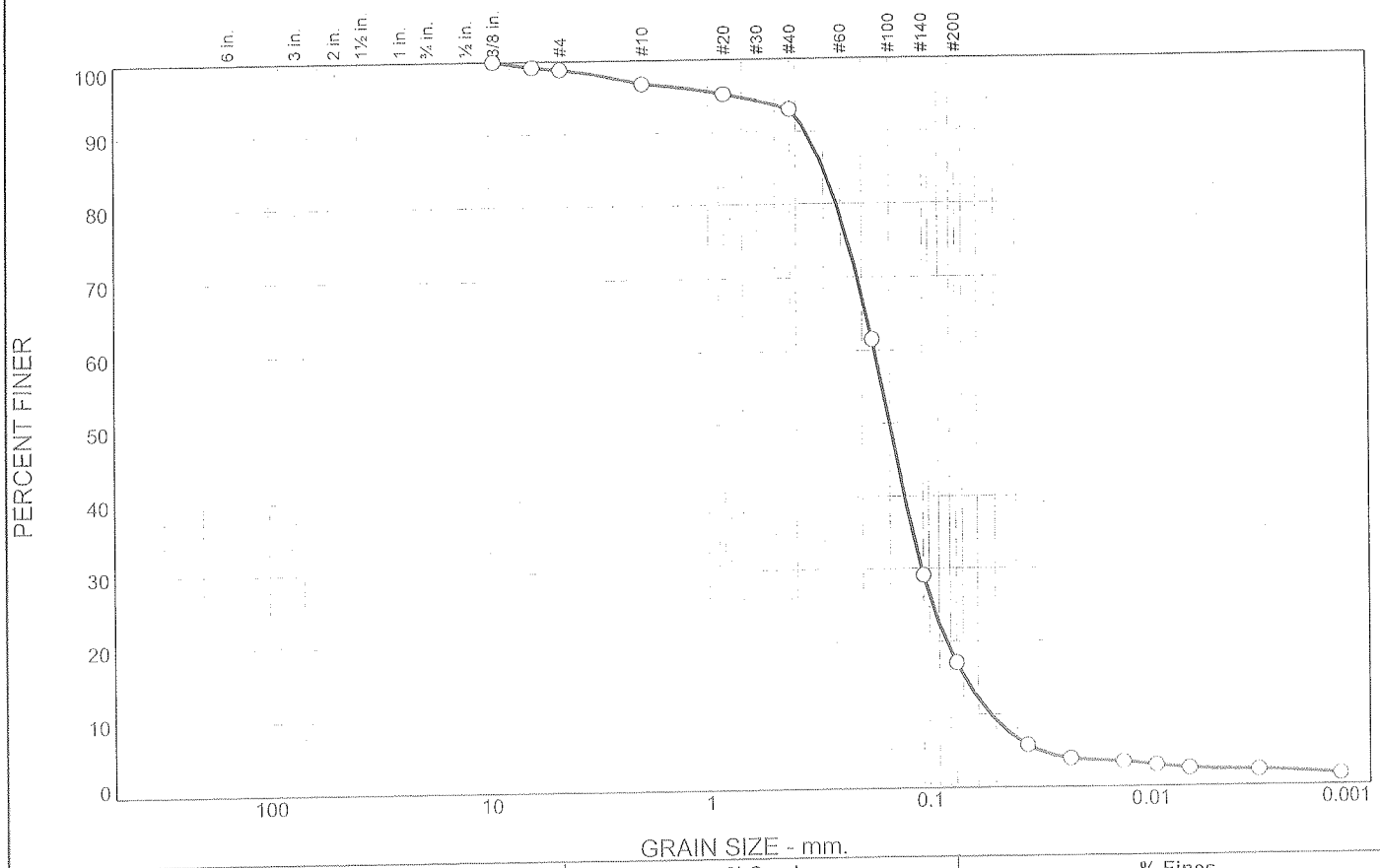
Sample No.: S-3 **Source of Sample:** B-32 **Date:** 10/19/09
Location: New Bedford, MA **Elev./Depth:** 4.2'-6.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972AAA

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.2	2.0	3.7	76.0	14.8	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	99.2		
#4	98.8		
#10	96.8		
#20	95.3		
#40	93.1		
#80	61.6		
#140	29.1		
#200	17.1		
0.0359 mm.	5.8		
0.0230 mm.	3.9		
0.0133 mm.	3.4		
0.0094 mm.	2.9		
0.0067 mm.	2.5		
0.0033 mm.	2.2		
0.0014 mm.	1.5		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 0.2993 D_{60}= 0.1754 D_{50}= 0.1502
D_{30}= 0.1080 D_{15}= 0.0687 D_{10}= 0.0526
C_u= 3.33 C_c= 1.26

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 23.6%

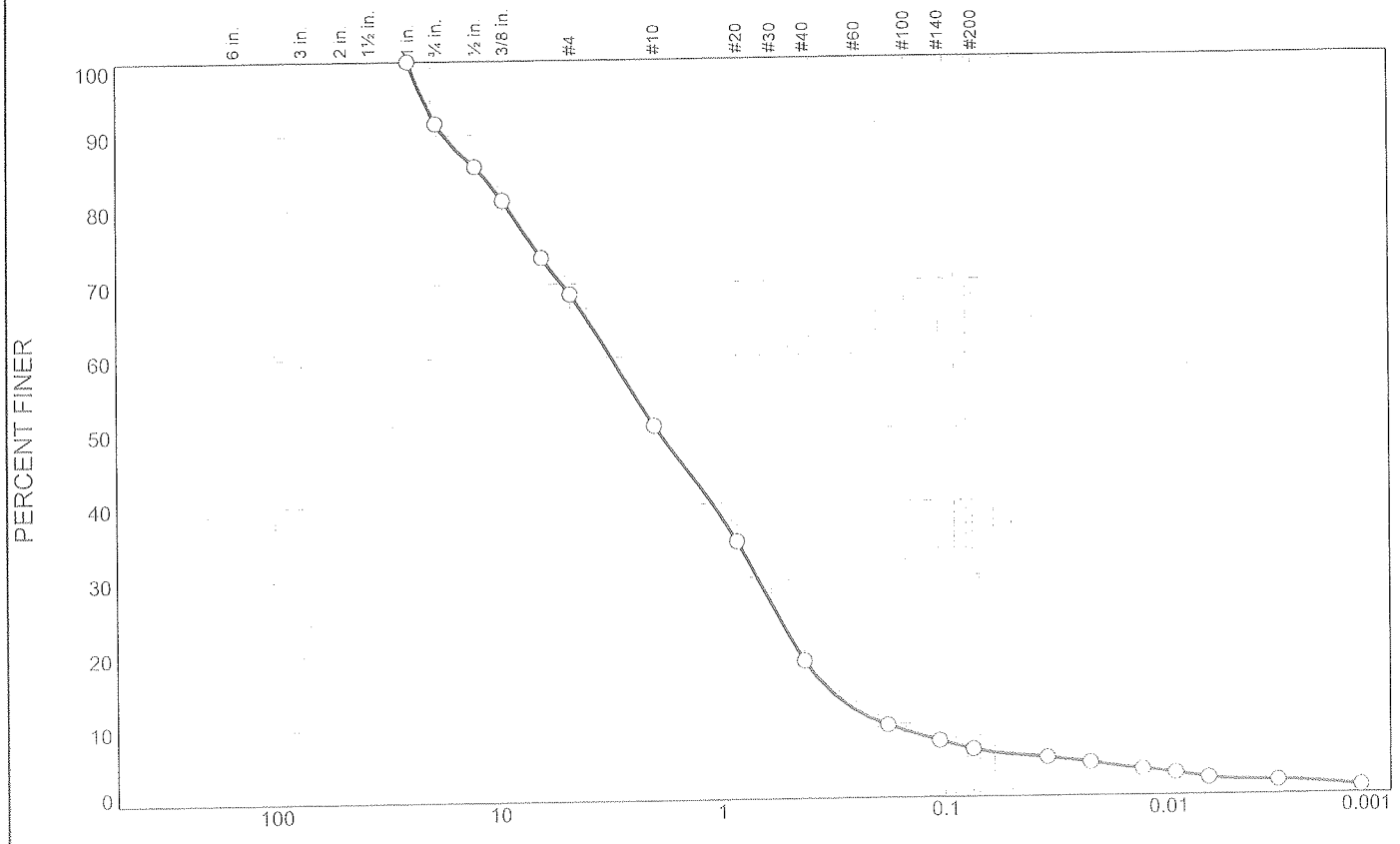
Sample No.: S-4 **Source of Sample:** B-32 **Date:** 10/20/09
Location: New Bedford, MA **Elev./Depth:** 6.2'-8.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972BBB

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.4	23.0	17.9	32.0	12.2	4.5	2.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	91.6		
1/2"	85.8		
3/8"	81.2		
1/4"	73.5		
#4	68.6		
#10	50.7		
#20	34.9		
#40	18.7		
#80	9.8		
#140	7.7		
#200	6.5		
0.0350 mm.	5.2		
0.0223 mm.	4.5		
0.0130 mm.	3.5		
0.0093 mm.	3.0		
0.0066 mm.	2.3		
0.0032 mm.	1.9		
0.0014 mm.	1.0		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 12.0045 D_{60}= 3.1091 D_{50}= 1.9317
D_{30}= 0.6912 D_{15}= 0.3366 D_{10}= 0.1857
C_u= 16.74 C_c= 0.83

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture content: 1.6%

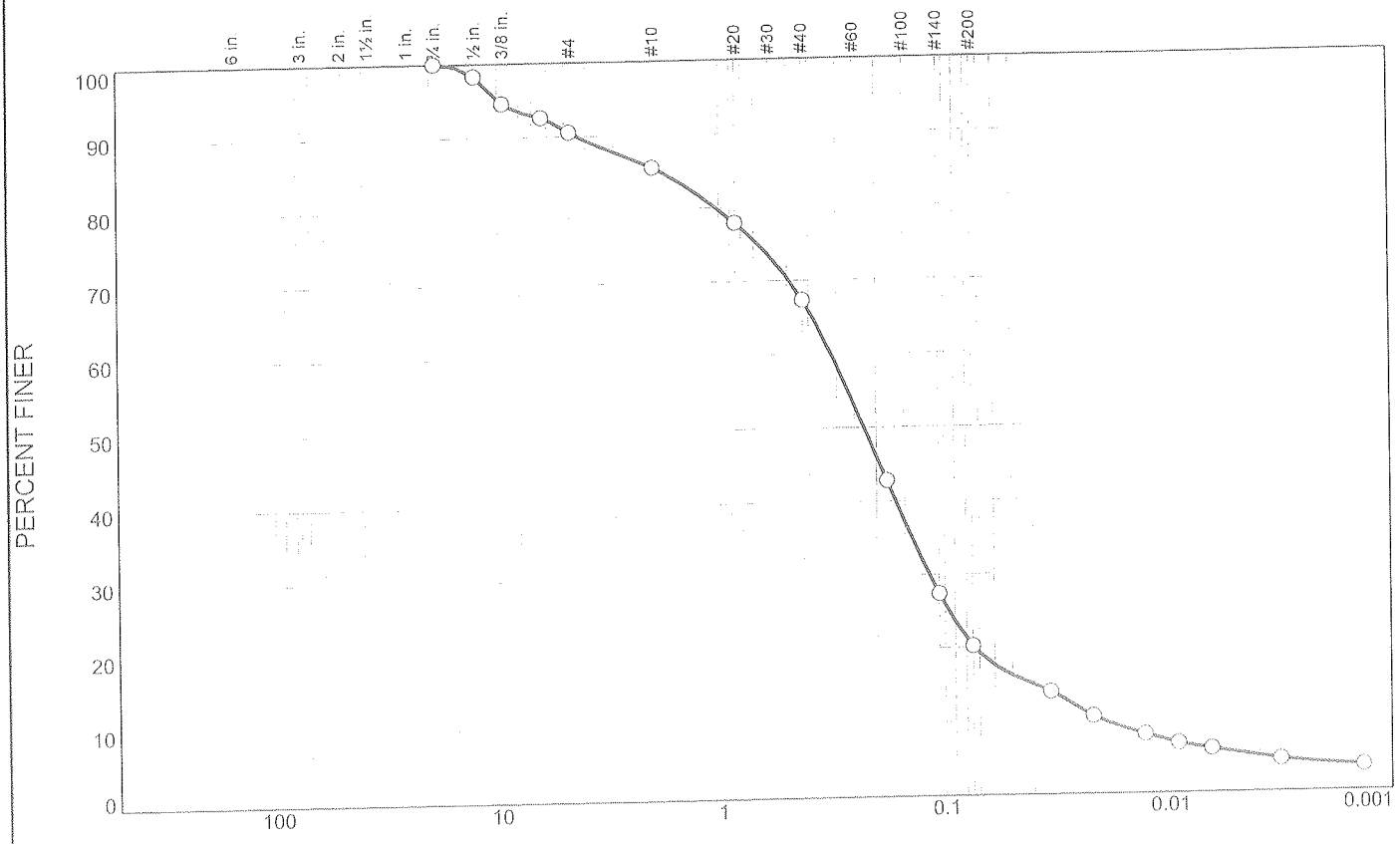
Sample No.: S-1 **Source of Sample:** B-33 **Date:** 10/20/09
Location: New Bedford, MA **Elev./Depth:** 2'-4'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972CCC

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.4	5.0	18.3	47.0	15.0	5.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	98.3		
3/8"	94.6		
1/4"	92.6		
#4	90.6		
#10	85.6		
#20	77.9		
#40	67.3		
#80	42.8		
#140	27.4		
#200	20.3		
0.0337 mm.	13.9		
0.0218 mm.	10.5		
0.0128 mm.	8.0		
0.0092 mm.	6.8		
0.0065 mm.	5.9		
0.0032 mm.	4.4		
0.0014 mm.	3.4		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 1.8179 D_{60}= 0.3166 D_{50}= 0.2260
D_{30}= 0.1172 D_{15}= 0.0406 D_{10}= 0.0200
C_u= 15.80 C_c= 2.16

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 9.5%

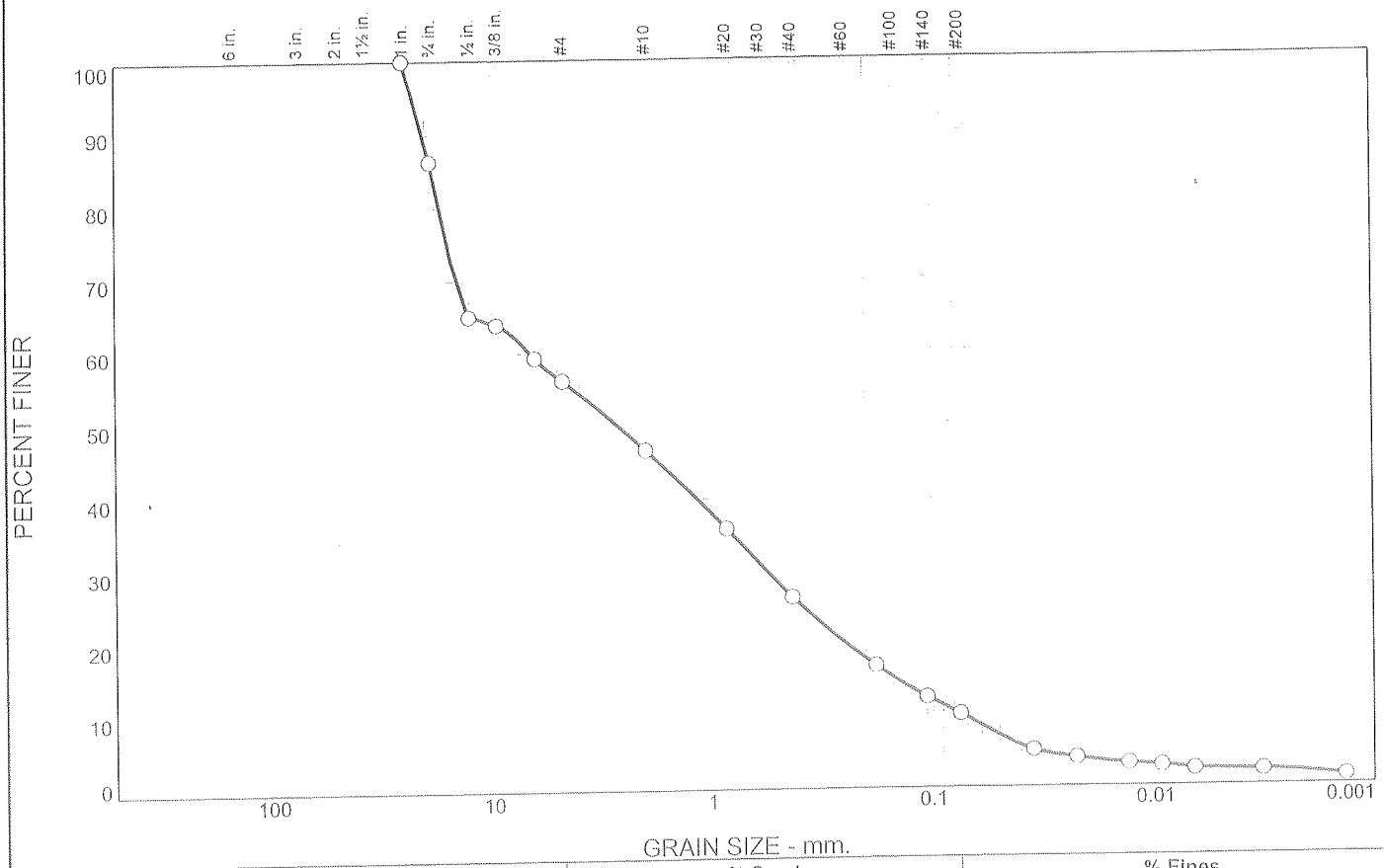
Sample No.: S-1 **Source of Sample:** B-34 **Date:** 10/20/09
Location: New Bedford, MA **Elev./Depth:** 0.2'-2.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972DDD

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.7	30.1	9.5	20.3	16.4	7.8	2.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	86.3		
1/2"	65.1		
3/8"	64.0		
1/4"	59.3		
#4	56.2		
#10	46.7		
#20	35.9		
#40	26.4		
#80	16.8		
#140	12.4		
#200	10.0		
0.0352 mm.	4.9		
0.0225 mm.	3.9		
0.0131 mm.	3.1		
0.0093 mm.	2.8		
0.0066 mm.	2.2		
0.0032 mm.	2.0		
0.0014 mm.	1.2		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 18.6113 D_{60}= 6.6596 D_{50}= 2.6497
D_{30}= 0.5554 D_{15}= 0.1470 D_{10}= 0.0745
C_u= 89.40 C_c= 0.62

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Moisture content: 3.0%

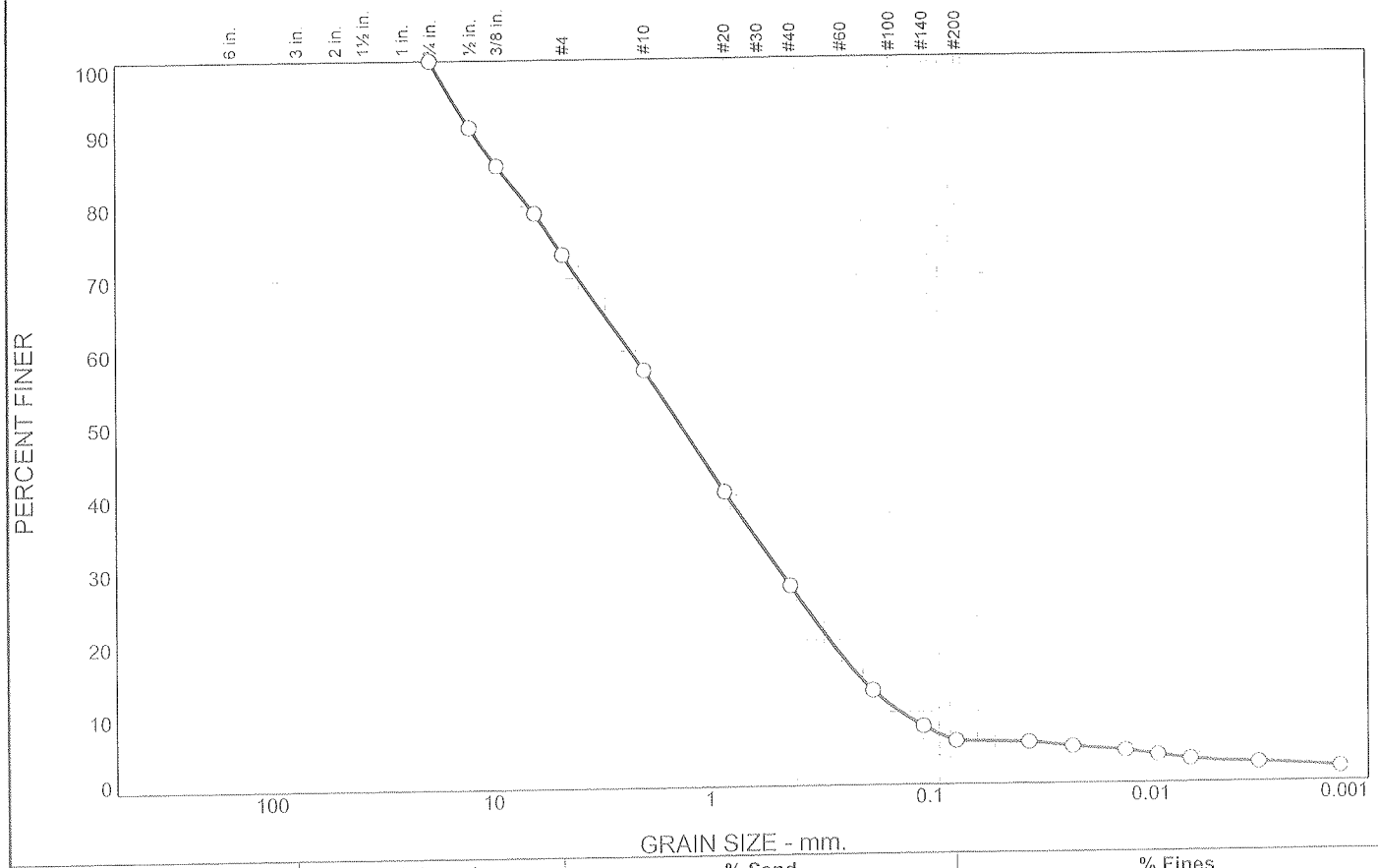
Sample No.: S-3 **Source of Sample:** B-34 **Date:** 10/21/09
Location: New Bedford, MA **Elev./Depth:** 4'-6'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972EEE

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	26.7	16.0	29.8	21.5	3.1	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	90.8		
3/8"	85.6		
1/4"	79.0		
#4	73.3		
#10	57.3		
#20	40.5		
#40	27.5		
#80	13.0		
#140	8.0		
#200	6.0		
0.0352 mm.	5.7		
0.0224 mm.	5.1		
0.0130 mm.	4.5		
0.0093 mm.	3.8		
0.0066 mm.	3.2		
0.0032 mm.	2.7		
0.0014 mm.	2.0		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 9.1926 D_{60}= 2.3132 D_{50}= 1.3717
D_{30}= 0.4860 D_{15}= 0.2082 D_{10}= 0.1352
C_u= 17.11 C_c= 0.76

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture content: 5.3%

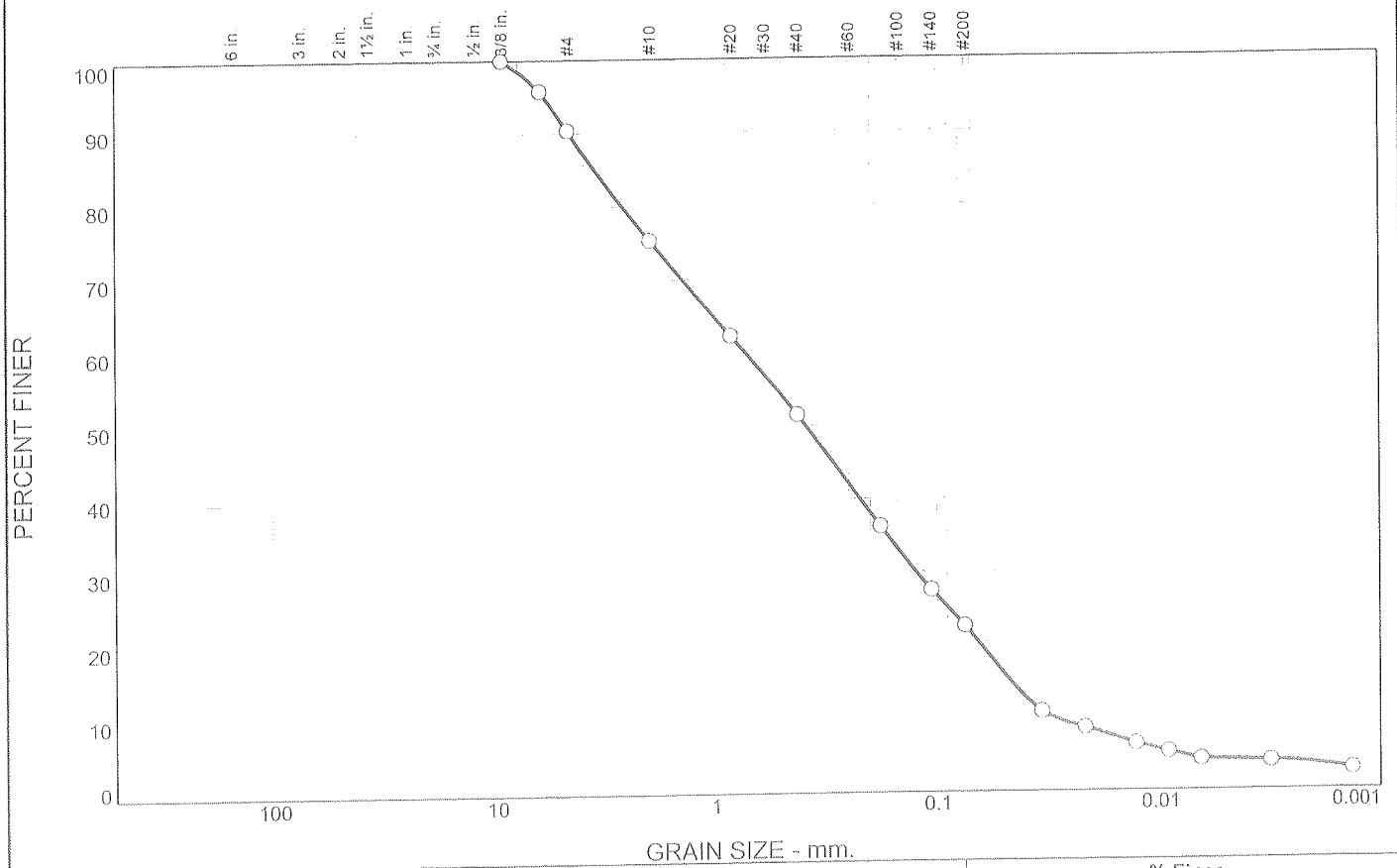
Sample No.: S-1 **Source of Sample:** B-35 **Date:** 10/21/09
Location: New Bedford, MA **Elev./Depth:** 0.2'-2.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972FFF

Tested By: JJH/MCS **Checked By:** MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.6	15.0	23.8	29.0	18.5	4.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
1/4"	95.8		
#4	90.4		
#10	75.4		
#20	62.3		
#40	51.6		
#80	36.2		
#140	27.6		
#200	22.6		
0.0340 mm.	10.8		
0.0219 mm.	8.6		
0.0129 mm.	6.4		
0.0092 mm.	5.3		
0.0066 mm.	4.2		
0.0032 mm.	3.9		
0.0014 mm.	2.7		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 3.5618 D_{60}= 0.7272 D_{50}= 0.3878
D_{30}= 0.1244 D_{15}= 0.0472 D_{10}= 0.0305
C_u= 23.84 C_c= 0.70

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture content: 8.7%

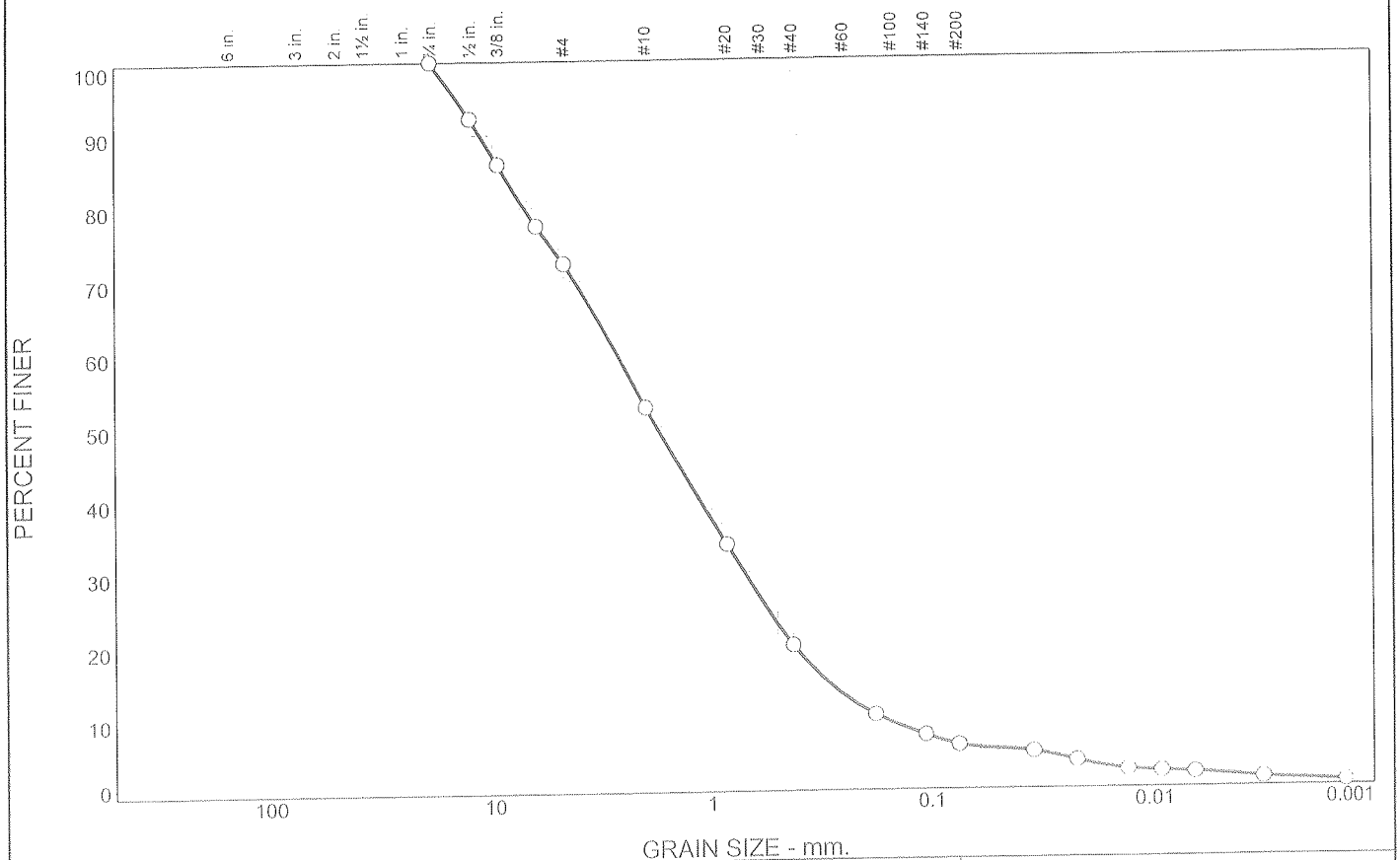
Sample No.: S-1 **Source of Sample:** B-36 **Date:** 10/21/09
Location: New Bedford, MA **Elev./Depth:** 0.2'-2.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 **Lab No.** 10972GGG

Tested By: JJH/MCS **Checked By:** MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	27.6	19.7	32.7	14.0	4.3	1.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	92.3		
3/8"	86.0		
1/4"	77.6		
#4	72.4		
#10	52.7		
#20	33.9		
#40	20.0		
#80	10.3		
#140	7.4		
#200	6.0		
0.0348 mm.	5.0		
0.0224 mm.	3.8		
0.0131 mm.	2.5		
0.0093 mm.	2.2		
0.0066 mm.	2.0		
0.0032 mm.	1.2		
0.0014 mm.	0.7		

* (no specification provided)

Soil Description

well-graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 9.0928 D_{60}= 2.7157 D_{50}= 1.7833
D_{30}= 0.7098 D_{15}= 0.3004 D_{10}= 0.1724
C_u= 15.75 C_c= 1.08

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Moisture content: 1.7%

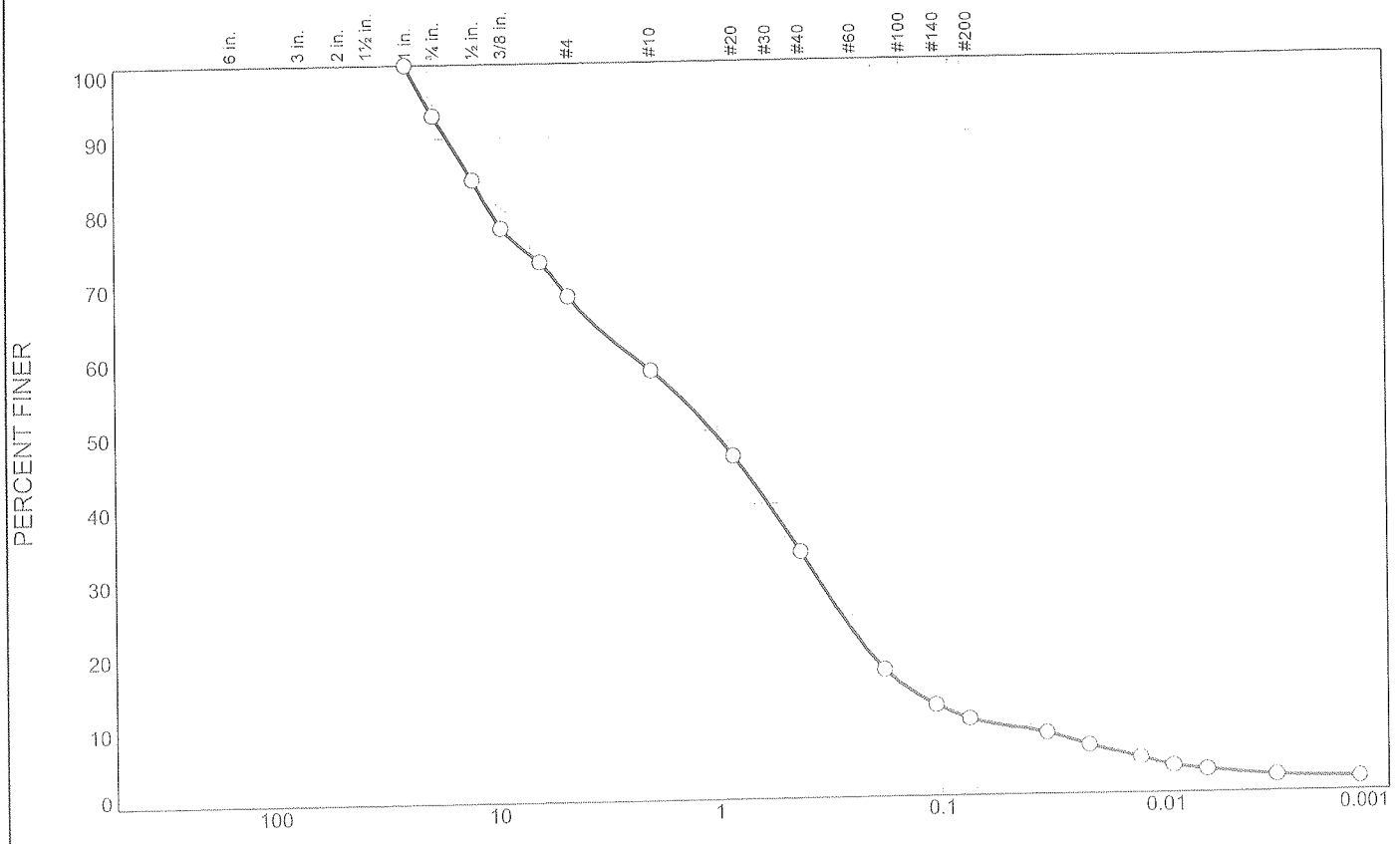
Sample No.: S-3 Source of Sample: B-36 Date: 10/22/09
Location: New Bedford, MA Elev./Depth: 4.2'-6.2'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 Lab No. 10972HHH

Tested By: JJH/DCH Checked By: MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.9	24.7	10.1	25.0	23.0	7.6	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	93.1		
1/2"	84.3		
3/8"	77.7		
1/4"	73.1		
#4	68.4		
#10	58.3		
#20	46.5		
#40	33.3		
#80	17.2		
#140	12.3		
#200	10.3		
0.0340 mm.	8.3		
0.0219 mm.	6.5		
0.0129 mm.	4.8		
0.0092 mm.	3.6		
0.0065 mm.	3.1		
0.0032 mm.	2.2		
0.0014 mm.	1.8		

* (no specification provided)

Soil Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 13.0766 D_{60}= 2.3644 D_{50}= 1.0558
D_{30}= 0.3622 D_{15}= 0.1488 D_{10}= 0.0687
C_u= 34.39 C_c= 0.81

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture content: 4.7%

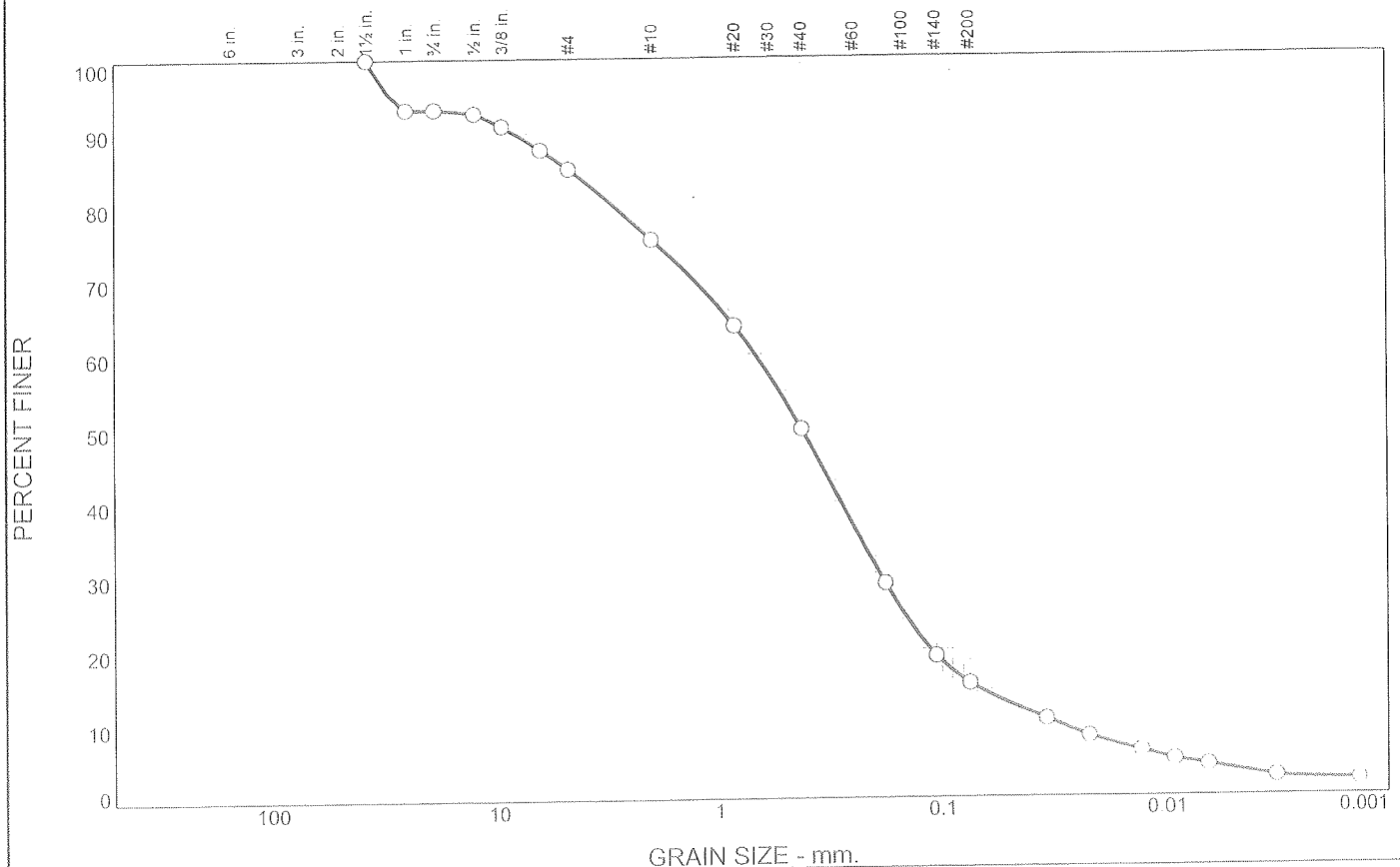
Sample No.: S-1 Source of Sample: TP-1 Date: 11/9/09
Location: New Bedford, MA Elev./Depth: 0.3'-2.3'

R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 Lab No. 10972III

Tested By: DCH/JJH Checked By: MTG MTG

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.8	8.1	9.6	25.6	34.5	11.9	3.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	93.2		
3/4"	93.2		
1/2"	92.7		
3/8"	91.0		
1/4"	87.7		
#4	85.1		
#10	75.5		
#20	63.9		
#40	49.9		
#80	29.0		
#140	19.1		
#200	15.4		
0.0342 mm.	10.5		
0.0220 mm.	8.1		
0.0129 mm.	6.2		
0.0092 mm.	5.0		
0.0065 mm.	4.2		
0.0032 mm.	2.6		
0.0014 mm.	2.1		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= np LL= nv PI=

Coefficients

D_{85}= 4.6785 D_{60}= 0.6849 D_{50}= 0.4277
D_{30}= 0.1882 D_{15}= 0.0716 D_{10}= 0.0312
C_u= 21.97 C_c= 1.66

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture content: 11.4%

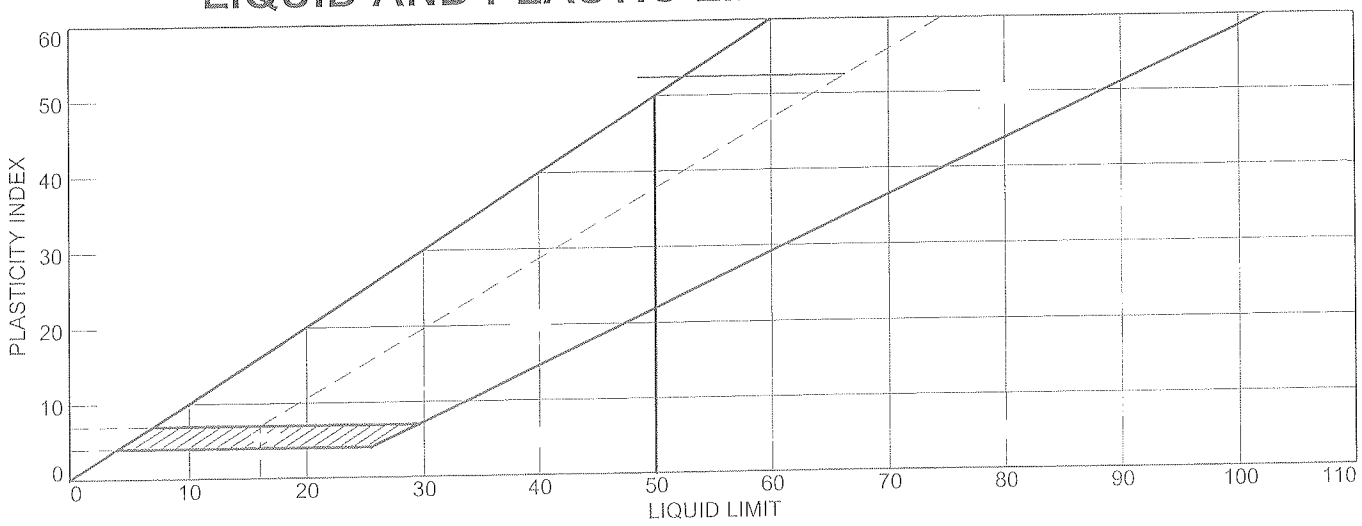
Sample No.: S-1 Source of Sample: TP-2 Date: 11/9/09
Location: New Bedford, MA Elev./Depth: 0.3'-2.3'

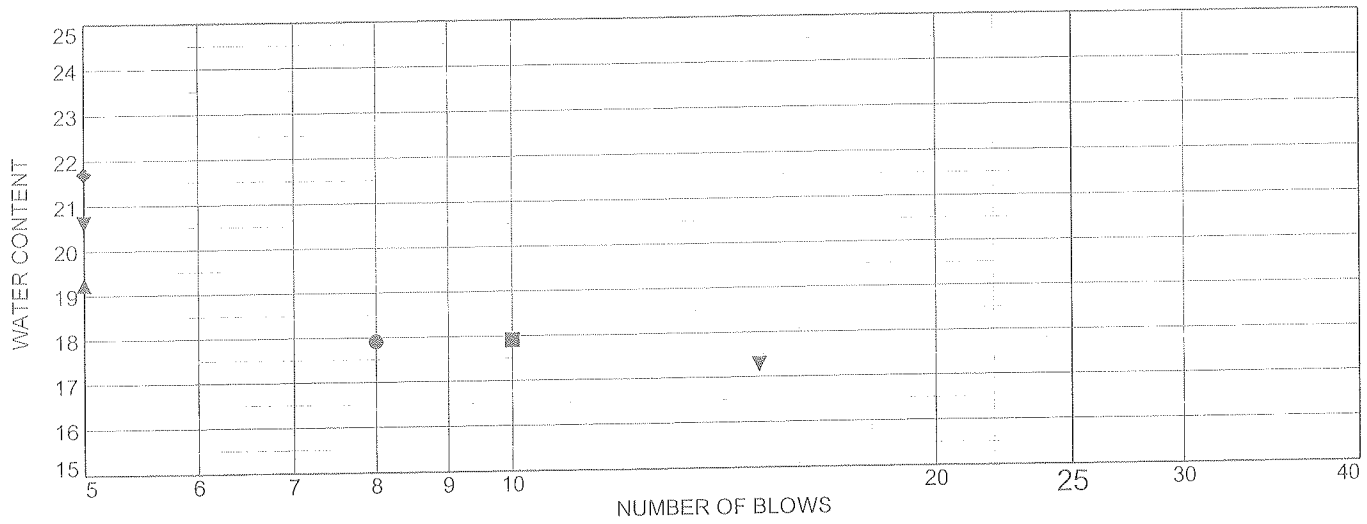
R.W. Gillespie & Associates, Inc.
Saco, Maine

Client: Airport Solutions Group
Project: Pavement Rehabilitation Strategies for Ramps
Project No: 1229-01 Lab No. 10972JJJ

Tested By: DCH/JJH Checked By: MTG MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	silty sand	16	NP	NP			
■	silty sand with gravel	16	NP	NP			
▲	silty sand with gravel	16	NP	NP			
◆	silty sand	18	NP	NP			
▼	silty sand with gravel	17	NP	NP			

Project No. 1229-01 **Client:** Airport Solutions Group

Project: Pavement Rehabilitation Strategies for Ramps

●	**Source of Sample:** B-5	**Depth:** 6.3'-8.3'	**Sample Number:** S-4
■	**Source of Sample:** B-7	**Depth:** 2.4'-4.4'	**Sample Number:** S-2
▲	**Source of Sample:** B-9	**Depth:** 2.5'-4.5'	**Sample Number:** S-2
◆	**Source of Sample:** B-10	**Depth:** 6.4'-8.4'	**Sample Number:** S-4
▼	**Source of Sample:** B-11	**Depth:** 2.4'-4.4'	**Sample Number:** S-2

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Saco, Maine

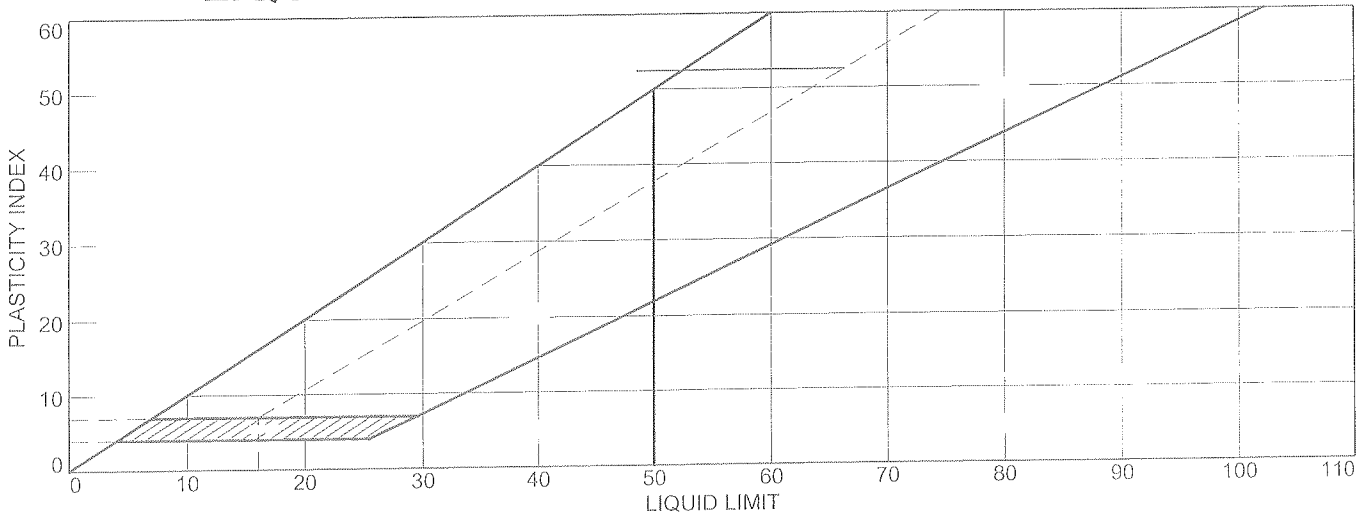
Remarks:

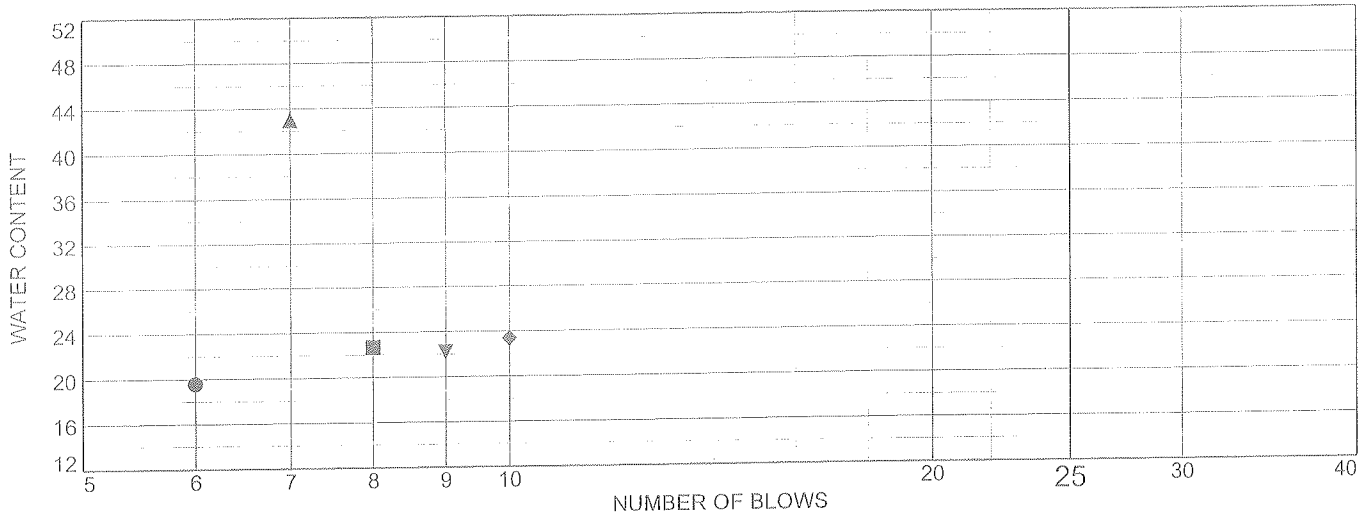
- ● Moisture content: 12.2%
- ■ Moisture content: 12.3%
- ▲ Moisture content: 6.5%
- ◆ Moisture content: 15.5%
- ▼ Moisture content: 5.1%

Lab No. 11025a

Tested By: DCH **Checked By:** MTG MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	poorly graded sand with silt and gravel	16	NP	NP			
■	poorly graded sand with silt and gravel	20	NP	NP			
▲	poorly graded sand with silt and gravel	37	NP	NP			
◆	silty sand	21	NP	NP			
▼	silty sand	20	NP	NP			

Project No. 1229-01 **Client:** Airport Solutions Group

Project: Pavement Rehabilitation Strategies for Ramps

- ● **Source of Sample:** B-13 **Depth:** 5'-7' **Sample Number:** S-3
- ■ **Source of Sample:** B-17 **Depth:** 4.5'-6.5' **Sample Number:** S-3
- ▲ **Source of Sample:** B-18 **Depth:** 2.5'-4.5' **Sample Number:** S-2
- ◆ **Source of Sample:** B-20 **Depth:** 2.2'-4.2' **Sample Number:** S-2
- ▼ **Source of Sample:** B-23 **Depth:** 6'-8' **Sample Number:** S-4

Remarks:

- ● Moisture content: 11.6%
- ■ Moisture content: 20.1%
- ▲ Moisture content: 32.5%
- ◆ Moisture content: 23.8%
- ▼ Moisture content: 23.1%

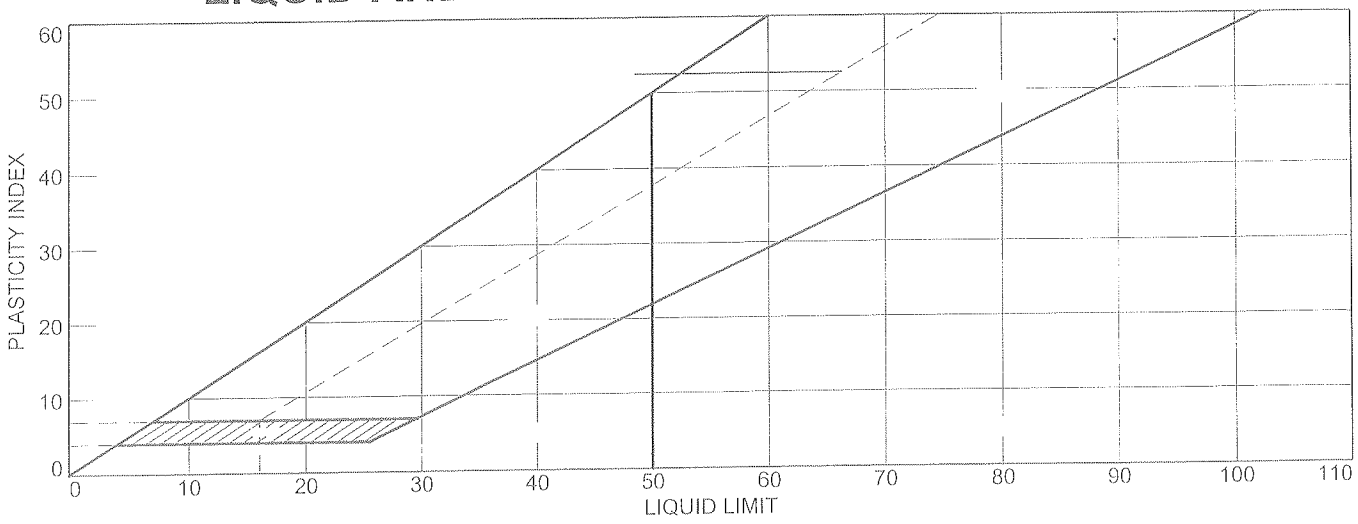
R.W. Gillespie & Associates, Inc.

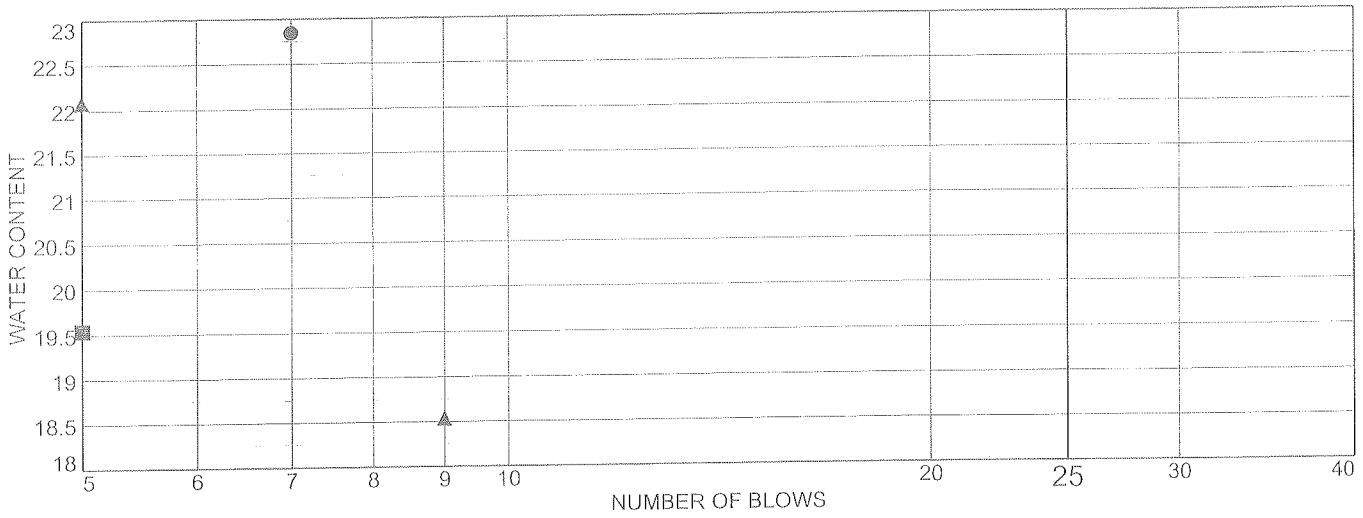
Saco, Maine

Lab No. 11025b

Tested By: DCH **Checked By:** MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	poorly graded sand with silt	20	NP	NP			
■	poorly graded sand	16	NP	NP			
▲	poorly graded gravel with silt and sand	17	NP	NP			

Project No. 1229-01 **Client:** Airport Solutions Group

Project: Pavement Rehabilitation Strategies for Ramps

● **Source of Sample:** B-24 **Depth:** 6.4'-8' **Sample Number:** S-4

■ **Source of Sample:** B-26 **Depth:** 2.2'-4.2' **Sample Number:** S-2

▲ **Source of Sample:** B-29 **Depth:** 4.3'-6.3' **Sample Number:** S-3

Remarks:

● Moisture content: 24.0%

■ Moisture content: 8.8%

▲ Moisture content: 13.7%

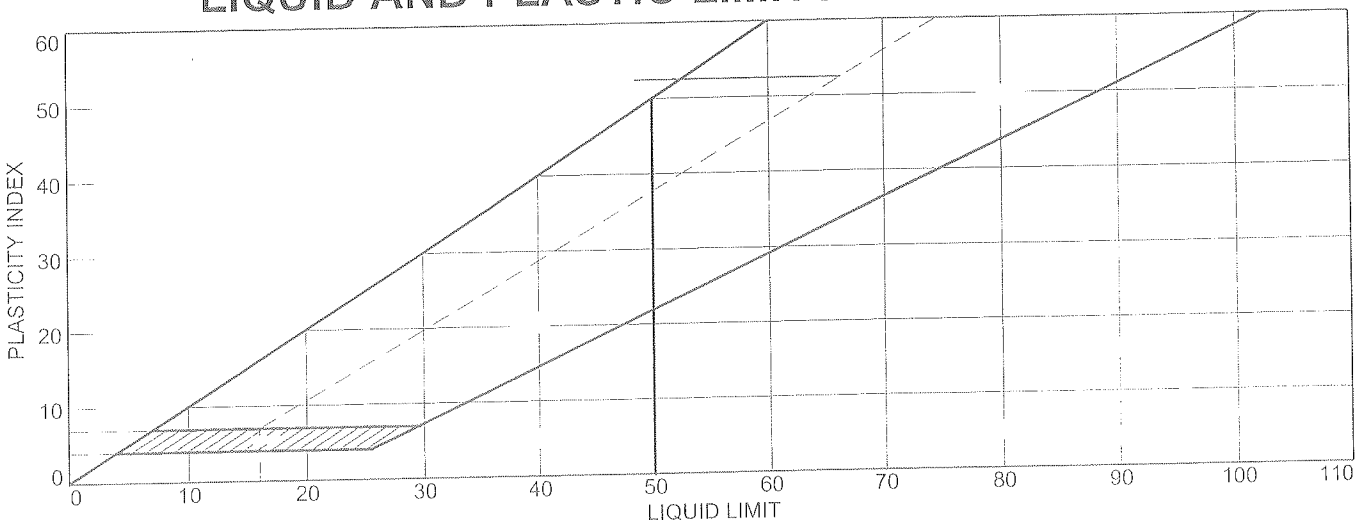
R.W. Gillespie & Associates, Inc.

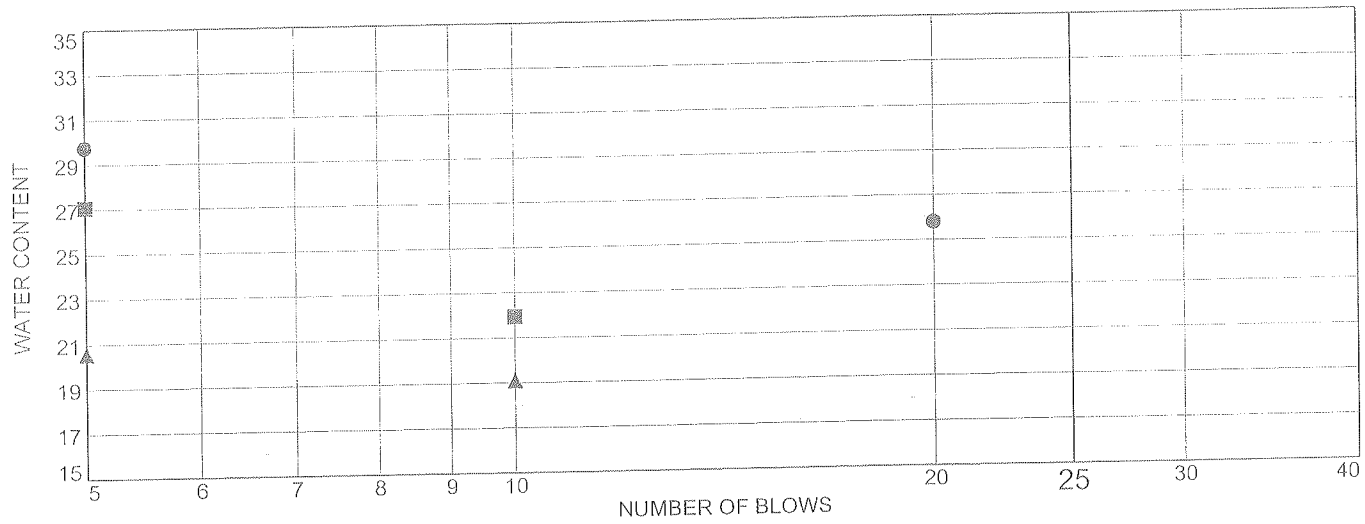
Saco, Maine

Lab No. 11025c

Tested By: DCH **Checked By:** MTG MTG

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	silty sand	25	NP	NP			
■	poorly graded sand with silt and gravel	21	NP	NP			
▲	silty sand	17	NP	NP			

Project No. 1229-01 **Client:** Airport Solutions Group

Project: Pavement Rehabilitation Strategies for Ramps

● **Source of Sample:** B-30 **Depth:** 6.5'-8.5' **Sample Number:** S-4

■ **Source of Sample:** B-33 **Depth:** 4'-6' **Sample Number:** S-2

▲ **Source of Sample:** B-36 **Depth:** 2.2'-4.2' **Sample Number:** S-2

Remarks:

● Moisture content: 26.0%

■ Moisture content: 22.6%

▲ Moisture content: 3.3%

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Saco, Maine

Lab No. 11025d

Tested By: DCH Checked By: MTG MTG

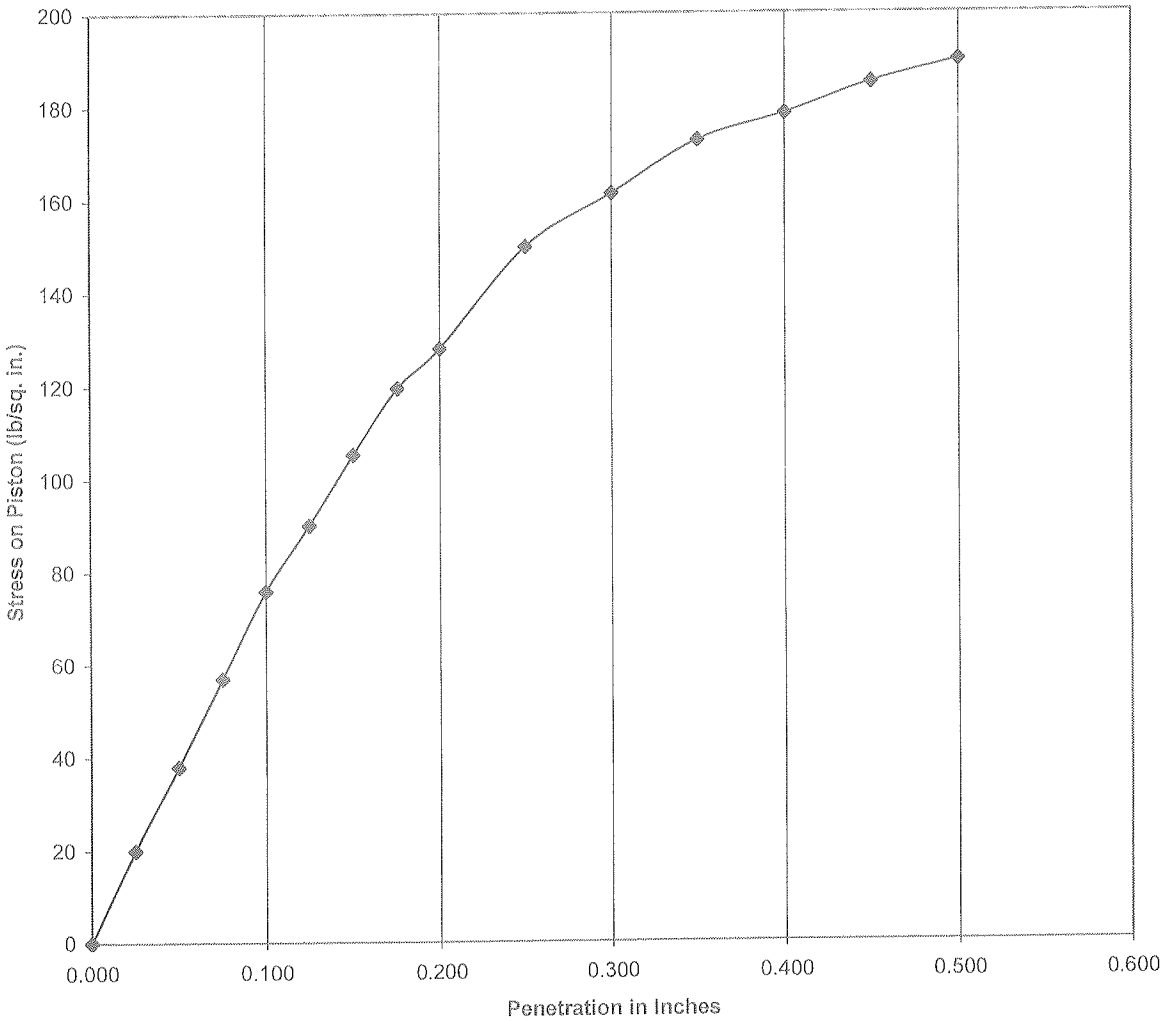
APPENDIX C

FIELD CBR TESTS

Pavement Rehabilitation Strategies for Ramps
New Bedford Regional Airport
New Bedford, Massachusetts

Field California Bearing Ratio

ASTM D4429



Bearing Ratio at 0.1 inch penetration = 7.6

Test Location:	B-6	Test Depth:	27"
Project:	Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport		
RWG&A Project No:	1229-01	Client:	Airport Solutions Group
Location:	New Bedford, MA	Date:	18-Sep-2009

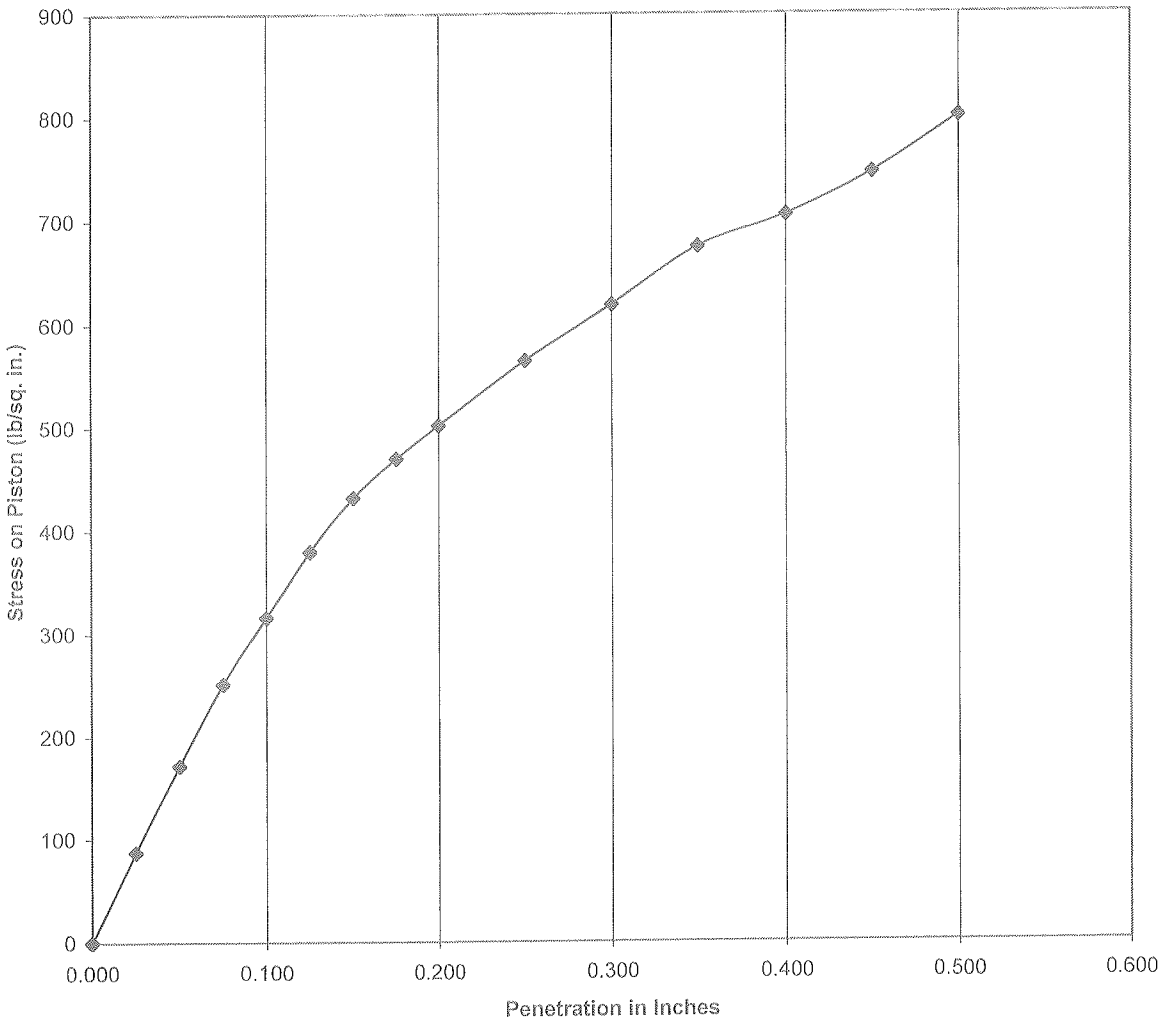
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Saco, ME 04072

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Portsmouth, NH 03801

Field California Bearing Ratio

ASTM D4429



Bearing Ratio at 0.1 inch penetration = 31.6

Test Location:	B-8	Test Depth:	30"

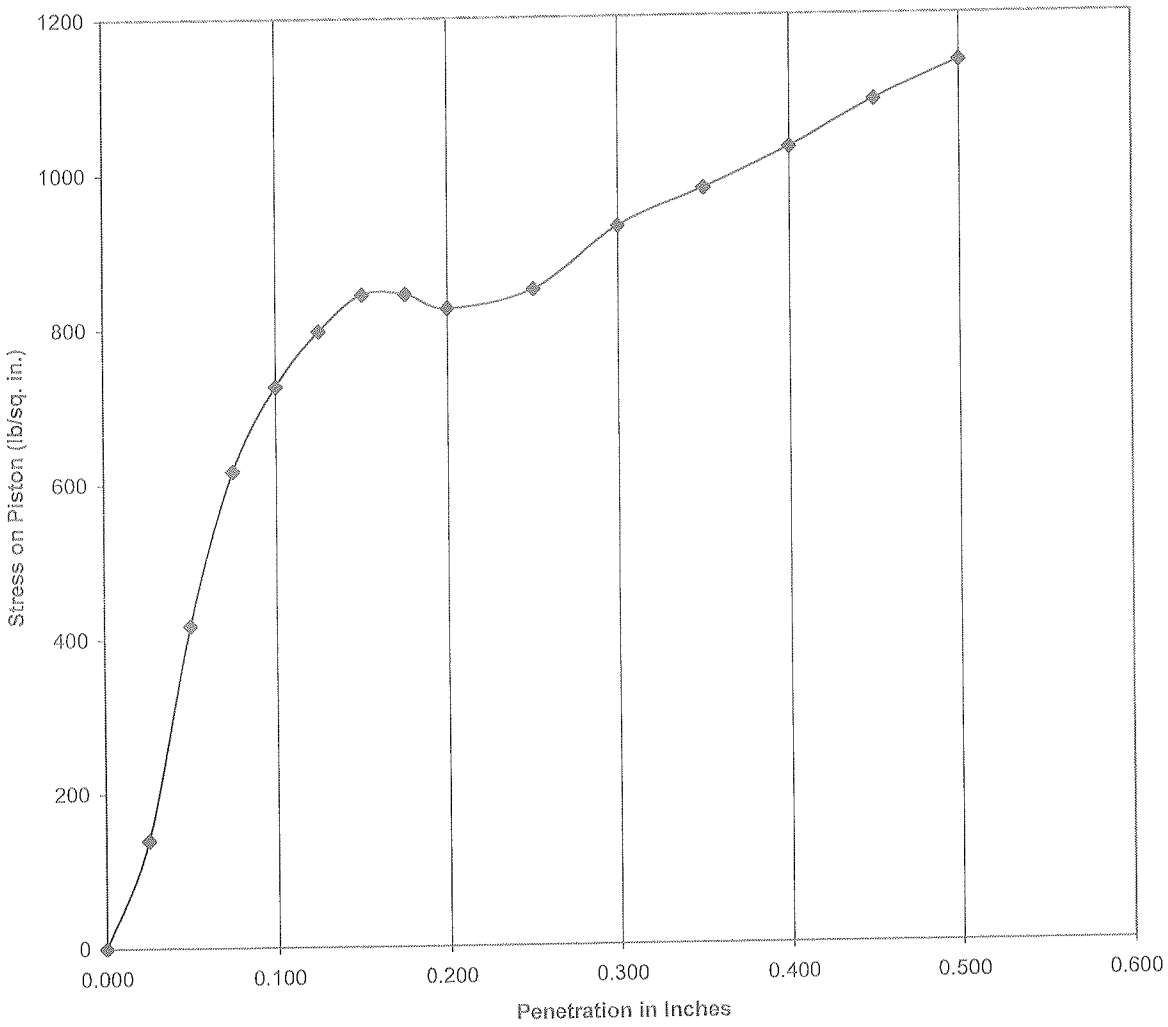
Project: Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport
RWG&A Project No: 1229-01 Client: Airport Solutions Group
Location: New Bedford, MA Date: 18-Sep-2009

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Field California Bearing Ratio
ASTM D4429



Bearing Ratio at 0.1 inch penetration = 72.6

Test Location:	B-15	Test Depth:	26"

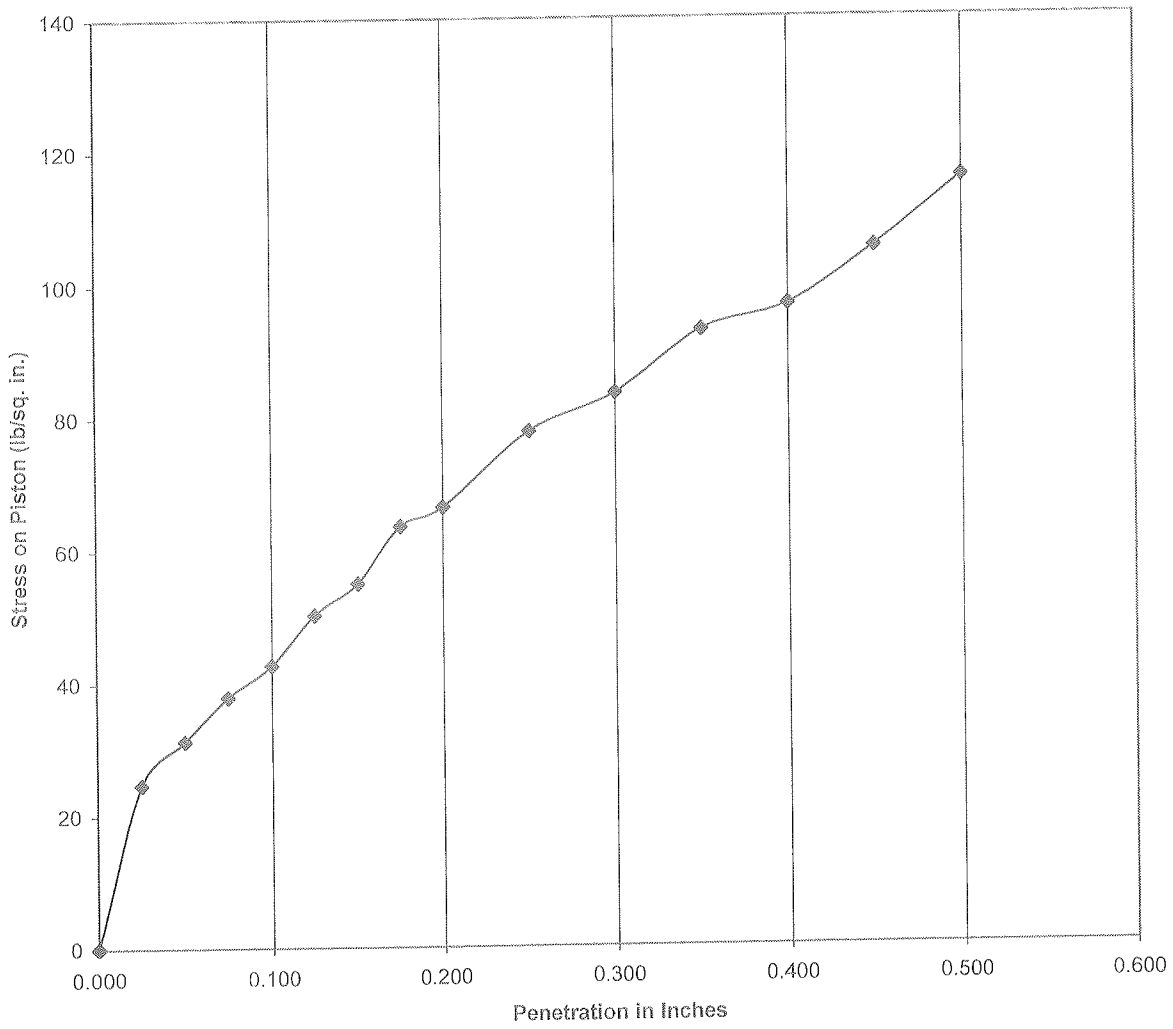
Project: Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport
RWG&A Project No: 1229-01 Client: Airport Solutions Group
Location: New Bedford, MA Date: 17-Sep-2009

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Field California Bearing Ratio
ASTM D4429



Bearing Ratio at 0.1 inch penetration = 4.3

Test Location:	B-18	Test Depth:	26"

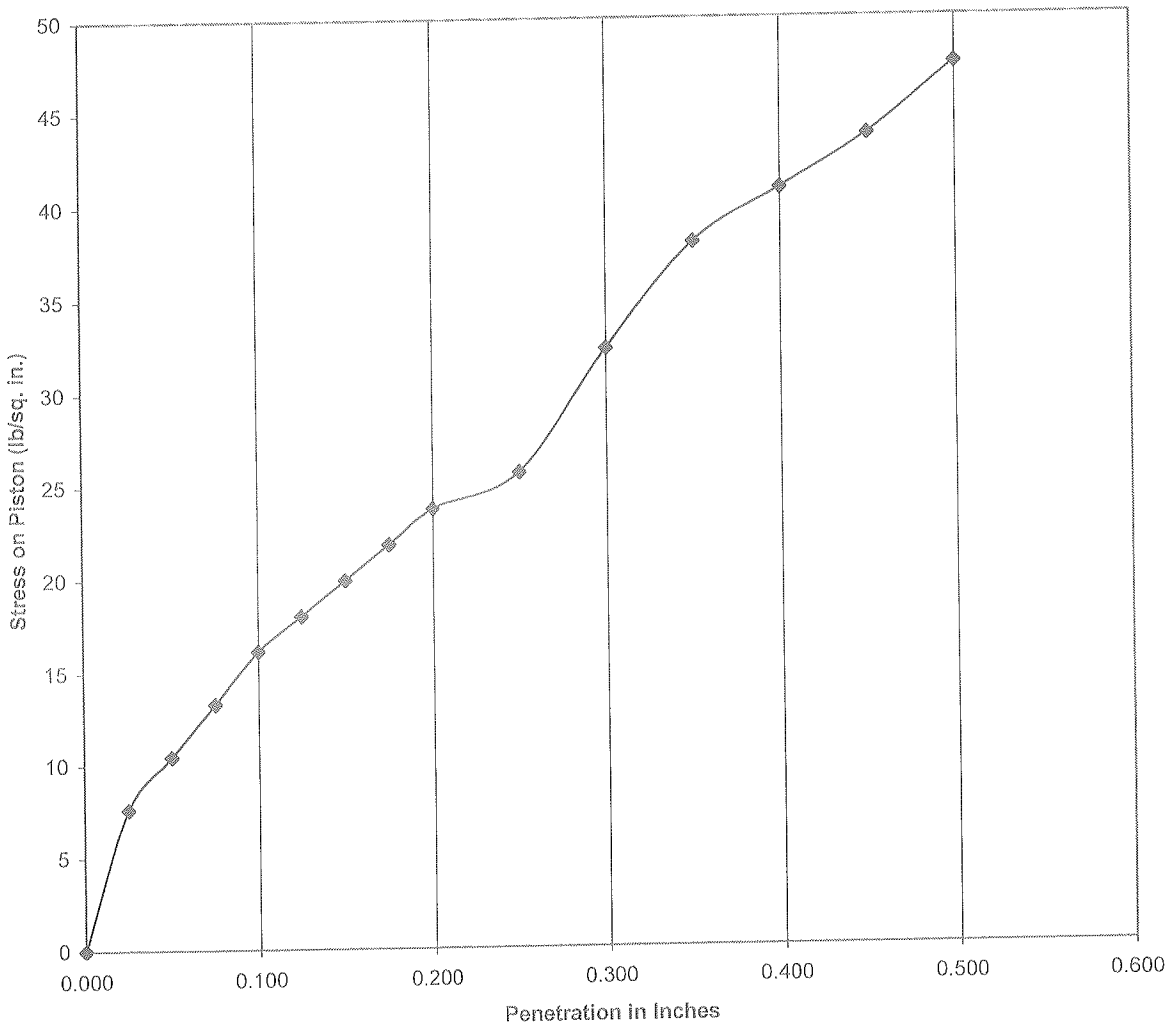
Project: Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport
RWG&A Project No: 1229-01 Client: Airport Solutions Group
Location: New Bedford, MA Date: 16-Sep-2009

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Field California Bearing Ratio
ASTM D4429



Bearing Ratio at 0.1 inch penetration = 1.6

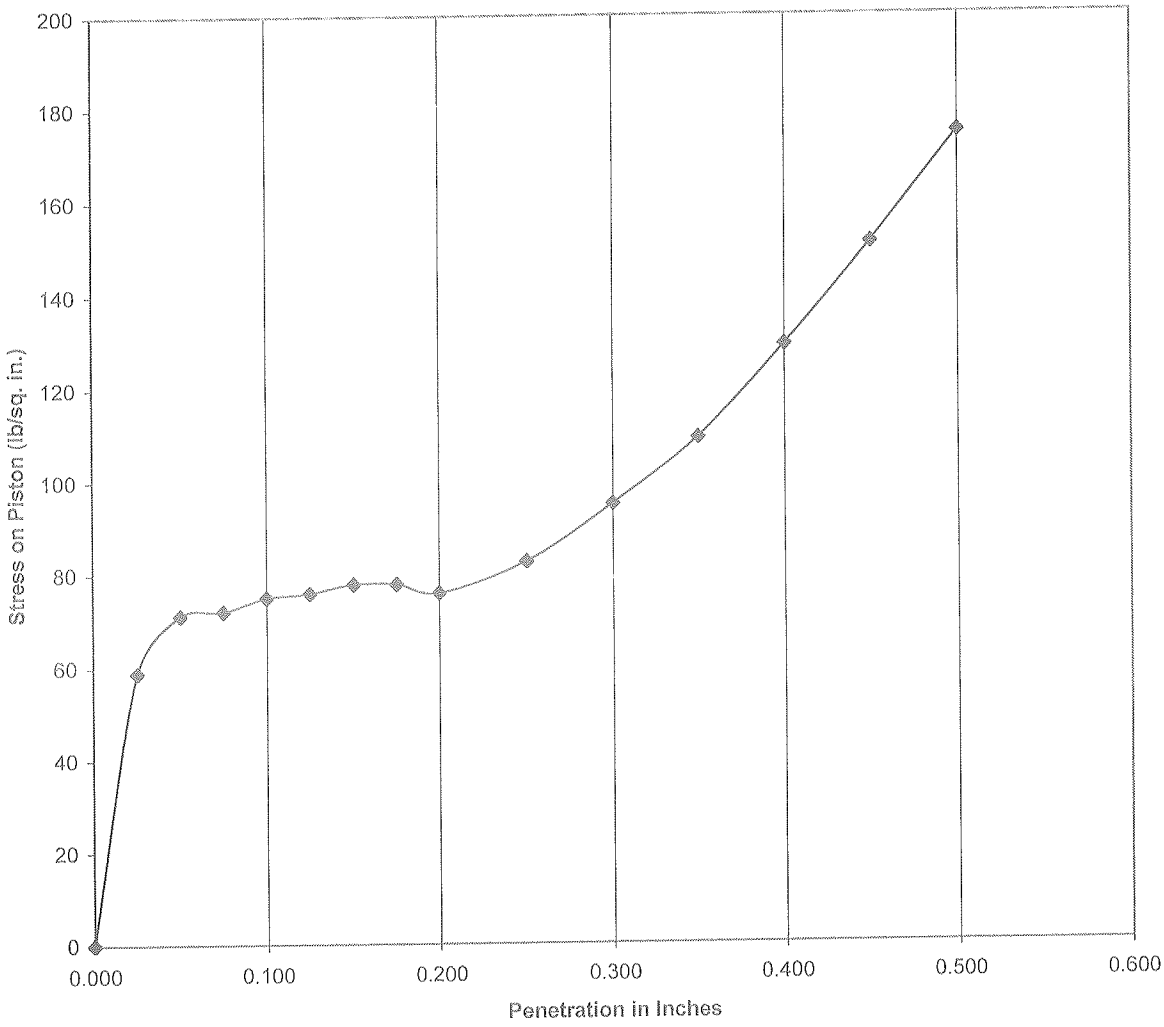
Test Location:	B-20	Test Depth:	26"
Project:	Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport		
RWG&A Project No:	1229-01	Client:	Airport Solutions Group
Location:	New Bedford, MA	Date:	16-Sep-2009

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Field California Bearing Ratio
ASTM D4429



Bearing Ratio at 0.1 inch penetration = 7.5

Test Location:	B-25	Test Depth:	27"
Project:	Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport		
RWG&A Project No:	1229-01	Client:	Airport Solutions Group
Location:	New Bedford, MA	Date:	16-Sep-2009

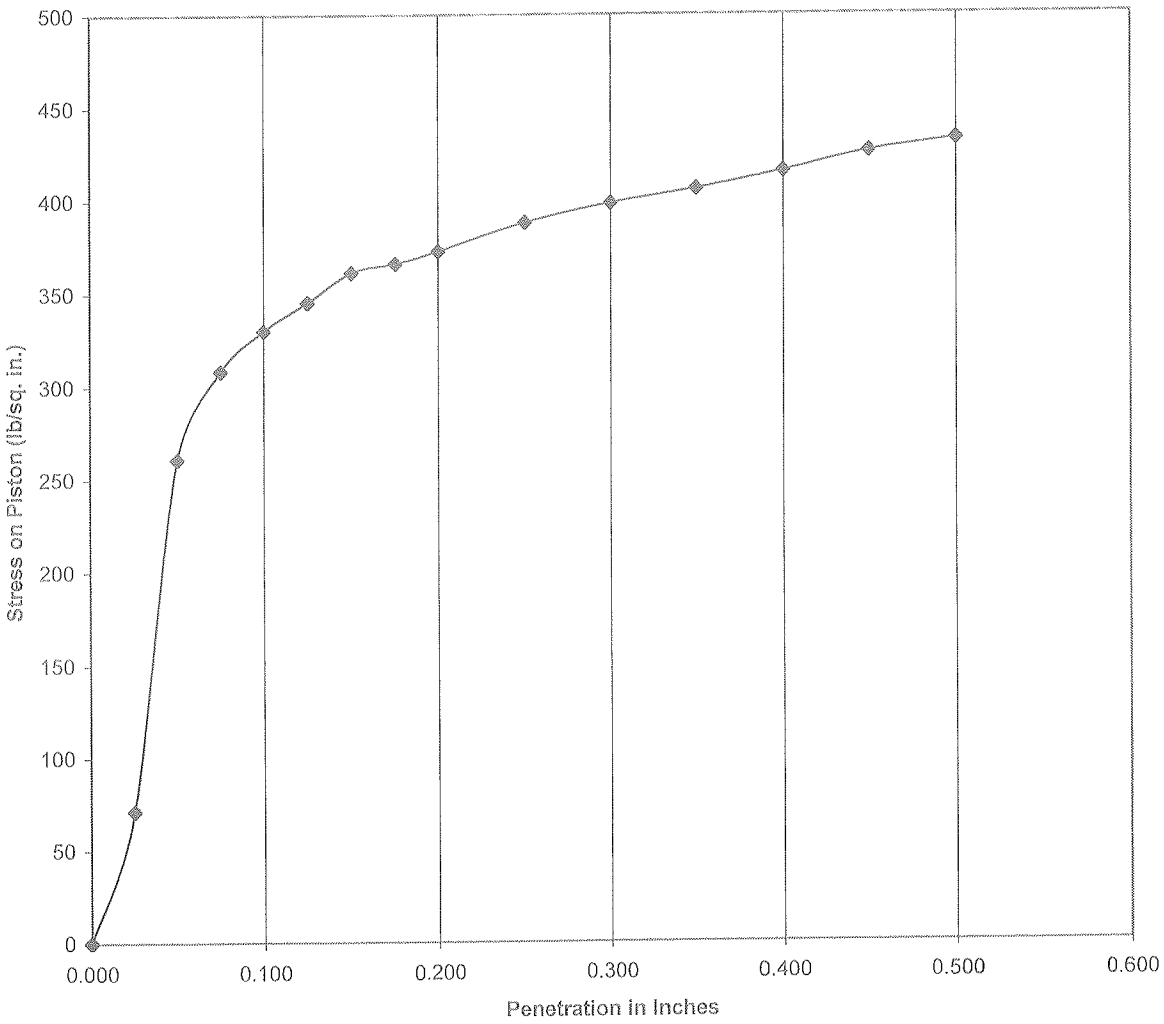
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Field California Bearing Ratio

ASTM D4429



Bearing Ratio at 0.1 inch penetration = 33.0

Test Location:	B-27	Test Depth:	27"

Project: Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport
RWG&A Project No: 1229-01 Client: Airport Solutions Group
Location: New Bedford, MA Date: 15-Sep-2009

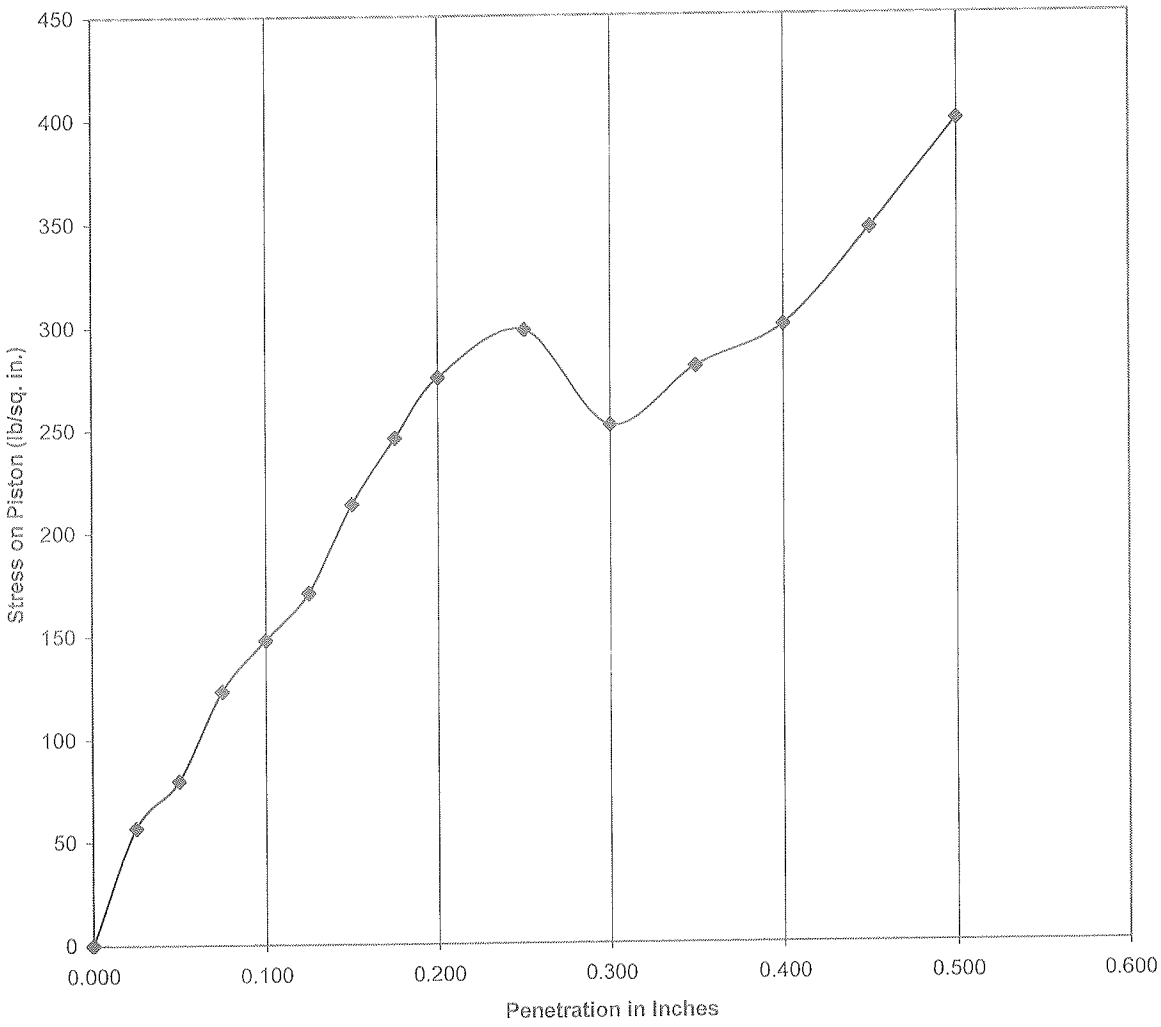
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Field California Bearing Ratio

ASTM D4429



Bearing Ratio at 0.1 inch penetration = 14.8

Test Location:	B-30	Test Depth:	28"

Project: Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport

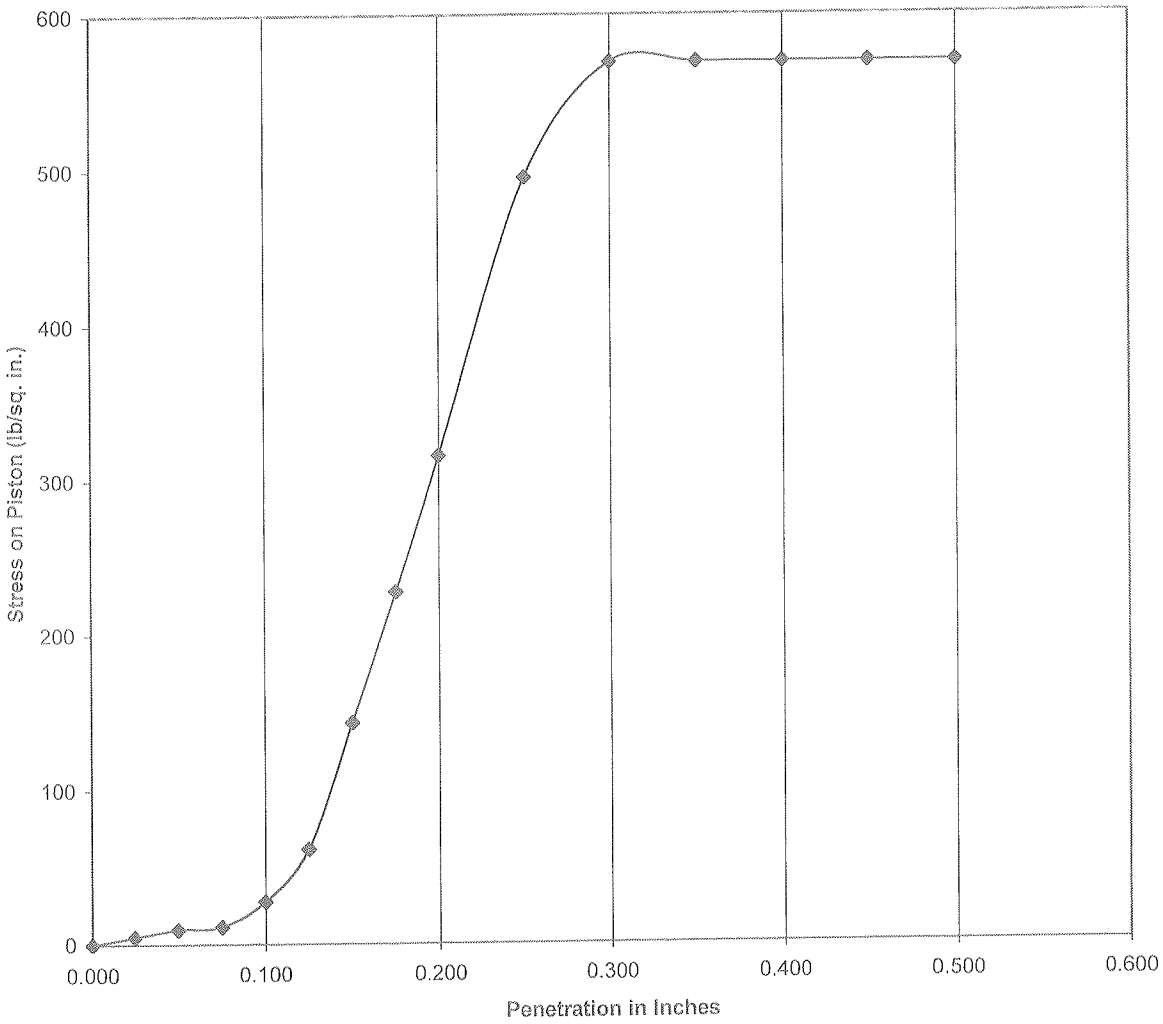
RWG&A Project No:	1229-01	Client:	Airport Solutions Group
Location:	New Bedford, MA	Date:	15-Sep-2009

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Portsmouth, NH 03801

Field California Bearing Ratio
ASTM D4429



Bearing Ratio at 0.1 inch penetration = 2.8

Test Location:	B-33	Test Depth:	16"

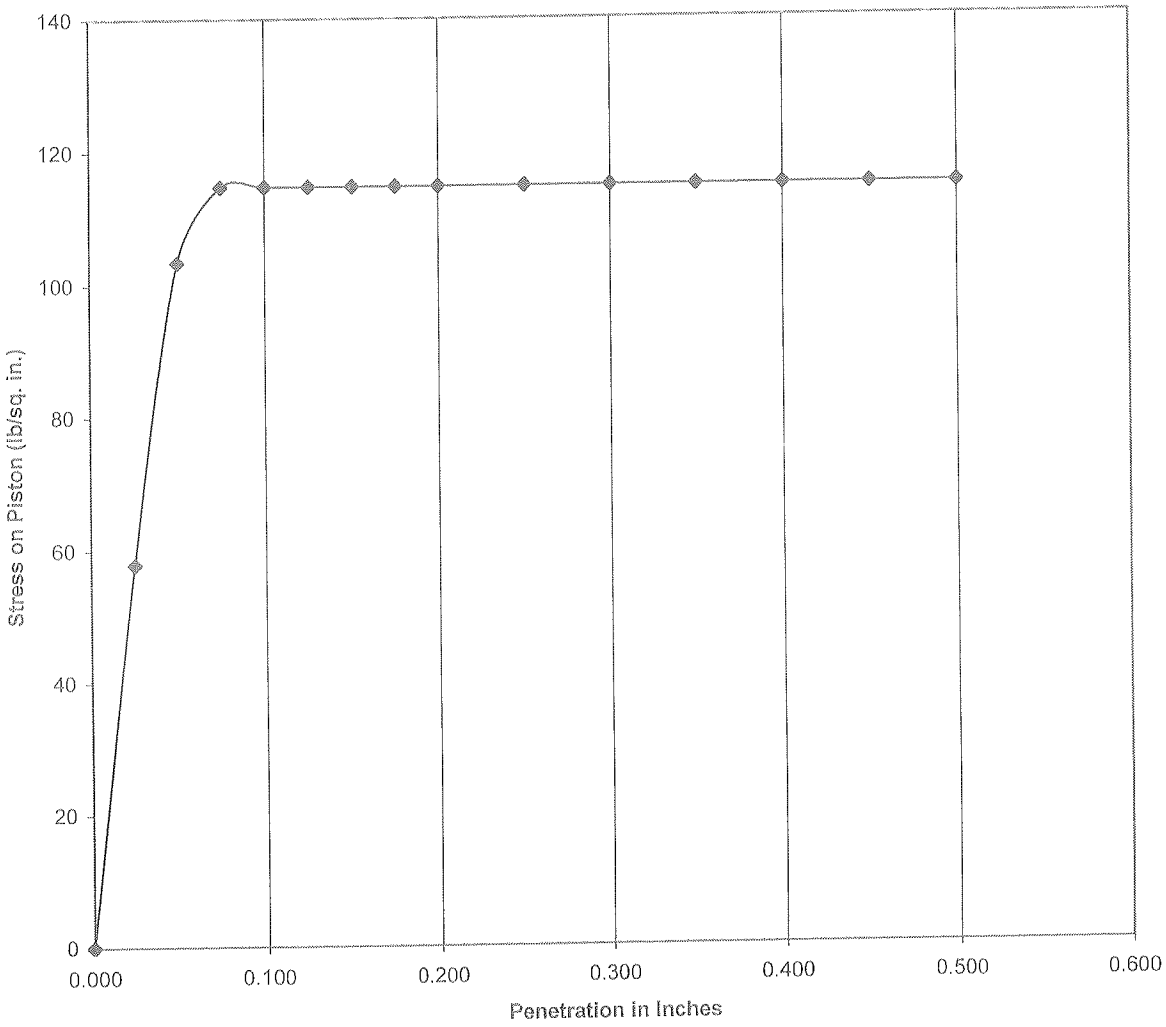
Project: Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport
RWG&A Project No: 1229-01 Client: Airport Solutions Group
Location: New Bedford, MA Date: 15-Sep-2009

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Field California Bearing Ratio
ASTM D4429



Bearing Ratio at 0.1 inch penetration = 11.5

Test Location:	B-35	Test Depth:	24"

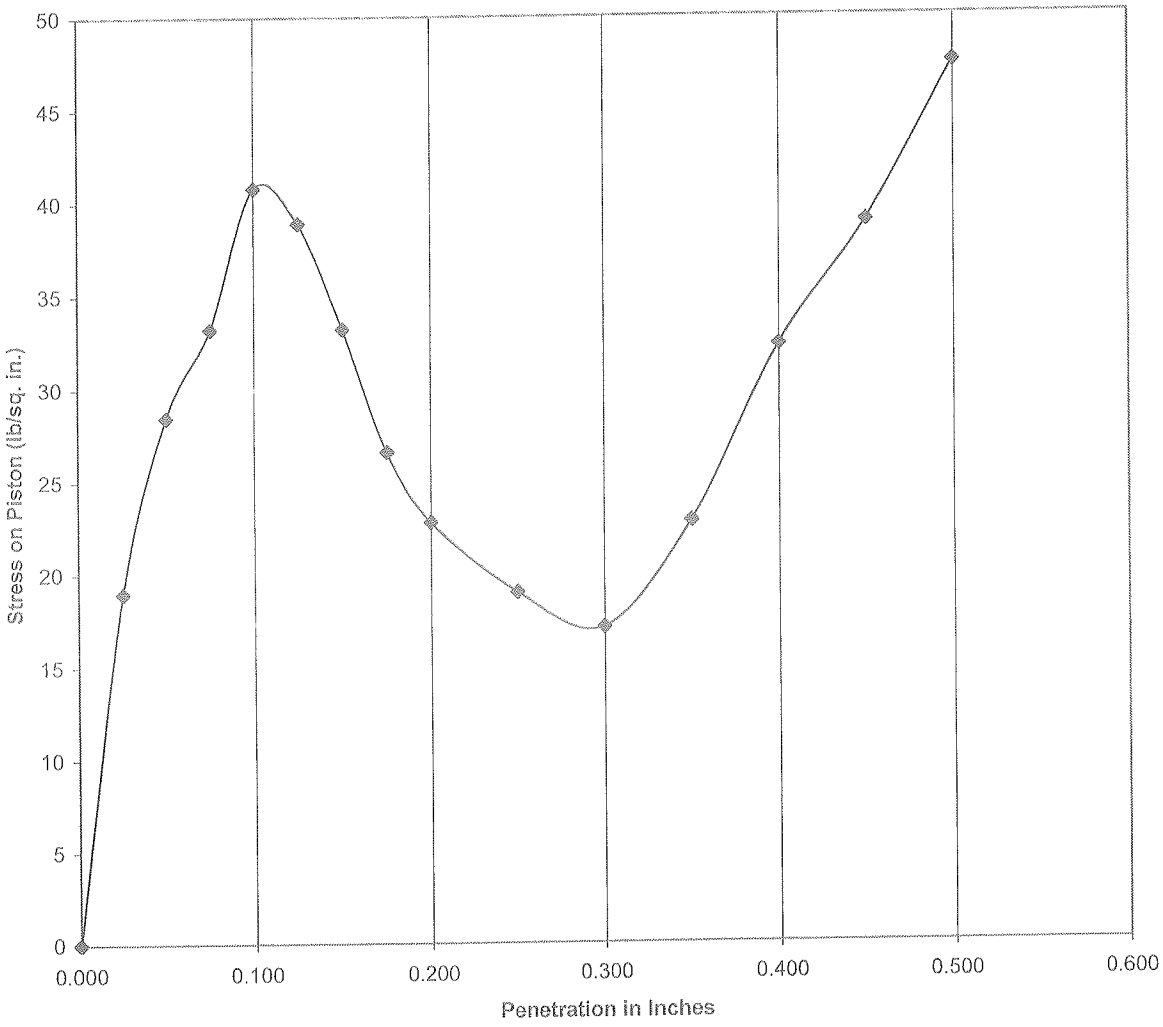
Project: Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport
RWG&A Project No: 1229-01 Client: Airport Solutions Group
Location: New Bedford, MA Date: 14-Sep-2009

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Portsmouth, NH 03801

Field California Bearing Ratio
ASTM D4429



Bearing Ratio at 0.1 inch penetration = **4.1**

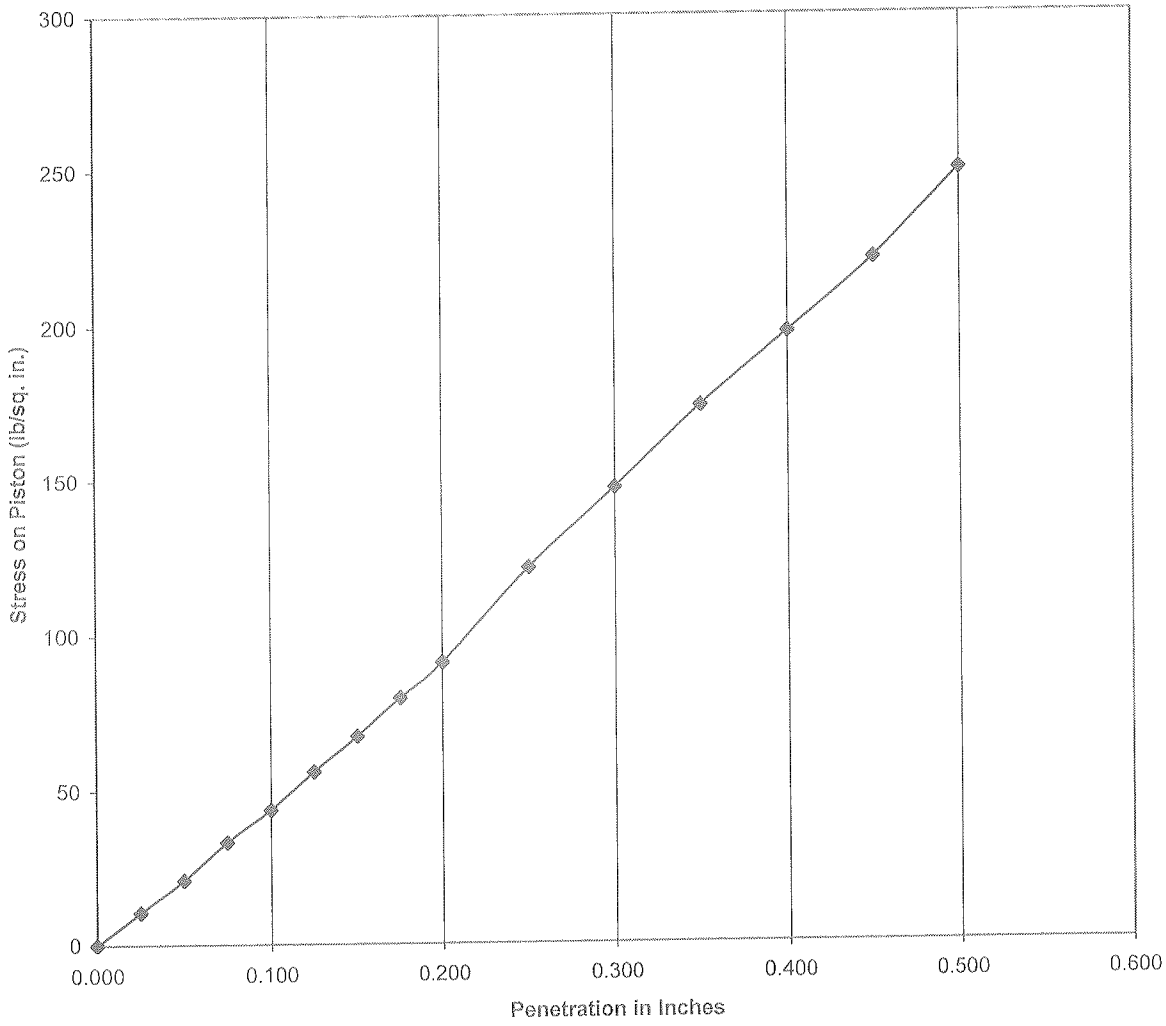
Test Location:	TP-1	Test Depth:	27"
Project:	Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport		
RWG&A Project No:	1229-01	Client:	Airport Solutions Group
Location:	New Bedford, MA	Date:	21-Sep-2009

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Portsmouth, NH 03801

Field California Bearing Ratio
ASTM D4429



Bearing Ratio at 0.1 inch penetration = 4.4

Test Location:	TP-2	Test Depth:	28"
Project:	Pavement Rehabilitation Strategies for Ramps - New Bedford Regional Airport		
RWG&A Project No:	1229-01	Client:	Airport Solutions Group
Location:	New Bedford, MA	Date:	16-Sep-2009

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APPENDIX D

ASPHALTIC PAVEMENT EXTRACTION/GRADATION TESTS

Pavement Rehabilitation Strategies for Ramps
New Bedford Regional Airport
New Bedford, Massachusetts

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/20/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2279 | Lot #:

Contract #: | Material ID: B-4 (1.5" Base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	1790.3	Extracted Agg.+ Pan (W_3p):	2058.0
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	1790.3	Pan Tare Mass (P):	248.6
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	1709.4
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	19.3	Total Agg. Mass: (W_3 + W_4)	1714.1
		Final Filter Mass (Ff):	21.5	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	76.2
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	2.2		
Tare Weight of Flask 0.01g	241.51	Ash Correction (W_4a):	2.5	%PG Binder (Pb): ((Wpg/W_1)*100)	4.26
End Weight of Flask 0.01g	244.051	Mineral Matter Mass (W_4): (W_4f + W_4a)	4.7		
Mineral Matter	2.54			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+ / - Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm	29.4	1.7	98.3			
12.5 mm	298.6	17.4	80.9			
9.5 mm	232.8	13.6	67.3			
4.75 mm	324.5	18.9	48.4			
2.36 mm	215.0	12.5	35.9			
1.18 mm	148.6	8.7	27.2			
600 µm	99.5	5.8	21.4			
300 µm	84.8	4.9	16.5			
150 µm	78.1	4.6	11.9			
75 µm	69.2	4.0	7.9			
PAN	133.6	7.9				
TOTAL:	1714.1					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/20/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/21/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2280 | Lot #:

Contract #: | Material ID: B-8 (5" Top & base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	4729.6	Extracted Agg.+ Pan (W_3p):	5104.1
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	4729.6	Pan Tare Mass (P):	683.6
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	4420.5
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	37.7	Total Agg. Mass: (W_3 + W_4)	4434.2
		Final Filter Mass (Ff):	41.9	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	295.4
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	4.2		
Tare Weight of Flask 0.01g	240.43	Ash Correction (W_4a):	9.5	%PG Binder (Pb): ((Wpg/W_1)*100)	6.25
End Weight of Flask 0.01g	249.89	Mineral Matter Mass (W_4): (W_4f + W_4a)	13.7		
Mineral Matter	9.46			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+ / - Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm	37.3	0.8	99.2			
12.5 mm	384.3	8.7	90.5			
9.5 mm	256.6	5.8	84.7			
4.75 mm	724.0	16.3	68.4			
2.36 mm	622.4	14.0	54.4			
1.18 mm	795.5	17.9	36.5			
600 µm	530.6	12.0	24.5			
300 µm	383.4	8.6	15.9			
150 µm	277.6	6.3	9.6			
75 µm	173.3	3.9	5.7			
PAN	249.2	5.7				
TOTAL:	4434.2					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | 559m

Certification #: 559m | Certification #:

Date: 10/21/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/21/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2281 | Lot #:

Contract #: | Material ID: B-11 (2.125 Top) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	2091.1	Extracted Agg.+ Pan (W_3p):	2316.1
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	2091.1	Pan Tare Mass (P):	340.3
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	1975.8
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	18.7	Total Agg. Mass: (W_3 + W_4)	1979.8
		Final Filter Mass (Ff):	21.2	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	111.3
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	2.5		
Tare Weight of Flask 0.01g	274.96	Ash Correction (W_4a):	1.5	%PG Binder (Pb): ((Wpg/W_1)*100)	5.32
End Weight of Flask 0.01g	276.478	Mineral Matter Mass (W_4): (W_4f + W_4a)	4.0		
Mineral Matter	1.52			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+/- Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm			100.0			
12.5 mm	50.9	2.6	97.4			
9.5 mm	339.9	17.2	80.2			
4.75 mm	437.1	22.1	58.1			
2.36 mm	268.1	13.5	44.6			
1.18 mm	308.9	15.6	29.0			
600 µm	179.4	9.1	19.9			
300 µm	114.4	5.8	14.1			
150 µm	93.5	4.7	9.4			
75 µm	73.6	3.7	5.7			
PAN	114.0	5.7				
TOTAL:	1979.8					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/21/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/20/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2282 | Lot #:

Contract #: | Material ID: B 11 (2.125" base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	2103.3	Extracted Agg.+ Pan (W_3p):	2335.1
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	2103.3	Pan Tare Mass (P):	347.5
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	1987.6
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	20.2	Total Agg. Mass: (W_3 + W_4)	1991.3
		Final Filter Mass (Ff):	21.8	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	112.0
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	1.6		
Tare Weight of Flask 0.01g	240.415	Ash Correction (W_4a):	2.1	%PG Binder (Pb): ((Wpg/W_1)*100)	5.32
End Weight of Flask 0.01g	242.47	Mineral Matter Mass (W_4): (W_4f + W_4a)	3.7		
Mineral Matter	2.06			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+ / - Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm			100.0			
12.5 mm	78.6	3.9	96.1			
9.5 mm	288.8	14.5	81.6			
4.75 mm	447.9	22.5	59.1			
2.36 mm	231.9	11.6	47.5			
1.18 mm	294.9	14.8	32.7			
600 µm	186.7	9.4	23.3			
300 µm	134.3	6.7	16.6			
150 µm	113.8	5.7	10.9			
75 µm	83.9	4.2	6.7			
PAN	130.5	6.7				
TOTAL:	1991.3					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/20/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/21/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2283 | Lot #:

Contract #: | Material ID: B-18 (2.125 Top) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	2119.7	Extracted Agg.+ Pan (W_3p):	2335.8
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	2119.7	Pan Tare Mass (P):	338.3
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	1997.5
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	18.7	Total Agg. Mass: (W_3 + W_4)	2003.0
		Final Filter Mass (Ff):	21.0	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	116.7
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	2.3		
Tare Weight of Flask 0.01g	240.427	Ash Correction (W_4a):	3.2	%PG Binder (Pb): ((Wpg/W_1)*100)	5.51
End Weight of Flask 0.01g	243.646	Mineral Matter Mass (W_4): (W_4f + W_4a)	5.5		
Mineral Matter	3.22			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+/- Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm	24.6	1.2	98.8			
12.5 mm	110.5	5.5	93.3			
9.5 mm	301.3	15.0	78.3			
4.75 mm	483.7	24.1	54.2			
2.36 mm	247.3	12.3	41.9			
1.18 mm	242.4	12.1	29.8			
600 µm	159.2	7.9	21.9			
300 µm	122.3	6.1	15.8			
150 µm	111.5	5.6	10.2			
75 µm	82.7	4.1	6.1			
PAN	117.5	6.1				
TOTAL:	2003.0					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/21/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/21/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2284 | Lot #:

Contract #: | Material ID: B-18 (2.375 Base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	2258.4	Extracted Agg.+ Pan (W_3p):	2477.6
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	2258.4	Pan Tare Mass (P):	342.6
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	2135.0
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	18.7	Total Agg. Mass: (W_3 + W_4)	2138.6
		Final Filter Mass (Ff):	20.6	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	119.8
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	1.9		
Tare Weight of Flask 0.01g	240.414	Ash Correction (W_4a):	1.7	%PG Binder (Pb): ((Wpg/W_1)*100)	5.30
End Weight of Flask 0.01g	242.118	Mineral Matter Mass (W_4): (W_4f + W_4a)	3.6		
Mineral Matter	1.70			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+ / - Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm	37.0	1.7	98.3			
12.5 mm	191.2	8.9	89.4			
9.5 mm	211.1	9.9	79.5			
4.75 mm	408.5	19.1	60.4			
2.36 mm	286.2	13.4	47.0			
1.18 mm	332.6	15.6	31.4			
600 µm	198.6	9.3	22.1			
300 µm	136.3	6.4	15.7			
150 µm	121.4	5.7	10.0			
75 µm	93.4	4.4	5.6			
PAN	122.3	5.7				
TOTAL:	2138.6					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | 559m

Certification #: 559m | Certification #:

Date: 10/21/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/20/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2285 | Lot #:

Contract #: | Material ID: B-21 (3" Base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	2344.2	Extracted Agg.+ Pan (W_3p):	2618.3
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	2344.2	Pan Tare Mass (P):	342.5
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	2275.8
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	18.9	Total Agg. Mass: (W_3 + W_4)	2280.3
		Final Filter Mass (Ff):	20.9	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	63.9
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	2.0		
Tare Weight of Flask 0.01g	240.447	Ash Correction (W_4a):	2.5	%PG Binder (Pb): ((Wpg/W_1)*100)	2.73
End Weight of Flask 0.01g	242.991	Mineral Matter Mass (W_4): (W_4f + W_4a)	4.5		
Mineral Matter	2.54			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+ / - Tolerance	Variance
31.5 mm	223.8	9.8	90.2			
25 mm	41.9	1.8	88.4			
19 mm	323.2	14.2	74.2			
12.5 mm	219.6	9.6	64.6			
9.5 mm	61.6	2.7	61.9			
4.75 mm	169.8	7.4	54.5			
2.36 mm	208.5	9.1	45.4			
1.18 mm	293.1	12.9	32.5			
600 µm	248.5	10.9	21.6			
300 µm	216.5	9.5	12.1			
150 µm	136.9	6.0	6.1			
75 µm	47.0	2.1	4.0			
PAN	89.9	4.0				
TOTAL:	2280.3					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/20/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/21/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2286 | Lot #:

Contract #: | Material ID: B-26 (2.125 Top & Base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	2325.4	Extracted Agg.+ Pan (W_3p):	2547.4
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	2325.4	Pan Tare Mass (P):	352.2
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	2195.2
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	18.9	Total Agg. Mass: (W_3 + W_4)	2198.9
		Final Filter Mass (Ff):	20.7	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	126.5
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	1.8		
Tare Weight of Flask 0.01g	241.536	Ash Correction (W_4a):	1.9	%PG Binder (Pb): ((Wpg/W_1)*100)	5.44
End Weight of Flask 0.01g	243.404	Mineral Matter Mass (W_4): (W_4f + W_4a)	3.7		
Mineral Matter	1.87			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+ / - Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm			100.0			
12.5 mm	87.3	4.0	96.0			
9.5 mm	218.3	9.9	86.1			
4.75 mm	683.3	31.1	55.0			
2.36 mm	319.0	14.5	40.5			
1.18 mm	258.8	11.8	28.7			
600 µm	176.4	8.0	20.7			
300 µm	141.3	6.4	14.3			
150 µm	123.1	5.6	8.7			
75 µm	78.9	3.6	5.1			
PAN	112.5	5.1				
TOTAL:	2198.9					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/21/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/21/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2287 | Lot #:

Contract #: | Material ID: B-30 (1.75 Top) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	1741.1	Extracted Agg.+ Pan (W_3p):	1970.4
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	1741.1	Pan Tare Mass (P):	347.3
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	1623.1
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	19.0	Total Agg. Mass: (W_3 + W_4)	1639.4
		Final Filter Mass (Ff):	21.8	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	101.7
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	2.8		
Tare Weight of Flask 0.01g	241.542	Ash Correction (W_4a):	13.5	%PG Binder (Pb): ((Wpg/W_1)*100)	5.84
End Weight of Flask 0.01g	255.02	Mineral Matter Mass (W_4): (W_4f + W_4a)	16.3		
Mineral Matter	13.48			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+ / - Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm			100.0			
12.5 mm	168.9	10.3	89.7			
9.5 mm	283.5	17.3	72.4			
4.75 mm	292.2	17.8	54.6			
2.36 mm	148.7	9.1	45.5			
1.18 mm	138.5	8.4	37.1			
600 µm	177.0	10.8	26.3			
300 µm	203.0	12.4	13.9			
150 µm	96.6	5.9	8.0			
75 µm	37.6	2.3	5.7			
PAN	93.4	5.7				
TOTAL:	1639.4					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/21/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/20/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2288 | Lot #:

Contract #: | Material ID: B30 (2" Base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	1724.6	Extracted Agg.+ Pan (W_3p):	1948.0
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	1724.6	Pan Tare Mass (P):	342.7
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	1605.3
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	19.3	Total Agg. Mass: (W_3 + W_4)	1618.8
		Final Filter Mass (Ff):	22.4	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	105.8
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	3.1		
Tare Weight of Flask 0.01g	274.968	Ash Correction (W_4a):	10.4	%PG Binder (Pb): ((Wpg/W_1)*100)	6.13
End Weight of Flask 0.01g	285.404	Mineral Matter Mass (W_4): (W_4f + W_4a)	13.5		
Mineral Matter	10.44			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+ / - Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm			100.0			
12.5 mm	139.6	8.6	91.4			
9.5 mm	260.0	16.1	75.3			
4.75 mm	314.6	19.4	55.9			
2.36 mm	159.4	9.8	46.1			
1.18 mm	144.6	8.9	37.2			
600 µm	166.7	10.3	26.9			
300 µm	173.2	10.7	16.2			
150 µm	101.5	6.3	9.9			
75 µm	51.5	3.2	6.7			
PAN	107.7	6.7				
TOTAL:	1618.8					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/20/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/20/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2289 | Lot #:

Contract #: | Material ID: B32 (1.625 Base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	1544.7	Extracted Agg.+ Pan (W_3p):	1821.6
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	1544.7	Pan Tare Mass (P):	351.0
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	1470.6
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	18.7	Total Agg. Mass: (W_3 + W_4)	1476.4
		Final Filter Mass (Ff):	21.5	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	68.3
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	2.8		
Tare Weight of Flask 0.01g	274.957	Ash Correction (W_4a):	3.0	%PG Binder (Pb): ((Wpg/W_1)*100)	4.42
End Weight of Flask 0.01g	277.981	Mineral Matter Mass (W_4): (W_4f + W_4a)	5.8		
Mineral Matter	3.02			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+/- Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm	83.7	5.7	94.3			
12.5 mm	239.0	16.2	78.1			
9.5 mm	196.1	13.3	64.8			
4.75 mm	222.1	15.0	49.8			
2.36 mm	157.1	10.6	39.2			
1.18 mm	117.4	8.0	31.2			
600 µm	107.8	7.3	23.9			
300 µm	123.3	8.4	15.5			
150 µm	94.2	6.4	9.1			
75 µm	45.7	3.1	6.0			
PAN	90.0	6.0				
TOTAL:	1476.4					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/20/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

New England Transportation Technician Certification Program

HMA Asphalt Content and Gradation Test Report (T 110, T 164, T 30)

Date/Time: 10/20/09 | Lab/Location: Belmont, NH

Weather: | Date Rec'd #: 9-Oct | Random Sample: No

Project: Pavement Rehab.Strategies for Ramps | Lab Login #: 99-2290 | Lot #:

Contract #: | Material ID: B-35 (1" Base) | Sublot #:

Contractor: | Material #: | Sample Location:

Pay Item #: | Sample #: | Station:

Source: New Bedford MA Airport | Sample Type: QC | Offset:

Plant Type: | Sampled By/Cert. #:

Moisture Content (T 110)		Asphalt Content of HMA by Extraction Method (T 164)			
Sample Wet Mass (A):		Initial Sample Mass (W_1i):	1059.9	Extracted Agg.+ Pan (W_3p):	1361.3
Sample Dry Mass (B):		Corrected Sample Mass (W_1): (W_1i / (1+(.01*M)))	1059.9	Pan Tare Mass (P):	351.2
Water Mass (C): (A - B)				Extracted Agg. (W_3): (W_3p-P)	1010.1
% Moisture (M): (100*((A-B)/B))	0	Initial Filter Mass (Fi):	19.1	Total Agg. Mass: (W_3 + W_4)	1013.6
		Final Filter Mass (Ff):	21.7	PG Binder Mass (Wpg): (W_1 - (W_3 + W_4))	46.3
Continuous Centrifuge		Fines on Filter (W_4f): (Ff - Fi)	2.6		
Tare Weight of Flask 0.01g	241.531	Ash Correction (W_4a):	0.9	%PG Binder (Pb): ((Wpg/W_1)*100)	4.37
End Weight of Flask 0.01g	242.393	Mineral Matter Mass (W_4): (W_4f + W_4a)	3.5		
Mineral Matter	0.86			PG Binder JMF:	

Mechanical Analysis of Extracted Aggregate (T 30)

Sieve	Mass Retained	Percent Retained	Percent Passing	Job Mix Formula	+/- Tolerance	Variance
37.5 mm			100.0			
25 mm			100.0			
19 mm	24.0	2.4	97.6			
12.5 mm	298.4	29.4	68.2			
9.5 mm	126.8	12.5	55.7			
4.75 mm	106.1	10.5	45.2			
2.36 mm	79.9	7.9	37.3			
1.18 mm	88.2	8.7	28.6			
600 µm	59.8	5.9	22.7			
300 µm	57.0	5.6	17.1			
150 µm	51.8	5.1	12.0			
75 µm	41.9	4.1	7.9			
PAN	79.7	7.9				
TOTAL:	1013.6					

Comments:

☑ Washed Gradation

Tested by: DB Chamberlain | Reviewed by:

Certification #: 559m | Certification #:

Date: 10/20/2009 | Date:

Results Within Specification Limits: ☐ | Results Outside Specification Limits: ☐

APPENDIX F

STORMWATER MANAGEMENT SYSTEM OPERATIONAL AND MAINTENANCE PLAN

NEW BEDFORD REGIONAL AIRPORT
NEW BEDFORD, MASSACHUSETTS

STORMWATER MANAGEMENT SYSTEM
OPERATION AND MAINTENANCE PLAN

City of New Bedford

JANUARY 2020

Prepared For:

City of New Bedford Airport Commission
1569 Airport Road
New Bedford, Massachusetts

Prepared By:

Airport Solutions Group
39 Winn Street
Burlington, Massachusetts
(P) 780.491.0083

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1. Introduction

The airport will be reconstructing their main terminal ramp which will require the replacement of the entire existing drainage system and two outfalls in order to meet DEP stormwater requirements. The new drainage system will incorporate new stormwater BMPs, which were not originally present and will require updating of this O&M plan. This plan was formally created under the reconstruction of Runway 5-23 project (2014), MassDEP Wetland Variance/Order of Conditions (DEP File No. 049 0635) and Stormwater Standard No. 9 of the MassDEP's Stormwater Management Policy.

The airport, and any future responsible parties, shall be accountable for implementing this plan following the completion of the project's construction and the termination of the contractor's interim Storm Water Pollution Prevention Plan (SWPPP) per the National Pollutant Discharge Elimination System (NPDES) General Permit.

2. Purpose and Need

This document prescribes the methods required for the New Bedford Regional Airport to properly maintain the airport-wide stormwater management system. A program of regular stormwater drainage system field reviews and assessments, scheduled maintenance and repairs, as-needed, will be necessary. The program will be conducted by trained airport staff and/or licensed contractors, as required, familiar with the airport facility.

Included in this document is a list of Best Management Practices (BMP's) incorporated into the design of the stormwater management system, a summary of requirements and procedures for reviewing the BMP's, and a drainage system review checklist. It is understood that documentation of routine and non-routine maintenance of the system is not only required by the Massachusetts Stormwater Regulations, but is an important tool for the airport to access future maintenance requirements and improvements.

3. Stormwater Management System Owner

The New Bedford Regional Airport is publicly owned by the City of New Bedford, Massachusetts under the care, custody, and control of the New Bedford Airport Commission. The Airport Commission currently appoints a full time Airport Manager who is responsible for the management and operation of the airport.

New Bedford Regional Airport Commission
1569 Airport Road
New Bedford, MA 02746
Phone: 508.991.6161

Airport Manager
New Bedford Regional Airport
1569 Airport Road
New Bedford, MA 02746

4. Parties Responsible for Operation and Maintenance

The New Bedford Regional Airport is under the direct authority of the airport manager and the policies of the New Bedford Regional Airport Commission, for the maintenance of the airport and the airport's stormwater management systems. Therefore, the responsible party of this O & M Plan will be referred to collectively as the Airport.

The Airport keeps on file record plans of the Airport's stormwater management system, O & M plans developed during previous improvement projects, routine drainage system, review and maintenance reports, and the facilities Stormwater Pollution Prevention Plan per the EPA NPDES Multi-Sector General Permit.

In the event that the New Bedford Regional Airport was to change ownership, the above mentioned stormwater management system documentation and EPA NPDES Multi-Sector SWPPP would remain on file at the Airport.

This O & M plan shall be located in the Airport Manager's office. The O&M Plan located in the Airport Manager's office shall be the O&M plan of record and shall be maintained up-to-date at all times. Any changes to the stormwater system, runways, taxiways, or any stormwater BMP's shall be recorded in this O&M plan and all drawings or exhibits shall be updated to reflect said changes.

5. Routine and Non-Routine Maintenance Tasks

The New Bedford Regional Airport's stormwater management system has been designed to comply with the Massachusetts Stormwater Management Standards that were incorporated into the Wetlands Protection Act Regulations on January 2, 2008 (see 310 CMR 10.05(6)(k)). To ensure the proposed stormwater management systems are functioning adequately, routine and non-routine maintenance, system reviews, and preventative measures are necessary. The system utilizes Best Management Practices (BMP) source controls including the following:

1. Vegetative Filter Strips
   Description: Grassed Area
   Location: Adjacent pavement edges throughout the airport.
   Purpose: Pre-treat stormwater run-off from asphalt surfaces prior to discharging to catch basins or infiltration trenches.
   Review: At least once a year (every six months during first year) the edge of pavement and toe-of-slope shall be checked for sediment build up and vegetation reviewed for signs of erosion and bare spots.
   Maintenance: Mowing to occur on routine basis. Sediment, debris and trash removal from edge of pavement and reseeded as necessary to fill in bare spots.

2. Drainage Channels
   Description: Grass Channels
   Location: Various locations throughout the airport property.
   Purpose: To provide for non-erosive conveyance of stormwater to inlets, infiltration trenches and other bodies of water.
   Review: At least twice per year review channels for adequate vegetation growth, rilling or gullying.
   Maintenance: Mowing to occur on routine basis. Sediment, debris and trash removal shall occur at least once per year or as necessary. Repair of any erosion and reseeding shall occur as necessary.

3. Grassed Channels
   Description: Grass Channels
   Location: Along airport gravel access roads.
   Purpose: To provide for pre-treatment for and conveyance of stormwater to inlets, infiltration trenches, sediment forebays, and other bodies of water

Review: At least once per year review channels for adequate vegetation growth, rilling or gullying.
Maintenance: Mowing to occur once a month during growing season. Sediment, debris and trash removal shall occur at least once per year or as necessary. Repair of any erosion and reseeding shall occur as necessary, but no less than once a year.

4. Catch Basin (Deep Sump Hooded)
Description: Underground Retention Basins.
Location: Various locations throughout the airport property.
Purpose: Designed to remove trash debris and coarse sediment from stormwater runoff. Also serve as temporary spill containment devices for oils and grease.
Review: At least four times per year, and at the end of foliage and snow-removal seasons, review structures for sedimentation, debris build-up, floatables and structural damage.
Maintenance: Remove sediment debris at least four times per year or whenever depth of deposits is greater than or equal to one half the depth from the bottom of the sump to the invert of the lowest pipe in the basin. Remove trash and floatables as required. Replace structure as necessary.

5. Infiltration Trenches
Description: Shallow Excavations Filled with Stone.
Location: At the toe of slope of vegetative filter strips, typically at the edge of Runway and Taxiway Safety Areas.
Purpose: The stone provides underground storage for stormwater runoff which gradually exfiltrates through the bottom and/or sides of the trench into the subsoil and eventually into the water table.
Review: At least two times per year review for sedimentation, debris, trash and grass clippings within trench. Check pre-treatment BMP's as required, to maximize infiltration trench useable lifetime.
Maintenance: At least two times per year remove sedimentation, debris, trash and grass clipping from trench and pretreatment BMP's. Rehabilitate the trench when required.

6. Proprietary Separator
Description: Stormwater Treatment Units.
Location: Adjacent to Aircraft Aprons or Hangars and other areas of the airport.
Purpose: Removes heavy particulates, floating debris and hydrocarbons from stormwater.
Review: At least once a month (and after every major storm) review for sediments and debris.
Maintenance: At least twice per year, by qualified personnel, the unit shall be cleaned of oil, grease and sediments using a specialized vacuum truck.

7. Infiltration Basin
Description: Stormwater runoff impoundment constructed over permeable soils.
Location: Adjacent to the Colonial Hangar.
Purpose: Stormwater runoff is stored until it exfiltrates through the soil of the basin floor, typically within 72 hours.
Review: At least twice per year review for sediments and debris. Review pre-treatment BMP's, as specified, to reduce maintenance for basin.
Maintenance: At least twice per year mow buffer area, side slopes and basin bottom (if grass) or rake (if stone bottom). Remove grass clippings, accumulated organic matter, trash and debris and eradicate any invasive plant species. Note: Remove sediment from basin as necessary, but

wait until basin floor is dry. Use light equipment to remove the top layer so as not to compact the underlying soil.

8. Leaching Catch Basin
   Description: Pre-cast concrete structure with an open bottom.
   Location: Throughout existing airport.
   Purpose: To permit runoff to infiltrate into the ground.
   Review: At once per year, and at the end of foliage and snow-removal seasons, review structures for sedimentation, debris build-up, floatables, grass clippings and structural damage.
   Maintenance: Remove sediment debris at once per year, 50% full or whenever deposits impact exfiltration. Replace structure as necessary.

9. Outlet Erosion Control Protection
   Description: Devices that controls the flow of stormwater from an outlet device (i.e. Rip-Rap)
   Location: Downstream of headwalls or any outlet.
   Purpose: To dissipate energy from stormwater runoff to control erosion as it enters streams and wetland areas.
   Review: At least two times per year review for erosion sedimentation, vegetation debris, trash and grass clippings. Review pre-treatment BMP's to reduce maintenance.
   Maintenance: At least two times per year remove sedimentation, debris, trash and grass clipping from outlet erosion control device and pretreatment BMP's.

10. Check Dams
    Description: A small earthen or stone dam constructed across a drainage ditch, swale or channel.
    Location: Various locations throughout the airport property.
    Purpose: To lower the velocity of flow to reduce erosion and gullying in a channel and allow sediments to settle out.
    Review: After every significant rainfall event review the check dams.
    Maintenance: Repair damage and remove sediment as necessary.

11. Catch Basin Inlet Controls (Temporary during construction)
    Description: Filter media insert that fits into a catch basin opening.
    Location: Currently none at the airport.
    Purpose: To remove a range of pollutants including debris, trash, fine sediments, oil/grease and metals depending on type of filter media.
    Review: Per manufacturer's schedule, review inserts for effectiveness and structural integrity. Must be OSHA certified to enter the structure.
    Maintenance: Per manufacturer's requirements, replace inserts as necessary or when ineffective.

12. Drain Manholes
    Description: Underground chambers with access from surface.
    Location: Various locations throughout the airport property.
    Purpose: Used for pipe connections, flow diversions and review access.
    Review: At least four times per year, and at the end of foliage and snow-removal seasons, review structures for sedimentation, debris build-up, floatables and structural damage. Must be OSHA certified to enter the structure.
    Maintenance: Remove sediment debris at least four times per year or whenever depth of deposits is greater than or equal to one half the depth from the bottom of the sump to the invert

of the lowest pipe in the basin. Remove trash and floatables as required. Replace structure as necessary.

13. Drainage Pipe
Description: Hollow cylindrical conduit of varying material such as steel, concrete, plastic and clay.
Location: Throughout stormwater system, typically between catch basins, manholes and outfalls.
Purpose: To convey stormwater throughout the system.
Review: At least four times per year, and at the end of foliage and snow-removal seasons, review pipes for sedimentation, debris build-up, floatables and structural damage.
Maintenance: Remove sediment debris at least four times per year or whenever depth of deposits is impeding stormwater conveyance. Remove trash and floatables as required. Replace pipe as necessary if structural failure is apparent.

14. Culverts
Description: A covered channel that crosses under a roadway or other paved airport surface.
Location: Throughout the airport property.
Purpose: To convey stormwater under a roadway crossing.
Review: At least four times per year review structures for sedimentation, debris build-up, floatables and structural damage.
Maintenance: Remove sediment debris at least four times per year or as required. Replace structure as necessary.

Table 1 includes a summary all BMP's associated with the Airport's stormwater management system and routine and non-routine maintenance required:

Table 1 – Operation and Maintenance Requirements

BMP	Approx. Quantity	Maintenance Required	Frequency
Vegetative Filter Strips	*TBD* LF	Review edge of pavement and toe-of-slope for sediment build up. Review vegetation for signs of erosion, bare spots and overall health.	**1 Time/Year**; Every six months during first year.
		Mowing	**As Needed**
		Remove sediment from the tow of slope or edge of pavement. Reseed bare spots.	**As Needed**
Drainage Channels	*TBD* LF	Review Channels to ensure adequate vegetation growth and no rilling or gullying. Repair rills, gullies and dead vegetation.	**2 Times/Year**; and first few months after construction.
		Mowing	**As Necessary**; Grass height shall not exceed 6 inches.
		Manually remove sediment and debris	**1 Time/Year** (Minimum)
		Reseed	**As necessary**; Deicing will necessitate yearly reseeding in the spring.
Grassed Channels	*TBD* LF	Review Channels to ensure adequate vegetation growth and no rilling or gullying. Repair rills, gullies and dead vegetation.	**1 Time/Year** (Minimum)
		Mowing	**Once a month during growing season**
		Manually remove sediment and debris	**1 Time/Year** (Minimum)
		Reseed	**As necessary**; Deicing will necessitate yearly reseeding in the spring.
Catch Basins (deep sump hooded)	*TBD* EA	Review Units	**4 Times/Year**; And at the end of foliage and snow-removal seasons.
		Clean Units	**4 Times/Year**; Or whenever depth of deposits is greater than or equal to one half the depth from the bottom of the sump to the invert of the lowest pipe in the basin.
Infiltration Trench	*TBD* LF	Review units and remove debris.	**2 Times/Year; and after every major storm**
		Remove sediment from pretreatment BMP's	**2 Times/Year; and after every major storm**

BMP	Approx. Quantity	Maintenance Required	Frequency
Proprietary Separator	3 EA	Review Units	**1 Time/Month**; and after every major storm
		Clean Units	**2 Times/Year**
Infiltration Basins	2 EA	Preventative Maintenance	**2 Times/Year**
		Review to ensure proper functioning	**2 Times/Year**; After every major storm for first 3 months of operation; after discharges through high outlet orifice.
		Mow the buffer area, side slopes, and basin bottom if grass; Rake if stone bottom	**2 Times/Year**
Infiltration Basin (Cont'd)	1 EA	Remove trash, debris, grass clippings and accumulated organic matter from unit	**2 Times/Year**
		Review and clean pretreatment devices	**2 Times/Year (Minimum)**; Every Two Months (Recommended); After Every Major Storm.
Leaching Catch Basin	2 EA	Review Units	**1 Time/Year**; And at the end of foliage and snow-removal seasons.
		Clean Units	**1 Times/Year;** 50% Full; As required
Outlet Erosion Control	N/A	Review and clean sedimentation, debris, trash and **grass clippings**. Review pre-treatment BMP's.	**2 Times/Year**
Check Dams	N/A	Review and repair or remove sediment.	**Following significant rainfall**
Catch Basin Inlet Controls	All CB's	Review and Replace per manufacturer's requirements	**Per Manufacturer**
Drain Manhole	*TBD* EA	Review Units	**2 Times/Year**
		Clean Units	**As Required**
Drainage Pipe	*TBD* LF	Review Pipes	**2 Times/Year**
		Clean/Repair Pipes	**As Required**
Open Box Culvert	4 EA	Review Structure	**2 Times/Year**
		Clean/Repair	**As Required**
Invasive Species Removal		Review for the presence of invasive species.	**1 Time/Year**
		Mechanical removal preferred (i.e., hand tools); apply herbicides as necessary.	**As Required**

For reference, MassDEP Specifications from the Stormwater Management Standards have been included in **Appendix B** for all BMP's associated with the Airport's stormwater system.

6. Plan of Stormwater BMP's

Maps of the New Bedford Regional Airport's existing stormwater management system can be found in earlier versions of this Plan. Existing and Proposed Drainage Plans for the current project can be found in the Stormwater Management Report.

7. Public Safety Features

The proposed stormwater management system will mostly be constructed entirely within the Airport's restricted and fenced-in areas. These areas are controlled by the Airport and are closed to public access. There are a couple of areas which the drainage work is in public areas (road crossing; parking lot). Public safety measures (traffic control devices; barricades; traffic barrels, etc.) will be implemented to keep the public safe during construction.

The proposed systems have been, and will be designed to manage any changes in the existing rate of runoff due to airport improvements. System designs to control increases in runoff include infiltration trenches and basins that will be designed to infiltrate stormwater runoff quickly to prevent water retention and eliminate the migration of wildlife such as water fowl and the infestation of insects.

8. Estimated Operations and Maintenance Budget

The City of New Bedford owns and operates the Airport through the New Bedford Airport Commission. The Airport has a maintenance staff of municipal employees who are responsible for the maintenance of the Airport's facilities. The additional cost associated with reviewing and maintaining proposed Gravel Access Road drainage improvements would not add any significant burden onto the current maintenance budget for the entire Airport facility.

9. O & M Compliance Statement

The Airport shall report compliance with the following statements during all drainage system reviews and maintenance activities:

The site has been reviewed for erosion and appropriate steps have been taken to permanently stabilize any eroded areas;

1. All aspects of the stormwater BMP's have been reviewed for damage, wear and malfunction, and appropriate steps have been taken to repair or replace the system or portions of the system so that the stormwater at the site may be managed in accordance with the Stormwater Management Standards;
2. Future responsible parties must be notified of their continuing legal responsibility to operate and maintain the structure; and
3. The Operation and Maintenance Plan for the stormwater BMP's is being implemented.

10. Maintenance Log Book

All stormwater BMP's shall be operated and maintained in accordance with the design plans and this O&M Plan. The Airport will report on all drainage system reviews, repairs, replacement, and disposal (for disposal, the log shall indicate the type of material and the disposal location) activities. These reports will be kept on file for a minimum of three (3) years and will be made available to the MassDEP and the City of New Bedford Conservation Commission upon request. In addition, the Airport will escort

members of the MassDEP and the City of New Bedford Conservation Commission onto the Airport premises to review, evaluate, and ensure compliance with this O&M Plan during regular business hours. A 24-hour advanced notice is requested to ensure proper escort is available and to prevent interference with airport operations.

An example copy of the drainage system review report for use by Airport Maintenance Staff is included in **Appendix C**.

11. Snow Removal

Snow shall not be plowed, deposited, or dumped into any Wetland Resource Area or buffer zone. Snow shall not be plowed, deposited, or dumped into stormwater management structures including infiltration trenches. Snow removal shall be directed away from these areas to the extent practicable.

Excess snow shall be stored in prescribed areas. Prescribed snow storage areas include:

a.) infield areas between taxiways and runways a minimum of 50' from infiltration trenches,
b.) east of Taxiway "B" south of Runway 32,
c.) west of the Bridgewater State apron, and
d.) west of the T-hangar adjacent to the west end of Taxiway "B".

Winter conditions and rates of accumulations of precipitation vary widely. Wind speed and direction, available equipment, and conditions may require special equipment and techniques collectively for snow storage. Snow shall be positioned off the movement area surfaces so all airplane propellers, engine pods, rotors, and wing tips will clear any snowdrift and snow bank as the airplane's landing gear traverses any portion of the movement area.

Snow storage sites shall not compromise airplane operations, airport NAVAIDS, airport traffic, and ATCT operations such as ATCT line-of-sight requirements.

Depending on the amount of snow cleared and the size of the ramp, ramp signage directing pilots toward the runway could become obscured (covered with snow), and the resulting height of snow stockpiles could cause clearance issues between taxiing airplanes and the snow stockpile. Snow banks piled adjacent to paved Aircraft Operating Areas shall be in accordance with the FAA AC 150/5200-30D Airport Field Condition Assessments and Winter Operations Safety.

12. Pollution Prevention

A stormwater pollution prevention plan (SWPPP) was previously developed for the New Bedford Regional Airport. This SWPPP contains helpful information regarding pollution prevention, spill containment, and maintenance procedures to be enacted to limit the pollution potential from the Airport.

Operators and Maintenance Staff shall thoroughly read, understand, and enact all procedures as indicated in the SWPPP. Operators and Staff shall pay special attention to Section 3 – Stormwater Control Measures. The SWPPP shall be kept and maintained in the Airport Manager's office. Any questions regarding the SWPPP shall be directed to the Airport Manager, or his/her designate.

Appendix A

Stormwater Management System Diagram



TERMINAL BUILDING INSET

SCALE: 1"=100'

RW23 INSET

SCALE: 1"=200'

COMMONWEALTH OF MASSACHUSETTS
CRAIG A. REHUSTER
CIVIL
No. 52305
REGISTERED PROFESSIONAL ENGINEER

ASG
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NO.	DATE	DESCRIPTION	BY

PROJECT

RECONSTRUCT TERMINAL APRONS
PHASES 1, 2, AND 3
DESIGN ONLY

OWNER

NEW BEDFORD AIRPORT COMMISSION
NEW BEDFORD REGIONAL AIRPORT
1569 AIRPORT ROAD, NEW BEDFORD, MA 02746

PROJECT NO.	103-046
DESIGNED BY	TAV
DRAWN BY	TAV
CHECKED BY	SJR
DATE	January 2020
DRAWING SCALE	1" = 200'

SHEET TITLE

DRAINAGE SYSTEM DIAGRAM

GRAPHIC SCALE
0 100' 200' 400'

DRAWING NO.

FIG. 1

1 OF 1

PRELIMINARY - NOT FOR CONSTRUCTION

Appendix B

BMP Specifications

Vegetated Filter Strips



Description: Vegetated filter strips, also known as filter strips, grass buffer strips and grass filters, are uniformly graded vegetated surfaces (i.e., grass or close-growing native vegetation) that receive runoff from adjacent impervious areas. Vegetated filter strips typically treat sheet flow or small concentrated flows that can be distributed along the width of the strip using a level spreader. Vegetated filter strips are designed to slow runoff velocities, trap sediment, and promote infiltration, thereby reducing runoff volumes.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	Provides some peak flow attenuation but usually not enough to achieve compliance with Standard 2
3 - Recharge	No recharge credit
4 - TSS Removal	If greater than or equal to 25' and less than 50' wide, 10% TSS removal. If greater than or equal to 50' wide, 45% TSS removal.
5 - Higher Pollutant Loading	May be used as part of a pretreatment train if lined
6 - Discharges near or to Critical Areas	May be used as part of a pretreatment train if lined. May be used near cold-water fisheries.
7 - Redevelopment	Suitable for pretreatment or as a stand-alone practice if sufficient land is available.

Advantages/Benefits:

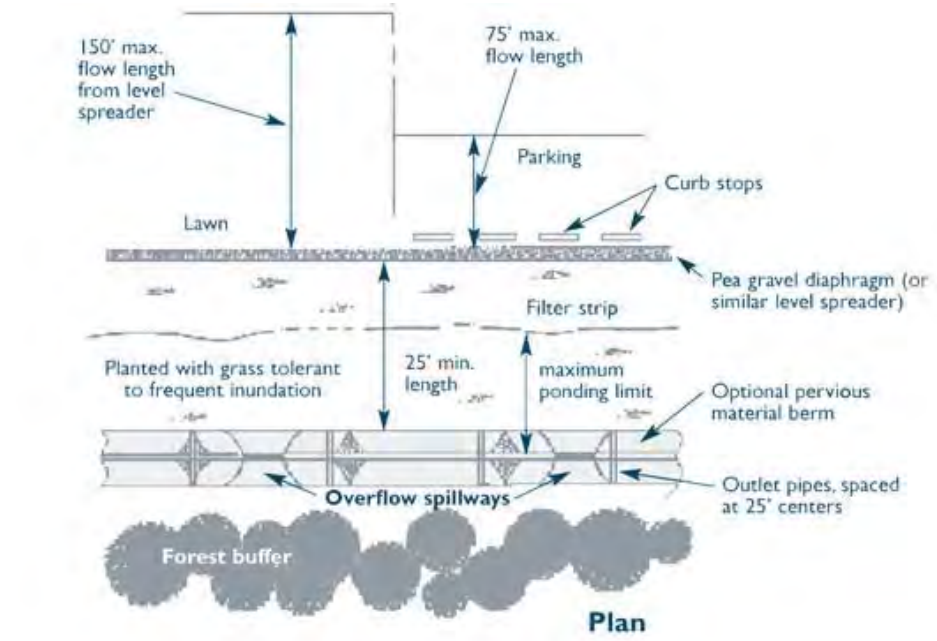
- Reduces runoff volumes and peak flows.
- Slows runoff velocities and removes sediment.
- Low maintenance requirements.
- Serves as an effective pretreatment for bioretention cells
- Can mimic natural hydrology
- Small filter strips may be used in certain urban settings.
- Ideal for residential settings and to treat runoff from small parking lots and roads.
- Can be used as part of runoff conveyance system in combination with other BMPs
- Little or no entrapment hazard for amphibians or other small creatures

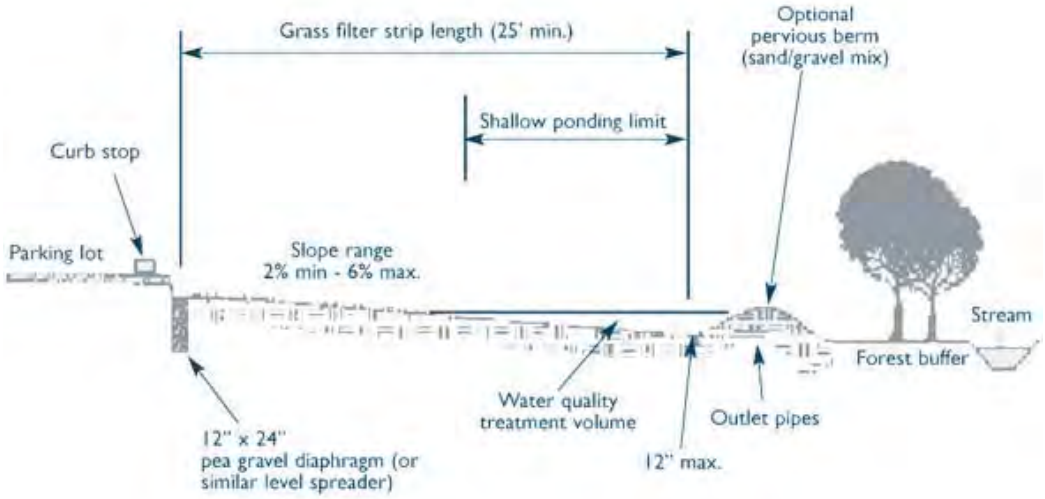
Disadvantages/Limitations:

- Variability in removal efficiencies, depending on design
- Little or no treatment is provided if the filter strip is short-circuited by concentrated flows.
- Often a poor retrofit option due to large land requirements.
- Effective only on drainage areas with gentle slopes (less than 6 percent).
- Improper grading can greatly diminish pollutant removal.

Pollutant Removal Efficiencies

• TSS (if filter strip is 25 feet wide)	10% assumed (Regulatory)
• TSS (if filter strip is 50 feet wide)	45% assumed (Regulatory)
• Nutrients (Nitrogen, phosphorus)	Insufficient data
• Metals (copper, lead, zinc, cadmium)	Insufficient data
• Pathogens (coliform, e coli)	Insufficient data





adapted from the "Design of Stormwater Systems" 1996

Maintenance

Activity	Frequency
Inspect the level spreader for sediment buildup and the vegetation for signs of erosion, bare spots, and overall health.	Every six months during the first year. Annually thereafter.
Regularly mow the grass.	As needed
Remove sediment from the toe of slope or level spreader and reseed bare spots.	As needed

Special Features

Include an impermeable liner and underdrain for discharges from Land Use with Higher Potential Pollutant Loads and for discharges within Zone IIs and Interim Wellhead Protection Areas; for discharges near or to other critical areas or in soils with rapid infiltration rates greater than 2.4 inches per hour.

Vegetated Filter Strips

Applicability
Vegetated filter strips are used to pretreat sheet flow from roads, highways, and small parking lots. In residential settings, they are useful in pretreating sheet flow from driveways. They provide effective pretreatment, especially when combined with bioretention areas and stream buffers. Urban areas can sometimes accommodate small filter strips depending on available land area, making them potential retrofit options in certain urban settings. Vegetated filter strips can also be used as side slopes of grass channels or water quality swales to enhance infiltration and remove sediment.

Effectiveness
Variable TSS removal efficiencies have been reported for filter strips, depending on the size of the contributing drainage area, the width of the filter strip, the underlying parent soil, the land slope, the type of vegetation, how well the vegetation is established, and maintenance practices. Vegetated filter strips may remove nutrients and metals depending on the length and slope of the filter, soil permeability, size and characteristics of the drainage area, type of vegetative cover, and runoff velocity.

Planning Considerations
Vegetated filter strips may be used as a stand-alone practice for redevelopments, only where other practices are not feasible. Vegetated filter strips can be designed to fit within the open space and rights of way that are available along roads and highways. Do not design vegetated filter strips to accept runoff from land uses with higher potential pollutant loads (LUHHPL) without a liner. Vegetated filter strips function best for drainage areas of one acre or less with gentle slopes.

Design
Do not locate vegetated filter strips in soils with high clay content that have limited infiltration or in soils that cannot sustain grass cover.

The filter strip cannot extend more than 50 feet into a Buffer Zone to a wetland resource area.

The contributing drainage area to a vegetated filter strip is limited to one acre of less.

Design vegetated filter strips with slopes between 2 and 6 percent. Steeper slopes tend to create concentrated flows. Flatter slopes can cause ponding and create mosquito-breeding habitat.

Design the top and toe of the slope to be as flat as possible. Use a level spreader at the top of the slope to evenly distribute overland flows or concentrated runoff across the entire length of the filter strip. Many variations of level spreader designs may be used including level trenches, curbing and concrete weirs. The key to any level spreader design is creating a continuous overflow elevation along the entire width of the filter strip.

Velocity dissipation (e.g. by using riprap) may be required for concentrated flows.

Design the filter strip to drain within 24 hours after a storm. The design flow depth must not exceed 0.5 inches.

To recieve TSS removal credit, make the filter strip at least 25 feet long and generally as wide as the area draining to the strip. To prevent high-velocity concentrated flows, the length of the flow path must be limited to 75 feet if the filter strip handles runoff from impervious surfaces, and 150 feet if the filter strip handles runoff from pervious surfaces. The minimum width of the filter strip must be 20% of the length of the flow path or 8 feet, whichever is greater.

To prevent groundwater contamination, the filter strip must be constructed at least 2 feet above seasonal high groundwater and 2 to 4 feet above bedrock.

The filter strip must be planted with grasses that are relatively salt-tolerant. Select grasses to withstand high flow velocities under wet weather conditions.

A vegetated filter strip may be used as a qualifying pervious area for purposes of the LID Site Design Credits for disconnecting rooftop and nonroof top runoff.

Construction
Proper grading is essential to establish sheet flow from the level spreader and throughout the filter strip.

Implement soil stabilization measures until permanent vegetation is established.

Protect the area to be used for the filter strip by using upstream sediment traps.

Use as much of the existing topsoil on the site as possible to enhance plant growth.

Maintenance

Regular maintenance is critical for filter strips to be effective and to ensure that flow does not short-circuit the system. Conduct semi-annual inspections during the first year (and annually thereafter). Inspect the level spreader for sediment buildup and the vegetation for signs of erosion, bare spots, and overall health. Regular, frequent mowing of the grass is required. Remove sediment from the toe of slope or level spreader, and reseed bare spots as necessary. Periodically, remove sediment that accumulates near the top of the strip to maintain the appropriate slope and prevent formation of a "berm" that could impede the distribution of runoff as sheet flow.

When the filter strip is located in the buffer zone to a wetland resource area, the operation and maintenance plan must include strict measures to ensure that maintenance operations do not alter the wetland resource areas. Please note, filter strips are restricted to the outer 50 feet of the buffer zone.

Cold Climate Considerations

In cold climates such as Massachusetts, the depth of soil media that serves as the planting bed must extend below the frost line to minimize the effects of freezing. Avoid using peat and compost media, which retain water and freeze during the winter, and become impermeable and ineffective.

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Drainage Channels



Description: Drainage channels are traditional vegetated open channels that are designed to provide for non-erosive conveyance. They receive no infiltration or TSS removal credit (Standards 3 and 4).

Ability to meet specific standards

Standard	Description
2 - Peak Flow	Provides no peak flow attenuation
3 - Recharge	Provides negligible groundwater recharge.
4 - TSS Removal	0% TSS removal credit.
5 - Higher Pollutant Loading	Use as conveyance.
6 - Discharges near or to Critical Areas	May be used to achieve temperature reduction for runoff discharging to cold-water fisheries.
7 - Redevelopment	Limited applicability

Advantages/Benefits:

- Conveys stormwater
- Generally less expensive than curb and gutter systems.
- Accents natural landscape.
- Compatible with LID design practices
- Roadside channels reduce driving hazards by keeping stormwater flows away from street surfaces during storms

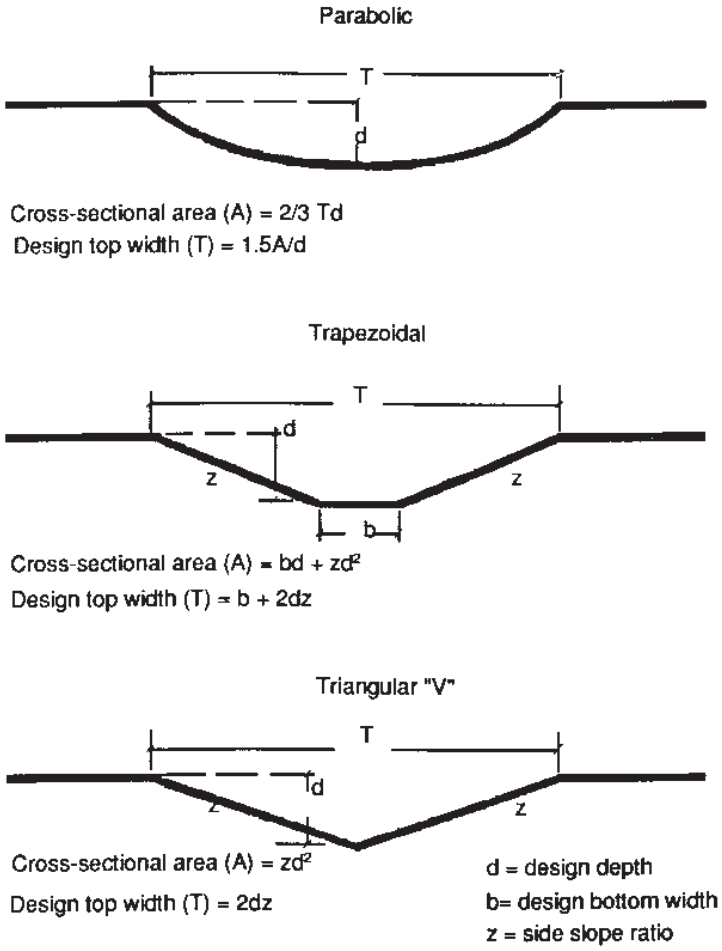
Disadvantages/Limitations:

- Higher degree of maintenance required than for curb and gutter systems.
- Roadside channels are subject to damage from off-street parking and snow removal.
- Provides limited pollutant removal compared to water quality swales
- May be impractical in areas with flat grades, steep topography or poorly drained soils
- Large area requirements for highly impervious sites.

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS) - 0%
- Nutrients (Nitrogen, phosphorus) - Insufficient data
- Metals (copper, lead, zinc, cadmium) - Insufficient data
- Pathogens (coliform, e coli) - Insufficient data

Figure DC 1



adapted from the University of New Hampshire

Maintenance

Activity	Frequency
Inspect channels to make sure vegetation is adequate and for signs of rilling and gullying. Repair any rills or gullies. Replace dead vegetation.	The first few months after construction and twice a year thereafter.
Mow	As necessary. Grass height shall not exceed 6 inches.
Remove sediment and debris manually	At least once a year
Reseed	As necessary. Use of road salt or other deicers during the winter will necessitate yearly reseeding in the spring.

Special Features

Drainage channels cannot be used to meet the Stormwater Management Standards. They are a component of a larger stormwater management system and serve to convey runoff from impervious surfaces to or from stormwater treatment BMPs.

Drainage Channels

Drainage Channels versus Water Quality Swales

The distinction between drainage channels and water quality swales lies in the design and planned use of the open channel conveyance. Drainage channels are designed to have sufficient capacity to convey runoff safely during large storm events without causing erosion. Drainage channels typically have a cross-section with sufficient hydraulic capacity to handle the peak discharge for the 10-year storm. The dimensions (slope and bottom width) of a drainage channel must not exceed a critical erosive velocity during the peak discharge. They must be vegetated with grasses to maintain bank and slope integrity. Other than basic channel size and geometry, there are no other design modifications to enhance pollutant removal capabilities. Therefore, pollutant removal efficiency is typically low for drainage channels.

Water quality swales and grass channels, on the other hand, are designed for the required water quality volume and incorporate specific features to enhance their stormwater pollutant removal effectiveness. Pollutant removal rates are significantly higher for water quality swales and grass channels. A water quality swale or grass channel must be used in place of the drainage channel when a water quality treatment credit is sought.

Applicability

Drainage channels are suitable for residential and institutional areas of low to moderate density. The percentage of impervious cover in the contributing areas must be relatively small. Drainage channels can also be used in parking lots to break up areas of impervious cover.

Along the edge of roadways, drainage channels can be used in place of curb and gutter systems. However, the effectiveness of drainage channels may decrease as the number of driveway culverts increases. They are also generally not compatible with extensive sidewalk systems. When using drainage channels in combination with roadways and sidewalks, it is most appropriate to place the channel between the two impervious covers (e.g., between the sidewalk and roadway).

The topography of the site should allow for the design of a drainage channel with sufficient slope and cross-sectional area to maintain non-erosive flow velocities. The longitudinal slope of the swale should be as close to zero as possible and not greater than 5%.

Planning Considerations

The two primary considerations when designing a drainage channel are maximizing channel capacity and minimizing erosion. Use the maximum expected retardance when checking drainage channel capacity. Usually the greatest flow retardance occurs when vegetation is at its maximum growth for the year. This usually occurs during the early growing season and dormant periods.

Other factors to be considered when planning for the drainage channel are land availability, maintenance requirements and soil characteristics. The topography of the site should allow for the design of a drainage channel with sufficient slope and cross-sectional area to maintain a non-erosive flow velocity, generally less than five feet per second.

The shape of the cross-sectional channel is also an important planning consideration. Figure DC 1 shows three different design shapes. The V-shaped or triangular cross-section can result in higher velocities than other shapes, especially when combined with steeper side slopes, so use this design only if the quantity of flow is relatively small. The parabolic cross-section results in a wide shallow channel that is suited to handling larger flows and blends in well with natural settings. Use trapezoidal channels when deeper channels are needed to carry larger flows and conditions require relatively high velocities. Select a grass type for the channel lining that is appropriate for site conditions, including one that is able to resist shear from the design flow, is shade tolerant, is drainage tolerant, and has low maintenance requirements. Use vegetation that is water tolerant and has a dense root system. Alternatively, the drainage channel may be lined with stone.

Design

See the following for complete design references: Site Planning for Urban Stream Protection. 1995. Schueler. Center for Watershed Protection.

The length of the drainage channel depends on the slope, contributing impervious surface area, and runoff volume. Because drainage channels with low velocities can act as sediment traps, add extra capacity to address sediment accumulation without reducing design capacity. Add an extra 0.3 to 0.5

feet of freeboard depth, if sediment accumulation is expected. Use side slopes of 3:1 or flatter to prevent side slope erosion. Make the longitudinal slope of the channel as flat as possible and not greater than 5%.

Install check dams in drainage channels when necessary to achieve velocities of 5 feet per second or less. Do not use earthen check dams because they tend to erode on the downstream side, and it is difficult to establish and maintain grass on the dams. The maximum ponding time behind the check dam should not exceed 24 hours. Use outlet protection at discharge points from a drainage channel to prevent scour at the outlet.

The design for the drainage channel must include access for maintenance. When located along a highway, provide a breakdown lane with a width of 15 feet. When located along a street, off-street parking can be doubled up as the access, provided signs are posted indicating no parking is allowed during maintenance periods. When locating drainage channels adjacent to pervious surfaces, include a 15-foot wide grass strip to provide access for maintenance trucks.

Construction

Use temporary erosion and sediment controls during construction. Soil amendments, such as aged compost that contains no biosolids, may be needed to encourage vegetation growth. Select a vegetation mix that suits the characteristics of the site. Seeding will require mulching with appropriate materials, such as mulch matting, straw, wood chips, other natural blankets, or synthetic blankets. Anchor blanket immediately after seeding. Provide new seedlings with adequate water until they are well established. Refer to the "Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas: A Guide for Planners, Designers, and Municipal Officials" for information regarding seeding, mulching, and use of blankets.

Maintenance

The maintenance and inspection schedule should take into consideration the effectiveness of the drainage channel. Inspect drainage channels the first few months after construction to make sure that there is no rilling or gullying, and that vegetation in the channels is adequate. Thereafter, inspect the channel twice a year for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding, and sediment accumulation.

Regular maintenance tasks include mowing, fertilizing, liming, watering, pruning, weeding, and pest control. Mow channels at least once per year. Do not cut the grass shorter than three to four inches. Keep grass height under 6 inches to maintain the design depth necessary to serve as a conveyance. Do not mow excessively, because it may increase the design flow velocity.

Remove sediment and debris manually at least once per year. Re-seed periodically to maintain the dense growth of grass vegetation. Take care to protect drainage channels from snow removal procedures and off-street parking. When drainage channels are located on private residential property, the operation and maintenance plan must clearly specify the private property owner who is responsible for carrying out the required maintenance. If the operation and maintenance plan calls for maintenance of drainage channels on private properties to be performed by a public entity or an association (e.g. homeowners association), maintenance easements must be obtained.

Grassed Channel (Biofilter Swale)



Description: Grassed Channels (formerly known as Biofilter swales) are treatment systems with a longer hydraulic residence time than drainage channels. The removal mechanisms are sedimentation and gravity separation, rather than filtration. To receive TSS credit, a sediment forebay or equivalent must be provided for pretreatment. Note that the sediment forebay does not receive a separate TSS removal credit.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	N/A
3 - Recharge	No infiltration credit
4 - TSS Removal	50% TSS with adequate pretreatment
5 - Higher Pollutant Loading	N/A
6 - Discharges near or to Critical Areas	Not suitable for vernal pools or bathing beaches. At other critical areas, may be used as a pretreatment device.
7 - Redevelopment	Typically not suited for retrofits.

Advantages/Benefits:

- Provides pretreatment if used as the first part of a treatment train.
- Open drainage system aids maintenance
- Accepts sheet or pipe flow
- Compatible with LID design measures.
- Little or no entrapment hazard for amphibians or other small animals

Disadvantages/Limitations:

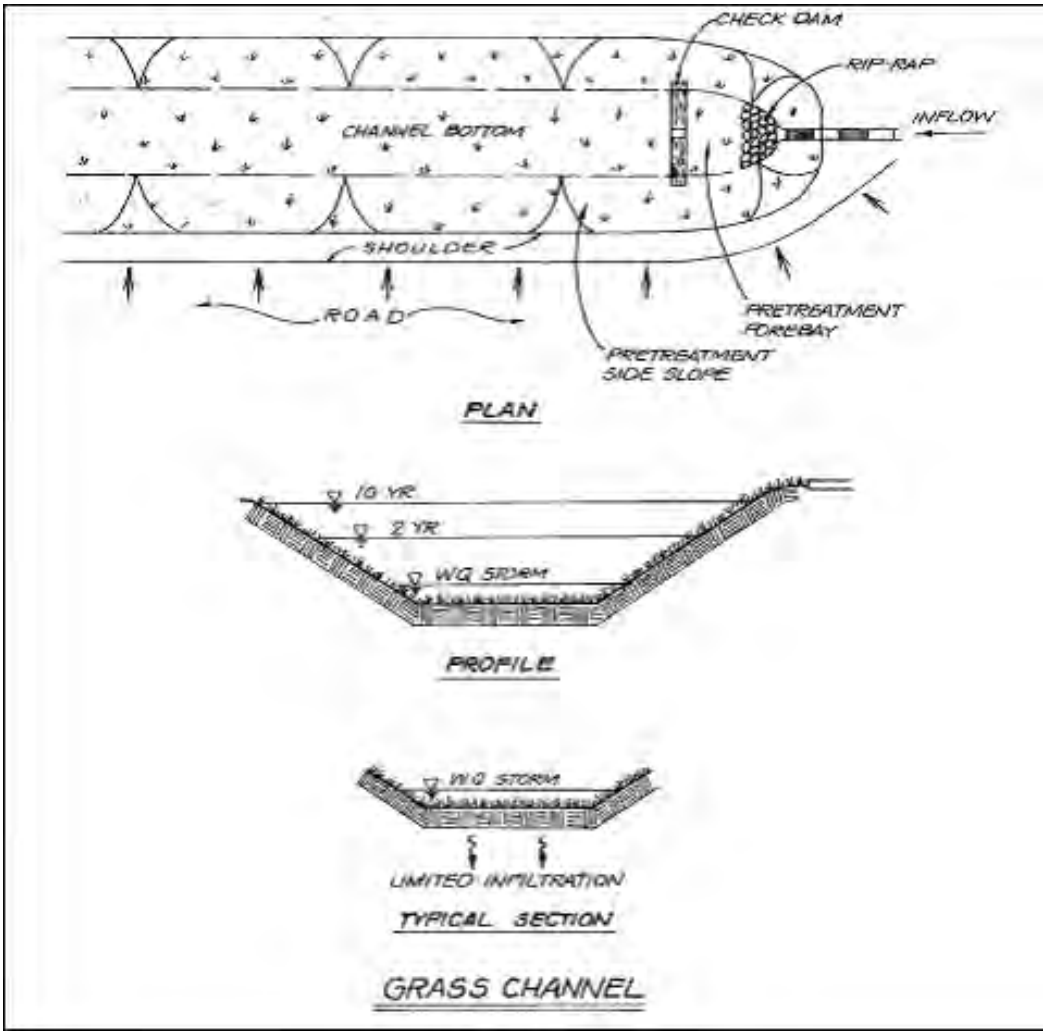
- Short retention time does not allow for full gravity separation·
- Limited biofiltration provided by grass lining.· Cannot alone achieve 80% TSS removal
- Must be designed carefully to achieve low flow rates for Water Quality Volume purposes (<1.0 fps)
- Mosquito control considerations

Pollutant Removal Efficiencies

• Total Suspended Solids (TSS)	50%[1] for Regulatory Purposes (47%)[2]
• Total phosphorus (TP)	-121%[2]
• Total Nitrogen	Insufficient Data
• Metals (copper, lead, zinc, cadmium)	Insufficient Data
• Pathogens (coliform, e. coli)	Insufficient Data

[1] Atlanta Regional Commission et al, 2001, Georgia Stormwater Manual, Volume 2, Section 3-3-2, http://georgiastormwater.com/vol2/3-3-2.pdf

[2] International Stormwater Database, based on MassDEP analysis of raw influent & effluent values reported in 2005.



adapted from the Vermont Stormwater Manual

Maintenance

Activity	Frequency
Remove sediment from forebay	Annually
Remove sediment from grass channel	Annually
Mow	Once a month during growing season
Repair areas of erosion and revegetate	As needed, but no less than once a year

Special Features

Reduces volume and rate of runoff.

Grass Channels

Grass channels convey and treat stormwater. Grass channels were referred to as biofilter swales in the 1996 MassDEP/CZM Stormwater Handbook, based on the nomenclature coined by the Center for Watershed Protection (CWP). The CWP is now referring to biofilter swales as grass channels – so MassDEP is adopting the same name as the CWP to minimize confusion.

Properly designed grass channels are ideal when used adjacent to roadways or parking lots, where runoff from the impervious surfaces can be directed to the channel via sheet flow. Runoff can also be piped to the channel. If piped, locate the sediment forebay at the pipe outlet and include a check dam separating the forebay from the channel. For sheet flow, use a vegetated filter strip on a gentle slope or a pea gravel diaphragm. Make the longitudinal slope as flat as possible. This increases the Hydraulic Residence Time (HRT) and allows gravity separation of solids and maximizes sediment removal. Install check dams to further increase the HRT.

Review of the International Stormwater Database, updated in 2005, indicates lower TSS removal when compared to similar treatment practices (dry water quality swales, wet water quality swales, and bioretention areas). The information in the International Stormwater Database indicates grass channels are likely to export phosphorus (hence the negative removal efficiency cited above). Grass channels are not a practice suitable for treating stormwater that discharges to waters impaired by phosphorus or for waters where phosphorus TMDLs have been established.

Differences from dry water quality swales, wet water quality swales, bioretention cells, and drainage channels: Dry water quality swales contain a specific soil media mix and underdrain, providing greater treatment than grass channels. Wet water quality swales are designed with a permanent wet channel, whereas grass channels must be designed to completely drain between storms. Bioretention areas, including rain gardens, are designed solely as a treatment practice, and not for conveyance. Lastly, drainage channels act solely as a conveyance, in contrast to properly designed grass channels where runoff flow is deliberately lagged to provide treatment.

Design Considerations

Sizing:

Water Quality Volume: Design grass channels to maximize contact with vegetation and soil surface to promote greater gravity separation of solids during the storm associated with the water quality event (either ½ inch or 1-inch runoff). Design the channel such that the velocity does not exceed 1 foot per second during the 24-hour storm associated with the water quality event. Do not allow the water depth during the storm associated with the water quality event to exceed 4 inches (for design purposes). Make sure the selected design storm provides at least 9 minutes of HRT within the channel. Increasing the HRT beyond 9 minutes increases the likelihood of achieving the 50% TSS removal efficiency. Adding meanders to the swale increases its length and may increase the HRT.

2-year and 10-year conveyance capacity: Design grass channels to convey both the 2-year and 10-year 24-hour storms. Provide a minimum of 1-foot freeboard above the 10-year storm. Make sure that the runoff velocities during the 2-year 24-hour storm do not cause erosion problems.

Channel Length: Length depends on design factors to achieve the minimum 9-minute residence time for the storm associated with the water quality event.

Channel Crossings: In residential settings, driveways will cross over the channel, typically via culverts (pre-cast concrete, PVC, or corrugated metal pipe).

Soils: Grass channels may be constructed from most parent soils, unless the soils are highly impermeable. Soils must be able to support a dense grass growth. MassDEP recommends sandy loams, with an organic content of 10 to 20%, and no more than 20% clay. Highly impermeable soils, such as clays, are not suitable for grass channels, because they do not support dense grass stands. Similarly, gravelly and coarse soils may not be suitable due to their lower moisture retention capability, leading to potential die-back of the grass lining during the summer when the inter-event period between storms is longer than during other times of the year.

Grasses: The grasses serve to stabilize the channel, and promote conditions suitable for sedimentation, such as offering resistance to flow, which reduces water velocities and turbulence. Select a grass height of 6 inches or less. Grasses over that height tend to flatten when water flows

over them, inhibiting sedimentation. Select grasses that produce a fine, uniform and dense cover that can withstand varying moisture conditions. Regularly mow the channel to ensure that the grass height does not exceed 6 inches. Select grasses that are salt tolerant to withstand winter deicing of roadways. In the spring, replant any areas where grasses died off due to deicing. (Franklin 2002 and Knoxville 2003 provide recommendations for the best grass species.)

Pea Gravel Diaphragm: Use clean bank-run gravel, conforming to ASTM D 448, varying in size from 1/8 inch to 3/8 inch (No. 6 stone).

Outlet Protection: Must be used at discharge points to prevent scour downstream of the outlet.

Construction Considerations: Stabilize the channel after it is shaped before permanent turf is established, using natural or synthetic blankets. Never allow grass channels to receive construction period runoff.

Site Constraints

A proponent may not be able to install a grass channel swale because of:

- High groundwater;
- Presence of utilities; or
- Other site conditions that limit depth of excavation because of stability.

Maintenance

Access: Maintenance access must be designed as part of the grass channel. If located adjacent to a roadway, make the maintenance access at least 15 feet wide, which can also be combined with a breakdown lane along a highway or on-street parking along a residential street. When combined with on-street parking, post signs prohibiting parking when the swale is to be inspected and cleaned. Do not use travel lanes along highways and streets as the required maintenance access.

Mowing: Set the mower blades no lower than 3 to 4 inches above the ground. Do not mow beneath the depth of the design flow during the storm associated with the water quality event (e.g., if the design flow is no more than 4 inches, do not cut the grass shorter than 4 inches). Mow on an as-needed basis during the growing season so that the grass height does not exceed 6 inches.

Inspection: Inspect semi-annually the first year, and at least once a year thereafter. Inspect the grass for growth and the side slopes for signs of erosion and formation of rills and gullies. Plant an alternative grass species if the original grass cover is not successfully established. If grass growth is impaired by winter road salt or other deicer use, re-establish the grass in the spring.

Trash/Debris Removal: Remove accumulated trash and debris prior to mowing.

Sediment Removal: Check on a yearly basis and clean as needed. Use hand methods (i.e., a person with a shovel) when cleaning to minimize disturbance to vegetation and underlying soils. Sediment build-up in the grass channel reduces its capacity to treat and convey the water quality event, 2-year and 10-year 24-hour storm.

References:

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Deep Sump Catch Basin



Description: Deep sump catch basins, also known as oil and grease or hooded catch basins, are underground retention systems designed to remove trash, debris, and coarse sediment from stormwater runoff, and serve as temporary spill containment devices for floatables such as oils and greases.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	Provides no peak flow attenuation
3 - Recharge	Provides no groundwater recharge
4 - TSS Removal	25% TSS removal credit when used for pretreatment. Because of their limited effectiveness and storage capacity, deep sump catch basins receive credit for removing TSS only if they are used for pretreatment and designed as off-line systems.
5 - Higher Pollutant Loading	Recommended as pretreatment BMP. Although provides some spill control capability, a deep sump catch basin may not be used in place of an oil grit separator or sand filter for land uses that have the potential to generate runoff with high concentrations of oil and grease such as: high-intensity-use parking lots, gas stations, fleet storage areas, vehicle and/or equipment maintenance and service areas.
6 - Discharges near or to Critical Areas	May be used as pretreatment BMP. not an adequate spill control device for discharges near or to critical areas.
7 - Redevelopment	Highly suitable.

Advantages/Benefits:

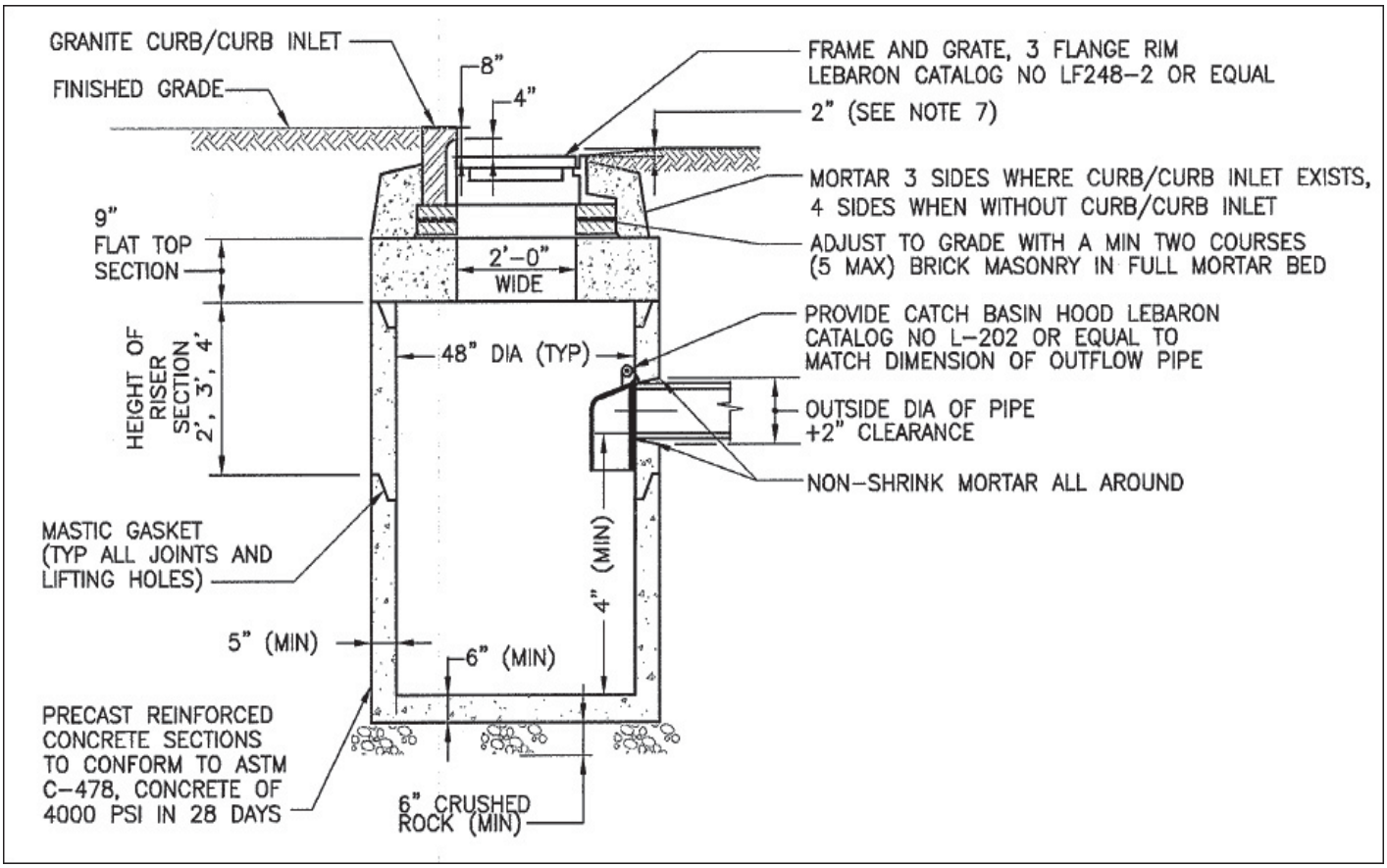
- Located underground, so limited lot size is not a deterrent.
- Compatible with subsurface storm drain systems.
- Can be used for retrofitting small urban lots where larger BMPs are not feasible.
- Provide pretreatment of runoff before it is delivered to other BMPs.
- Easily accessed for maintenance.
- Longevity is high with proper maintenance.

Disadvantages/Limitations:

- Limited pollutant removal.
- Expensive to install and maintain, resulting in high cost per unit area treated.
- No ability to control volume of stormwater
- Frequent maintenance is essential
- Requires proper disposal of trapped sediment and oil and grease
- Entrapment hazard for amphibians and other small animals

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS) - 25% (for regulatory purposes)
- Nutrients (Nitrogen, phosphorus) - Insufficient data
- Metals (copper, lead, zinc, cadmium) - Insufficient data
- Pathogens (coliform, e coli) - Insufficient data



adapted from the University of New Hampshire

Maintenance

Activity	Frequency
Inspect units	Four times per year
Clean units	Four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

Special Features

All deep sump catch basins must include hoods. For MassHighway projects, consult the Stormwater Handbook for Highways and Bridges for hood requirements.

LID Alternative

Reduce Impervious Surface
Disconnect rooftop and non-rooftop runoff
Vegetated Filter Strip

Deep Sump Catch Basin

Suitable Applications

- Pretreatment
- Residential subdivisions
- Office
- Retail

Design Considerations

- The contributing drainage area to any deep sump catch basin should not exceed ¼ acre of impervious cover.
- Design and construct deep sump catch basins as off-line systems.
- Size the drainage area so that the flow rate does not exceed the capacity of the inlet grate.
- Divert excess flows to another BMP intended to meet the water quantity requirements (peak rate attenuation) or to a storm drain system. An off-line design enhances pollutant removal efficiency, because it prevents the resuspension of sediments in large storms.

Make the sump depth (distance from the bottom of the outlet pipe to the bottom of the basin) at least four feet times the diameter of the outlet pipe and more if the contributing drainage area has a high sediment load. The minimum sump depth is 4 feet. Double catch basins, those with 2 inlet grates, may require deeper sumps. Install the invert of the outlet pipe at least 4 feet from the bottom of the catch basin grate.

The inlet grate serves to prevent larger debris from entering the sump. To be effective, the grate must have a separation between the grates of one square inch or less. The inlet openings must not allow flows greater than 3 cfs to enter the deep sump catch basin. If the inlet grate is designed with a curb cut, the grate must reach the back of the curb cut to prevent bypassing. The inlet grate must be constructed of a durable material and fit tightly into the frame so it won't be dislodged by automobile traffic. The inlet grate must not be welded to the frame so that sediments may be easily removed. To facilitate maintenance, the inlet grate must be placed along the road shoulder or curb line rather than a traffic lane.

Note that within parking garages, the State Plumbing Code regulates inlet grates and other stormwater management controls. Inlet grates inside parking garages are currently required to have much smaller openings than those described herein.

To receive the 25% removal credit, hoods must be used in deep sump catch basins. Hoods also help contain oil spills. MassHighway may install catch basins without hoods provided they are designed, constructed, operated, and maintained in accordance with the Mass Highway Stormwater Handbook.

Install the weep hole above the outlet pipe. Never install the weep hole in the bottom of the catch basin barrel.

Site Constraints

A proponent may not be able to install a deep sump catch basin because of:

- Depth to bedrock;
- High groundwater;
- Presence of utilities; or
- Other site conditions that limit depth of excavation because of stability.

Maintenance

Regular maintenance is essential. Deep sump catch basins remain effective at removing pollutants only if they are cleaned out frequently. One study found that once 50% of the sump volume is filled, the catch basin is not able to retain additional sediments.

Inspect or clean deep sump basins at least four times per year and at the end of the foliage and snow-removal seasons. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. If handling runoff from land uses with higher potential pollutant loads or discharging runoff near or to a critical area, more frequent cleaning may be necessary.

Clamshell buckets are typically used to remove sediment in Massachusetts. However, vacuum trucks are preferable, because they remove more trapped sediment and supernatant than clamshells. Vacuuming is also a speedier process and is less likely to snap the cast iron hood within the deep sump catch basin.

Always consider the safety of the staff cleaning deep sump catch basins. Cleaning a deep sump catch basin within a road with active traffic or even within a parking lot is dangerous, and a police detail may be necessary to safeguard workers.

Although catch basin debris often contains concentrations of oil and hazardous materials such as petroleum hydrocarbons and metals, MassDEP classifies them as solid waste. Unless there is evidence that they have been contaminated by a spill or other means, MassDEP does not routinely require catch basin cleanings to be tested before disposal. Contaminated catch basin cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000, and handled as hazardous waste.

In the absence of evidence of contamination, catch basin cleanings may be taken to a landfill or other facility permitted by MassDEP to accept solid waste, without any prior approval by MassDEP. However, some landfills require catch basin cleanings to be tested before they are accepted.

With prior MassDEP approval, catch basin cleanings may be used as grading and shaping materials at landfills undergoing closure (see Revised Guidelines for Determining Closure Activities at Inactive Unlined Landfill Sites) or as daily cover at active landfills. MassDEP also encourages the beneficial reuse of catch basin cleanings whenever possible. A Beneficial Reuse Determination is required for such use.

MassDEP regulations prohibit landfills from accepting materials that contain free-draining liquids. One way to remove liquids is to use a hydraulic lift truck during cleaning operations so that the material can be decanted at the site. After loading material from several catch basins into a truck, elevate the truck so that any free-draining liquid can flow back into the structure. If there is no free water in the truck, the material may be deemed to be sufficiently dry. Otherwise the catch basin cleanings must undergo a Paint Filter Liquids Test. Go to www. Mass.gov/dep/recycle/laws/cafacts.doc for information on all of the MassDEP requirements pertaining to the disposal of catch basin cleanings.

Proprietary Separators



Description: A proprietary separator is a flow-through structure with a settling or separation unit to remove sediments and other pollutants. They typically use the power of swirling or flowing water to separate floatables and coarser sediments, are typically designed and manufactured by private businesses, and come in different sizes to accommodate different design storms and flow conditions. Some rely solely on gravity separation and contain no swirl chamber. Since proprietary separators can be placed in almost any location on a site, they are particularly useful when either site constraints prevent the use of other stormwater techniques or as part of a larger treatment train. The effectiveness of proprietary separators varies greatly by size and design, so make sure that the units are sized correctly for the site's soil conditions and flow profiles, otherwise the unit will not work as designed.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	Provides no peak flow attenuation
3 - Recharge	Provides no groundwater recharge
4 - TSS Removal	Varies by unit. Must be used for pretreatment and be placed first in the treatment train to receive TSS removal credit. Follow procedures described in Chapter 4 to determine TSS credit.
5 - Higher Pollutant Loading	Suitable as pretreatment device.
6 - Discharges near or to Critical Areas	Suitable as pretreatment device or potentially a spill control device
7 - Redevelopment	Suitable as pretreatment device or treatment device if it is not possible to provide other BMPs.

Advantages/Benefits:

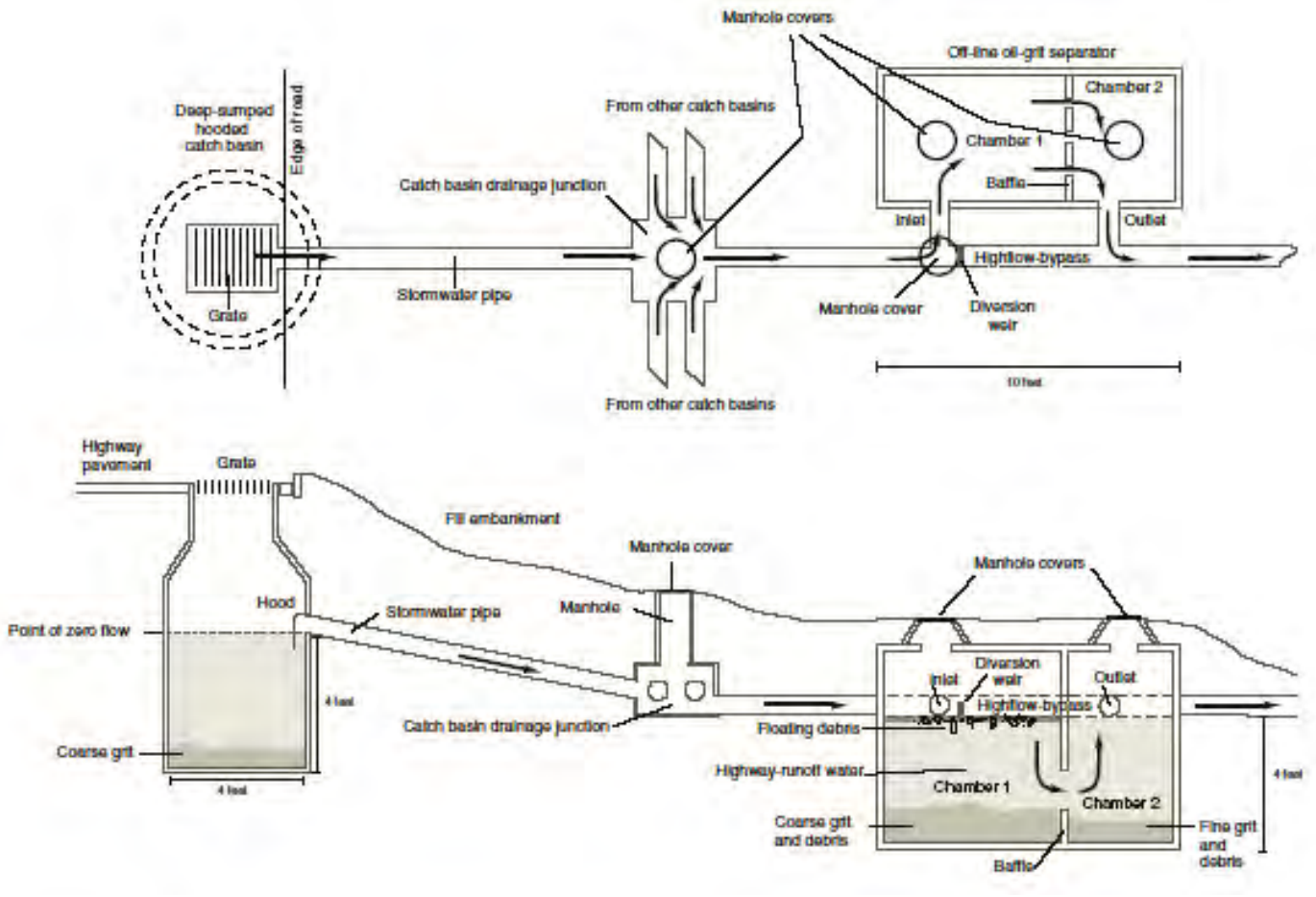
- Removes coarser sediment.
- Useful on constrained sites.
- Can be custom-designed to fit specific needs of a specific site.

Disadvantages/Limitations:

- Removes only coarse sediment fractions
- Provides no recharge to groundwater
- No control of the volume of runoff
- Frequent maintenance is essential

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS) - Varies.
- Nutrients (Nitrogen, phosphorus) - Insufficient data
- Metals (copper, lead, zinc, cadmium) - Insufficient data
- Pathogens (coliform, e coli) - Insufficient data



Schematic section of a deep-sump hooded catch basin and a 1,500-gallon off-line water quality inlet.

adapted from the MassHighway Storm Water Handbook for Highways

Maintenance

Activity	Frequency
Inspect in accordance with manufacturer requirements, but no less than twice a year following installation, and no less than once a year thereafter.	See activity
Remove sediment and other trapped pollutants at frequency or level specified by manufacturer.	See manufacturer information

Special Features

Can be custom-designed to fit specific needs at a specific site.

LID Alternative

Reduce impervious surfaces
Disconnect runoff from non-metal roofs, roadways, and driveways

Proprietary Separators

Applicability

Because they have limited pollutant removal and storage capacity, proprietary separators must be used for pretreatment only. Because they are placed underground, proprietary separators may be the only structural pretreatment BMPs feasible on certain constrained redevelopment sites where space or storage is not available for more effective BMPs. They may be especially useful in ultra-urban settings such as Boston or Worcester. Some proprietary separators may be used for spill control.

Effectiveness

Proprietary separators have a wide range of TSS efficiencies. To assess the ability of proprietary separators to remove TSS and other pollutants, a proponent should follow the procedures set forth in Chapter 4. The specific units proposed for a particular project cannot be effective unless they are sized correctly. Proprietary separators are usually sized based on flow rate. A proprietary separator must be sized to treat the required water quality volume. To be effective at removing TSS and other pollutants the system must be designed, constructed, and maintained in accordance with the manufacturer's specifications and the specifications in this Handbook.

Planning Considerations

To receive TSS removal credit, proprietary separators must be used for pretreatment and placed at the beginning of a stormwater treatment train. They can be configured either in-line or if subject to higher flows, off-line to reduce scouring. They must be sized in accordance with the manufacturer's specifications and the specifications in this Handbook. Proprietary separators used as spill control devices may have to be sized differently than those used for TSS removal.

Design

The design of proprietary separators varies by manufacturer. Units are typically precast concrete, but larger systems may be cast in place. Units may have baffles or other devices to direct incoming water into and through a series of chambers, slowing the water down to allow sediment to drop out into internal storage areas, then directing this pre-treated water to exit to other treatment or infiltration devices. In some cases, flow will be introduced tangentially, to induce swirl or vortex. Units may include skirts or weirs, to keep trapped sediments from becoming re-entrained. Some units combine a catch basin with the treatment function, providing off-line rather than in-line treatment.

Generally they are placed below ground on a gravel or stone base. Make sure all units contain inspection and access ports so that they may be inspected and cleaned. During design, take care to place the inspection and access ports where they will be accessible. Do not place the ports in locations such as travel lanes of roadways/highways and parking stalls.

Construction

Install construction barriers around the excavation area to prevent access by pedestrians. Use diversions and other soil erosion practices up-slope of the proprietary separator to prevent runoff from entering the site before construction of the units is complete. Implement practices to prevent construction period runoff from being discharged to the units until construction is complete and the soil is stabilized. Stabilize all surrounding area and any established outlets. Remove temporary structures after vegetation is established.

Maintenance

Inspect and clean these units in strict accordance with manufacturers' recommendations and requirements. Clean the units using the method specified by the manufacturer. Vactor trucks are typically used to clean these units. Clamshell buckets typically used for cleaning catch basins are almost never allowed by manufacturers. Sometimes it will be necessary to remove sediment manually.

Adapted from:
MassHighway. Storm Water Handbook for Highways and Bridges. May 2004.

Infiltration Trenches



Description: Infiltration trenches are shallow excavations filled with stone. They can be designed to capture sheet flow or piped inflow. The stone provides underground storage for stormwater runoff. The stored runoff gradually exfiltrates through the bottom and/or sides of the trench into the subsoil and eventually into the water table.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	Full exfiltration trench systems may be designed for peak rate attenuation
3 - Recharge	Provides groundwater recharge.
4 - TSS Removal	80% TSS removal credit when combined with one or more pretreatment BMPs.
5 - Higher Pollutant Loading	May be used if 44% of TSS is removed with a pretreatment BMP prior to infiltration. For some land uses with higher potential pollutant load an oil grit separator or equivalent must be used prior to discharge to the infiltration structure. Infiltration must be done in compliance with 314 CMR 5.00.
6 - Discharges near or to Critical Areas	Highly recommended with pretreatment to remove at least 44% TSS removal prior to discharge.
7 - Redevelopment	Suitable with pretreatment.

Advantages/Benefits:

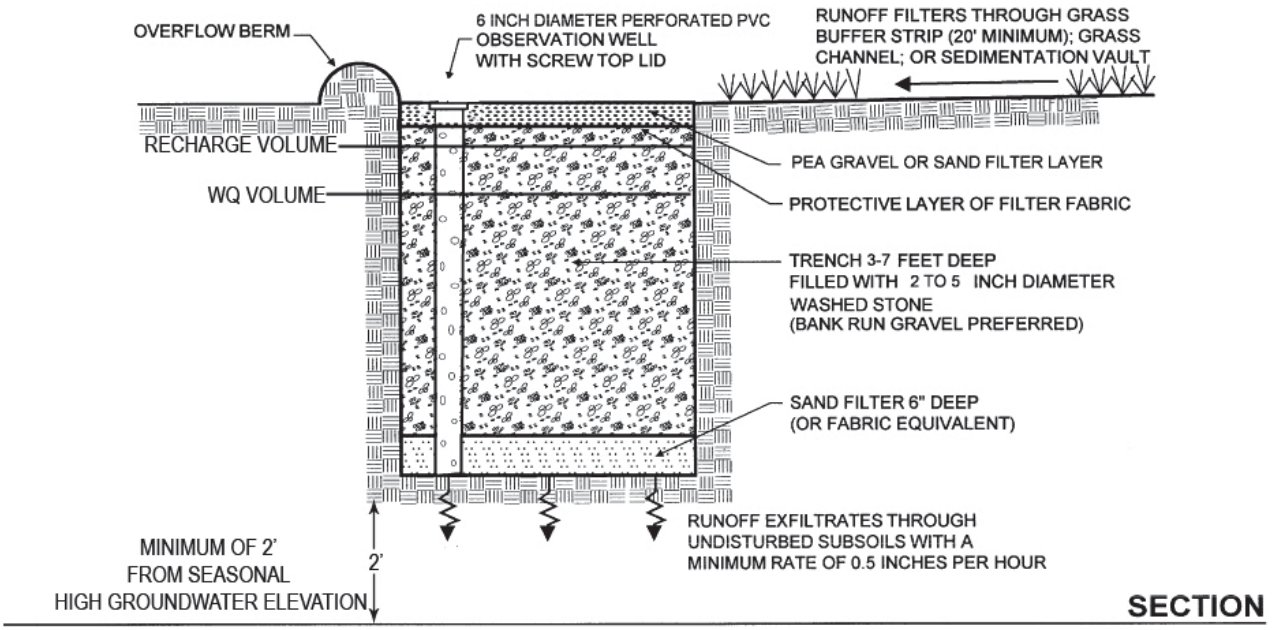
- Provides groundwater recharge.
- Reduces downstream flooding and protects stream bank integrity for small storms.
- Preserves the natural water balance of the site.
- Provides a high degree of runoff pollution control when properly designed and maintained.
- Reduces the size and cost of downstream stormwater control facilities and/or storm drain systems by infiltrating stormwater in upland areas.
- Suitable where space is limited.

Disadvantages/Limitations:

- High failure rates due to improper siting, inadequate pollution prevention and pretreatment, poor design, construction and maintenance.
- Use restricted to small drainage areas.
- Depending on runoff quality, potential risk of groundwater contamination.
- Requires frequent maintenance.
- Susceptible to clogging with sediment.

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS) — 80% with pretreatment
- Total Nitrogen — 40% to 70%
- Total Phosphorus — 40% to 70%
- Metals (copper, lead, zinc, cadmium) — 85% to 90%
- Pathogens (coliform, e coli) — Up to 90%



Example of Infiltration Trench

adapted from the University of New Hampshire

Maintenance

Activity	Frequency
Inspect units and remove debris	Every 6 months and after every major storm
Remove sediment from pretreatment BMPs	Every 6 months and after every major storm

Special Features:

High failure rate without adequate pretreatment and regular maintenance

LID Alternative:

Reduce impervious areas
Bioretention areas

Infiltration Trenches

Infiltration trenches can be designed for complete exfiltration or partial exfiltration, where a portion of the runoff volume is directed to the trench and the remainder is conveyed to other BMPs.

Full Exfiltration Trench Systems

Infiltration trenches must be sized to provide storage and exfiltration of the required water quality volume. Full exfiltration systems also provide control of peak discharges and water quality treatment for all storm events equal to or less than the design storm selected. In selecting the design storm, the minimum peak rate attenuation storm event must include the 2- and 10-year 24-hour storm events and may include the 100-year 24-hour storm event, if the runoff from that storm will increase flooding up- or downstream of the site. An emergency overflow channel is required to discharge runoff volumes in excess of the design storm. Economic and physical constraints can restrict the use of full exfiltration systems. Generally, it is not practical to provide storage for large infrequent storms, such as the 100-year storm.

Partial or Water Quality Exfiltration Trench Systems

These systems exfiltrate a portion of the runoff, while the remainder is conveyed to other BMPs. At a minimum, they must be sized to exfiltrate the recharge volume required by Stormwater Management Standard 3. There are two methods of partial infiltration. The first relies on off-line treatment where a portion of the runoff, or the "first-flush," is routed from the main channel to the trench by means of a weir or other diversion structure. The second method is on-line, and uses a perforated pipe at the top of the trench. This underdrain must be placed near the top of the trench. Refer to the design section below. After the trench fills to capacity, excess runoff is discharged through the perforated pipe and directed to other BMPs.

Applicability

Infiltration trenches always require a pretreatment BMP. For sheet flow, pretreatment BMP structures that may be used include vegetated filter strips and pea stone gravel diaphragms. For piped flow, a sediment forebay should be used.

Infiltration trenches are feasible at sites with gentle slopes, permeable soils, and where seasonal high groundwater levels are at least two feet below the bottom of the trench. MassDEP recommends providing greater depths from the bottom of the trench to seasonal high groundwater elevation to reduce the potential for failure. Depth to bedrock will need to be evaluated to determine if use of an infiltration trench is feasible.

Contributing drainage areas must be relatively small and not exceed 5 acres. Infiltration trenches are suitable for parking lots, rooftop areas, local roads, highways, and small residential developments.

Infiltration trenches are adaptable to many sites because of their thin profile. Table IT.1 lists the recommended site criteria. Infiltration trenches can be used in upland areas of larger sites to reduce the overall amount of runoff and improve water quality while reducing the size and costs of downgradient BMPs.

Infiltration trenches are effective at mimicking the natural, pre-development hydrological regime at a site. Full exfiltration systems that have been carefully designed may be capable of controlling peak discharges from the 2-year and 10-year 24-hour storm.

Planning Considerations

MassDEP highly recommends using infiltration trenches near Critical Areas. They may be used to treat stormwater discharges from areas of higher potential pollutant loads, provided 44% of TSS is removed prior to infiltration. For some land uses with higher potential pollutant load, an oil grit separator or equivalent device may be required prior to discharge to the infiltration trench. When an oil/grit separator is used, pipe the runoff to the infiltration trench. Discharges from land uses with higher potential pollutant loads require compliance with 314 CMR 5.00.

Before planning infiltration trenches, carefully evaluate the subsurface of the site including soils, depth to bedrock, and depth to the water table. Make sure soils have a minimum percolation rate of 0.17 inches per hour.

Make the slopes of the contributing drainage area less than 5%. Infiltration trenches have extremely high failure rates, usually due to clogging, so pretreatment is essential. Infiltration trenches are not intended to remove coarse particulate pollutants, and generally are difficult to rehabilitate once clogged. Typical pretreatment BMPs for infiltration trenches

Table IT.1 - Site Criteria for Infiltration Trenches
1. The contributing drainage area to any individual infiltration trench should be restricted to 5 acres or less.
2. The minimum depth to the seasonal high water table, bedrock, and/or impermeable layer should be 2 ft. from the bottom of the trench.
3. The minimum acceptable soil infiltration rate is 0.17 inches per hour. Infiltration trenches must be sized in accordance with the procedures set forth in Volume 3.
4. A minimum of 2 soil borings should be taken for each infiltration trench. Infiltration trenches over 100 ft. in length should include at least one additional boring location for each 50 ft. increment. Borings should be taken at the actual location of the proposed infiltration trench so that any localized soil conditions are detected.
5. Infiltration trenches should not be used at sites where soils have 30% or greater clay content, or 40% or greater silt clay content. Infiltration trenches will not function adequately in areas with hydrologic soils in group D and infiltration will be limited for hydrologic soils in group C.
6. Infiltration trenches should not be placed over fill materials.
7. The following setback requirements apply to infiltration trench installations: • Distance from any slope greater than 5% to any surface exposed trench: minimum of 100 ft. • Distance from any slope greater than 20% to any underground trench: minimum of 100 ft. • Distance from septic system soil absorption system: minimum of 50 ft. • Distance from any private well: minimum of 100 feet, additional setback distance may be required depending on hydrogeological conditions. • Distance from any public groundwater drinking water supplies: Zone I radius, additional setback distance may be required depending on hydrogeological conditions. • Distance from any surface water supply and its tributaries: Zone A
8. Distance from any surface water of the Commonwealth (other than surface drinking water supplies and their tributaries): minimum of 150 ft downslope and 100 ft upslope.
9. Distance from any building foundations including slab foundations without basements: minimum of 20 ft.

include oil grit separators, deep sump catch basins, vegetated filter strips, pea stone gravel diaphragms, or sediment forebays.
Clogging can be an issue even when infiltrating uncontaminated rooftop runoff as well, so it is important to implement some form of pretreatment to remove sediments, leaf litter, and debris to ensure the proper functioning of the trench and allow for longer periods between maintenance.

Consider the impacts of infiltrating stormwater on nearby resources. Infiltration trenches need to be set back outside Zone Is and Zone As for public drinking water supplies. Finally, avoid creating groundwater mounds near Chapter 21e sites that could alter subsurface flow patterns and spread groundwater pollution.

Design

See the following for complete design references: Maryland Stormwater Design Manual, Volumes I and II. October 2000. Maryland Department of Environment. Baltimore, MD.

The volume and surface area of an infiltration trench relate to the quantity of runoff entering the trench from the contributing area, the void space, and the infiltration rate. Because the infiltration trench is filled with stone, only the space between the stone is available for runoff storage. Effective designs call for infiltration trenches to be filled with 1.5-inch to 3.0-inch diameter clean washed stone. Conduct a geotechnical study to determine the final soil infiltration rate below the trench. For sizing purposes, assume a void ratio of 0.4.

Take a minimum of two borings or observation pits for each infiltration trench. For trenches over 100 feet long, include at least one additional boring or pit for each 50-foot increment. Take borings or dig observation pits at the actual location of the proposed infiltration trench to determine localized soil conditions.

Base the design of the infiltration trench on the soil evaluation set forth in Volume 3. The minimum acceptable rate is 0.17 inches per hour. Never use the results of a Title 5 percolation test to estimate an infiltration rate, as these tend to greatly overestimate the rate that water will infiltrate into the subsurface.

Place the maximum depth of the trench at least two feet above the seasonal high water table or bedrock, and below the frost line.

Include vegetated buffers (20-foot minimum) around surface trenches. Place permeable filter fabric 6 to 12 inches below the surface of the trench, along the sides, and at the bottom of the trench. Use filter fabric, especially at the surface to prevent clogging; if failure does occur, it can be alleviated without reconstructing the infiltration trench. Another option is to place twelve inches of sand at the bottom of the trench.

Install an observation well at the center of the trench to monitor how quickly runoff is clearing the system. Use a well-anchored, vertical perforated PVC pipe with a lockable above-ground cap.

The visible surface of the trench may either be stone or grassed. Stone is easier to rake out when clogged. If it is vegetated with grasses, use fabric above the stone to keep the soil that serves as the planting medium from clogging the stone. When trenches are designed to accept sheet flow, take into account the grass surface when determining how much of the runoff will exfiltrate into the trench.

A perforated pipe underdrain is sometimes used as part of the design. The purpose of the underdrain is to facilitate exfiltration into the parent soil. Except for underdrains placed between different trench cells, MassDEP does not allow underdrains placed near the bottom of the trench. Placement of an underdrain near the bottom of the trench reduces the amount of treatment and exfiltration, because more water is conveyed through the underdrain to the outlet point when it rains than exfiltrates into the surrounding soils.

Construction

Table IT.2 presents the minimum construction criteria for infiltration trenches. Take precautions before and during construction to minimize the risk of premature failure of the infiltration trench. First, prevent heavy equipment from operating at the locations where infiltration trenches are planned. Heavy equipment will compact soil and adversely affect the performance of the trench. Isolate the areas where the trenches will be located by roping them off and flagging them.

Construct infiltration trenches only after the site has been stabilized. Never use trenches as temporary sediment traps during construction. Use diversion berms or staked and lined hay bales around the perimeter of the trenches during their construction. Excavate and build the trench manually or with light earth-moving equipment. Deposit all excavated material downgradient of the trench to prevent re-deposition during runoff events.

Line the sides and bottom of the trench with permeable geotextile fabric. Twelve inches of sand (clean, fine aggregate) may be substituted or used in addition on the bottom. Place one to three inches of clean, washed stone in the lined trench and lightly compact the stone with plate compactors, to within approximately one foot of the surface. Place fabric filter over the top, with at least a 12-inch overlap on both sides. An underground trench may be filled with topsoil and planted. A surface trench may be filled with additional aggregate stone.

Divert drainage away from the infiltration trench until the contributing drainage area is fully stabilized, including full establishment of any vegetation.

Table IT.2 - Construction Criteria for Infiltration Trenches
1. Infiltration trenches should never serve as temporary sediment traps for construction.
2. Before the development site is graded, the area of the infiltration trench should be roped off and flagged to prevent heavy equipment from compacting the underlying soils.
3. Infiltration trenches should not be constructed until the entire contributing drainage area has been stabilized. Diversion berms should be placed around the perimeter or the infiltration trench during all phases of construction. Sediment and erosion controls should be used to keep runoff and sediment away from the trench area.
4. During and after excavation, all excavated materials should be placed downstream, away from the infiltration trench, to prevent redeposition of these materials during runoff events. These materials should be properly handled and disposed of during and after construction.
Light earth-moving equipment should be used to excavate the infiltration trench. Use of heavy equipment causes compaction of the soils in the trench floor, resulting in reduced infiltration capacity.

Maintenance

Because infiltration trenches are prone to failure due to clogging, it is imperative that they be aggressively maintained on a regular schedule. Using pretreatment BMPs will significantly reduce the maintenance requirements for the trench itself. Removing accumulated sediment from a deep sump catch basin or a vegetated filter strip is considerably less difficult and less costly than rehabilitating a trench. Eventually, the infiltration trench will have to be rehabilitated, but regular maintenance will prolong its operational life and delay the day when rehabilitation is needed. With appropriate design and aggressive maintenance, rehabilitation can be delayed for a decade or more. Perform preventive maintenance at least twice a year.

Inspect and clean pretreatment BMPs every six months and after every major storm event (2 year return frequency). Check inlet and outlet pipes to determine if they are clogged. Remove accumulated sediment, trash, debris, leaves and grass clippings from mowing. Remove tree seedlings, before they become firmly established.

Inspect the infiltration trench after the first several rainfall events, after all major storms, and on regularly scheduled dates every six months. If the top of the trench is grassed, it must be mowed on a seasonal basis. Grass height must be maintained to be no more than four inches. Routinely remove grass clippings leaves and accumulated sediment from the surface of the trench.

Inspect the trench 24 hours or several days after a rain event, to look for ponded water. If there is ponded water at the surface of the trench, it is likely that the trench surface is clogged. To address surface clogging, remove and replace the topsoil or first layer of stone aggregate and the filter fabric. If water is ponded inside the trench, it may indicate that the bottom of the trench has failed. To rehabilitate a failed trench, all accumulated sediment must be stripped from the bottom, the bottom of the trench must be scarified and tilled to induce infiltration, and all of the stone aggregate and filter fabric or media must be removed and replaced.

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Infiltration Basins



Description: Infiltration basins are stormwater runoff impoundments that are constructed over permeable soils. Pretreatment is critical for effective performance of infiltration basins. Runoff from the design storm is stored until it exfiltrates through the soil of the basin floor.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	Can be designed to provide peak flow attenuation.
3 - Recharge	Provides groundwater recharge.
4 - TSS Removal	80% TSS removal, with adequate pretreatment
5 - Higher Pollutant Loading	May be used if 44% of TSS is removed with a pretreatment BMP prior to infiltration. For some land uses with higher potential pollutant loads, use an oil grit separator, sand filter or equivalent for pretreatment prior to discharge to the infiltration basin. Infiltration must be done in compliance with 314 CMR 5.00
6 - Discharges near or to Critical Areas	Highly recommended, especially for discharges near cold-water fisheries. Requires 44% removal of TSS prior to discharge to infiltration basin
7 - Redevelopment	Typically not an option due to land area constraints

Advantages/Benefits:

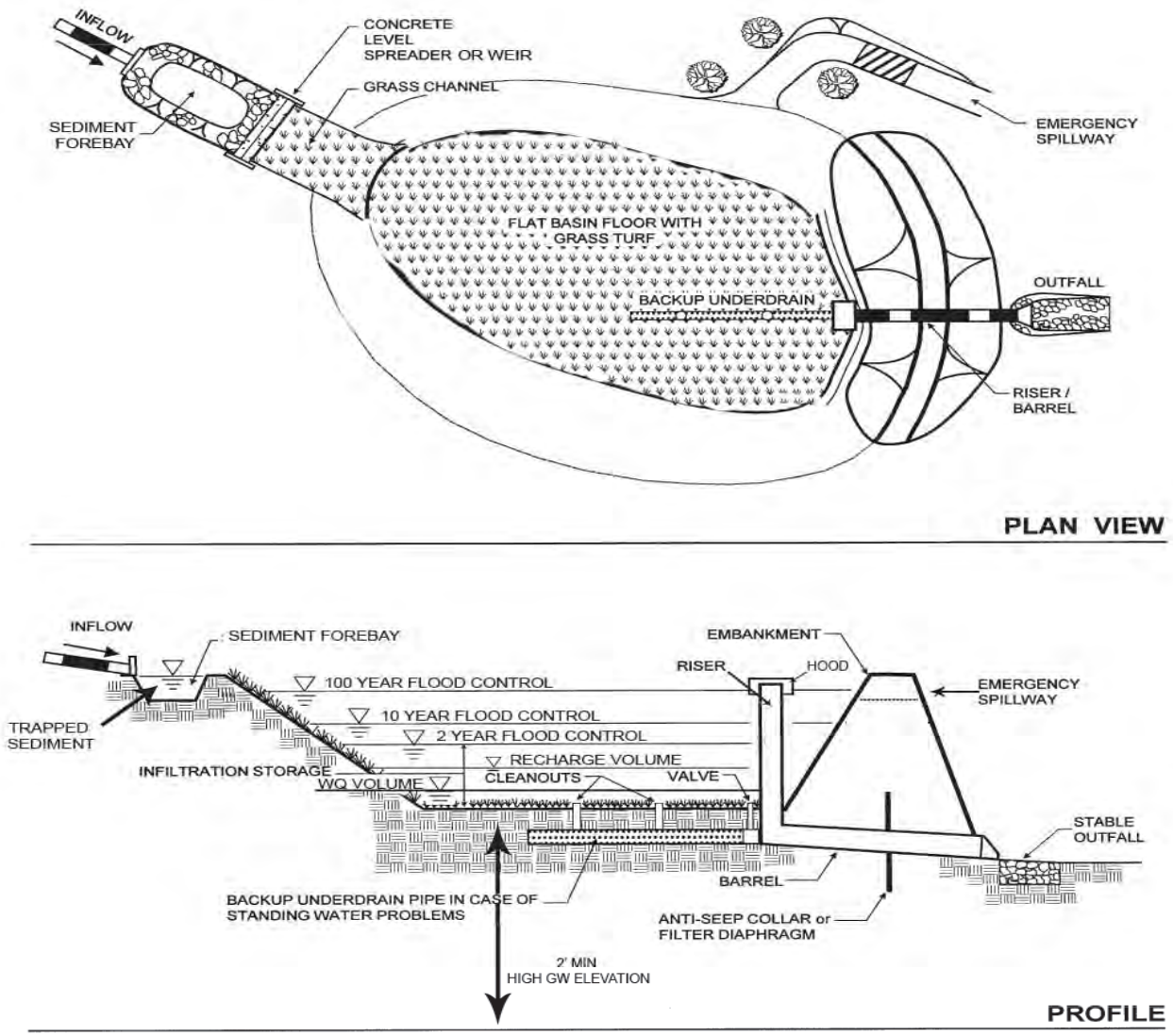
- Provides groundwater recharge.
- Reduces local flooding.
- Preserves the natural water balance of the site.
- Can be used for larger sites than infiltration trenches or structures.

Disadvantages/Limitations:

- High failure rates due to improper siting, inadequate pretreatment, poor design and lack of maintenance.
- Restricted to fairly small drainage areas.
- Not appropriate for treating significant loads of sediment and other pollutants.
- Requires frequent maintenance.
- Can serve as a “regional” stormwater treatment facility

Pollutant Removal Efficiencies

• Total Suspended Solids (TSS)	80% with pretreatment
• Total Nitrogen	50% to 60%
• Total Phosphorus	60% to 70%
• Metals (copper, lead, zinc, cadmium)	85% to 90%
• Pathogens (coliform, e coli)	90%



adapted from the Vermont Stormwater Manual

Maintenance

Activity	Frequency
Preventative maintenance	Twice a year
Inspect to ensure proper functioning	After every major storm during first 3 months of operation and twice a year thereafter and when there are discharges through the high outlet orifice.
Mow the buffer area, side slopes, and basin bottom if grassed floor; rake if stone bottom; remove trash and debris; remove grass clippings and accumulated organic matter	Twice a year
Inspect and clean pretreatment devices	Every other month recommended and at least twice a year and after every major storm event.

Special Features: High failure rate without adequate pretreatment and regular maintenance.

LID Alternative: Reduce impervious surfaces. Bioretention areas

Infiltration Basins

The following are variations of the infiltration basin design.

Full Exfiltration Basin Systems

These basin systems are sized to provide storage and exfiltration of the required recharge volume and treatment of the required water quality volume. They also attenuate peak discharges. Designs typically include an emergency overflow channel to discharge runoff volumes in excess of the design storm.

Partial or Off-line Exfiltration Basin Systems

Partial basin systems exfiltrate a portion of the runoff (usually the first flush or the first half inch), with the remaining runoff being directed to other BMPs. Flow splitters or weirs divert flows containing the first flush into the infiltration basin. This design is useful at sites where exfiltration cannot be achieved by downstream detention BMPs because of site condition limitations.

Applicability

The suitability of infiltration basins at a given site is restricted by several factors, including soils, slope, depth to water table, depth to bedrock, the presence of an impermeable layer, contributing watershed area, proximity to wells, surface waters, and foundations. Generally, infiltration basins are suitable at sites with gentle slopes, permeable soils, relatively deep bedrock and groundwater levels, and a contributing watershed area of approximately 2 to 15 acres. Table IB.1 presents the recommended site criteria for infiltration basins.

Pollution prevention and pretreatment are particularly important at sites where infiltration basins are located. A pollution prevention program that separates contaminated and uncontaminated runoff is essential. Uncontaminated runoff can be infiltrated directly, while contaminated runoff must be collected and pretreated using an appropriate combination of BMPs and then rerouted to the infiltration basin. This approach allows uncontaminated stormwater to be infiltrated during and immediately after the storm and permits the infiltration of contaminated stormwater after an appropriate detention time. The Pollution Prevention and Source Control Plan required by Stormwater Standard 4 must take these factors into account. For land uses with higher potential pollutant loads, provide a bypass to divert contaminated stormwater from the infiltration basin in storms larger than the design storm.

Table IB.1 - Site Criteria for Infiltration Basins
1. The contributing drainage area to any individual infiltration basin should be restricted to 15 acres or less.
2. The minimum depth to the seasonal high water table, bedrock, and/or impermeable layer should be 2 ft. from the bottom of the basin.
3. The minimum infiltration rate is 0.17 inches per hour. Infiltration basins must be sized in accordance with the procedures set forth in Volume 3.
4. One soil sample for every 5000 ft. of basin area is recommended, with a minimum of three samples for each infiltration basin. Samples should be taken at the actual location of the proposed infiltration basin so that any localized soil conditions are detected.
5. Infiltration basins should not be used at sites where soil have 30% or greater clay content, or 40% or greater silt clay content.
6. Infiltration basins should not be placed over fill materials.
7. The following setback requirements should apply to infiltration basin installations: • Distance from any slope greater than 15% - Minimum of 50 ft. • Distance from any soil absorption system- Minimum of 50 ft. • Distance from any private well - Minimum of 100 ft., additional setback distance may be required depending on hydrogeological conditions. • Distance from any public groundwater drinking supply wells - Zone I radius, additional setback distance may be required depending on hydrogeological conditions. • Distance from any surface drinking water supply - Zone A • Distance from any surface water of the commonwealth (other than surface water supplies and their tributaries) - Minimum of 50 ft. • Distance from any building foundations including slab foundations without basements - Minimum of 10 ft. downslope and 100 ft. upslope.

Prior to pretreatment, implement the pollution prevention and source control program specified in the Pollution Prevention and Source Control Plan to reduce the concentration of pollutants in the discharge. Program components include careful management of snow and deicing chemicals, fertilizers, herbicides, and pest control. The Plan must prohibit snow disposal in the basin and include measures to prevent runoff of stockpiled snow from entering the basin. Stockpiled snow contains concentrations of sand and deicing chemicals. At industrial sites, keep raw materials and wastes from being exposed to precipitation. Select pretreatment BMPs that remove coarse sediments, oil and grease, and floatable organic and inorganic materials, and soluble pollutants.

Effectiveness

Infiltration basins are highly effective treatment systems that remove many contaminants, including TSS. However, infiltration basins are not intended to remove coarse particulate pollutants. Use a pretreatment device to remove them before they enter the basin. The pollutant removal efficiency of the basin depends on how much runoff is exfiltrated by the basin.

Infiltration basins can be made to control peak discharges by incorporating additional stages in the design. To do this, design the riser outlet structure or weir with multiple orifices, with the lowest orifice set to achieve storage of the full recharge volume required by Standard 3. Design the upper orifices using the same procedures as extended detention basins. The basins can also be designed to achieve exfiltration of storms greater than the required recharge volume. However, in such cases, make sure the soils are permeable enough to allow the basin to exfiltrate the entire volume in a 72-hour period. This may necessitate increasing the size of the floor area of the basin. Generally, it is not economically feasible to provide storage for large infrequent storms, such as the 100-year 24-hour storm.

Planning Considerations

Carefully evaluate sites before planning infiltration basins, including investigating soils, depth to bedrock, and depth to water table. Suitable parent soils should have a minimum infiltration rate of 0.17 inches per hour. Infiltration basis must be sized in accordance with the procedures set forth in Volume 3. The slopes of the contributing drainage area for the infiltration basin must be less than 5%.

Design

Infiltration basins are highly effective treatment and disposal systems when designed properly. The first step before design is providing source control and implementing pollution prevention measures to minimize sediment and other contaminants in runoff discharged to the infiltration basin. Next, consider the appropriate pretreatment BMPs.

Design pretreatment BMPs to pretreat runoff before stormwater reaches the infiltration basin. For Critical Areas, land uses with potentially higher pollutant loads, and soils with rapid infiltration rates (greater than 2.4 inches/hour), pretreatment must remove at least 44% of the TSS. Proponents may comply with this requirement by proposing two pretreatment BMPs capable of removing 25% TSS. However, the issuing authorities (i.e., Conservation Commissions or MassDEP) may require additional pretreatment for other constituents beyond TSS for land uses with higher potential pollutant loads. If the land use has the potential to generate stormwater runoff with high concentrations of oil and grease, treatment by an oil grit separator or equivalent is required before discharge to the infiltration basin.

For discharges from areas other than Critical Areas, land uses with potentially higher pollutant loads, and soils with rapid infiltration rates, MassDEP also requires some TSS pretreatment. Common pretreatment for infiltration basins includes aggressive street sweeping, deep sump catch basins, oil/grit separators, vegetated filter strips, water quality swales, or sediment forebays. Fully stabilize all land surfaces contributing drainage to the infiltration practice after construction is complete to reduce the amount of sediment in runoff that flows to the pretreatment devices.

Always investigate site conditions. Infiltration basins must have a minimum separation from seasonal high groundwater of at least 2 feet. Greater separation is necessary for bedrock. If there is bedrock on the site, conduct an analysis to determine the appropriate vertical separation. The greater the distance from the bottom of the basin media to the seasonal high groundwater elevation, the less likely the basin will fail to drain in the 72-hour period following precipitation.

Determine soil infiltration rates using samples collected at the proposed location of the basin. Take one soil boring or dig one test pit for every 5,000 feet

of basin area, with a minimum of three borings for each infiltration basin. Conduct the borings or test pits in the layer where infiltration is proposed. For example, if the A and B horizons are to be removed and the infiltration will be through the C horizon, conduct the borings or test pits through the C horizon. MassDEP requires that borings be at least 20 feet deep or extend to the depth of the limiting layer.

For each bore hole or test pit, evaluate the saturated hydraulic conductivity of the soil, depth to seasonal high groundwater, NRCS soil textural class, NRCS Hydrologic Soil Group, and the presence of fill materials in accordance with Volume 3. Never locate infiltration basins above fill. Never locate infiltration basins in Hydrologic Soil Group "D" soils. The minimum acceptable final soil infiltration rate is 0.17 inches per hour. Design the infiltration basin based on the soil evaluation set forth in Volume 3.

If the proposed basin is determined to be in Hydrologic Soil Group "C" soils, incorporate measures in the design to reduce the potential for clogging, such as providing more pretreatment or greater media depth to provide additional storage. Never use the results of a Title 5 percolation test to estimate a saturated hydraulic conductivity rate, because it tends to greatly overestimate the rate that water will infiltrate into the subsurface.

Estimate seasonal high groundwater based on soil mottles or through direct observation when borings are conducted in April or May, when groundwater levels are likely to be highest. If it is difficult to determine the seasonal high groundwater elevation from the borings or test pits, then use the Frimpter method developed by the USGS (Massachusetts/ Rhode Island District Office) to estimate seasonal high groundwater. After estimating the seasonal high groundwater using the Frimpter method, re-examine the bore holes or test pits to determine if there are any field indicators that corroborate the Frimpter method estimate.

Stabilize inlet channels to prevent incoming flow velocities from reaching erosive levels, which can scour the basin floor. Riprap is an excellent inlet stabilizer. Design the riprap so it terminates in a broad apron, thereby distributing runoff more evenly over the basin surface to promote better infiltration.

At a minimum, size the basin to hold the required recharge volume. Determine the required recharge volume using either the static or dynamic methods set forth in Volume 3. Remember that the required storage volume of an infiltration basin is the sum of the quantity of runoff entering the basin from the contributing area and the precipitation directly entering the basin. Include one foot of freeboard above the total of the required recharge volume and the direct precipitation volume to account for design uncertainty. When applying the dynamic method to size the basin, use only the bottom of the basin (i.e., do not include side wall exfiltration) for the effective infiltration area.

Design the infiltration basin to exfiltrate in no less than 72 hours. Consider only the basin floor as the effective infiltration area when determining whether the basin meets this requirement.

Design the basin floor to be as flat as possible to provide uniform ponding and exfiltration of the runoff. Design the basin floor to have as close to a 0% slope as possible. In no case shall the longitudinal slope exceed 1%. Enhanced deposition of sediment in low areas may clog the surface soils, resulting in reduced infiltration and wet areas. Design the side slopes of the basin to be no steeper than 3:1 (horizontal: vertical) to allow for proper vegetative stabilization, easier mowing, easier access, and better public safety.

For basins with a 1% longitudinal slope, it will be necessary to incorporate cells into the design, making sure that the depth of ponded water does not exceed 2 feet, because sloped basin floors cause water to move downhill, thereby decreasing the likelihood of infiltration. Make lateral slopes flat (i.e., 0% slope).

After the basin floor is shaped, place soil additives on the basin floor to amend the soil. The soil additives shall include compost, properly aged to kill any seed stock contained within the compost. Do not put biosolids in the compost. Mix native soils that were excavated from the A or B horizons to create the basin with the compost, and then scarify the native

materials and compost into the parent material using a chisel plow or rotary device to a depth of 12 inches. Immediately after constructing the basin, stabilize its bottom and side slopes with a dense turf of water-tolerant grass. Use low-maintenance, rapidly germinating grasses, such as fescues. The selected grasses must be capable of surviving in both wet and dry conditions. Do not use sod, which can prevent roots from directly contacting the underlying soil. During the first two months, inspect the newly established vegetation several times to determine if any remedial actions (e.g., reseeding, irrigating) are necessary.

Never plant trees or shrubs within the basin or on the impounding embankments as they increase the chance of basin failure due to root decay or subsurface disturbance. The root penetration and thatch formation of the turf helps to maintain and may even enhance the original infiltration capacity. Soluble nutrients are taken up by the turf for growth, improving the pollutant removal capacity. Dense turf will impede soil erosion and scouring of the basin floor.

In place of turf, use a basin liner of 6 to 12 inches of fill material, such as coarse sand. Clean and replace this material as needed. Do not use loose stone, riprap, and other irregular materials requiring hand removal of debris and weeds.

Design embankments and spillways to conform to the regulatory guidelines of the state's Office of Dam Safety (302 CMR 10.00). Design infiltration basins to be below surrounding grade to avoid issues related to potential embankment failure. All infiltration basins must have an emergency spillway capable of bypassing runoff from large storms without damage to the impounding structure. Design the emergency spillway to divert the storm associated with brimful conditions without impinging upon the structural integrity of the basin. The brimful condition could be the required recharge volume or a design storm (such as the 2-year, 10-year, or 100-year storm if the basin is designed to provide peak rate attenuation in addition to exfiltration). The storm associated with the brimful conditions should not include the one foot of freeboard required to account for design uncertainty. Design the emergency spillway to shunt water toward a location where the water will not damage wetlands or buildings. A common error is to direct the spillway runoff toward an adjoining property not owned by an applicant. If the emergency spillway is designed to drain the emergency overflow toward an adjoining property, obtain a drainage easement and submit it to the Conservation Commission as part of the Wetlands NOI submission. Place vegetative buffers around the perimeter of the basin for erosion control and additional sediment and nutrient removal.

Monitoring wells: Install one monitoring well in the basin floor per every 5,000 square feet of basin floor. Make sure the monitoring well(s) extend 20 feet beneath the basin floor or to the limiting layer, whichever is higher.

Access: Include access in the basin design. The area at the top of the basin must provide unimpeded vehicular access around the entire basin perimeter. The access area shall be no less than 15 feet.

Inlet Structures: Place inlet structures at one longitudinal end of the basin, to maximize the flow path from the inlet to the overflow outlet. A common error is to design multiple inlet points around the entire basin perimeter.

Outlet structures: Infiltration basins must include an overflow outlet in addition to an emergency spillway. Whether using a single orifice or multiple orifices in the design, at a minimum, set the lowest orifice at or above the required recharge volume.

Drawdown device: Include a device to draw the basin down for maintenance purposes. If the basin includes multiple cells, include a drawdown device for each cell.

Fences: Do not place fences around basins located in Riverfront Areas, as required by 310 CMR 10.58(4)(d)1.d. to avoid impeding wildlife movement. In such cases, consider including a safety bench as part of the design.

Construction

Prior to construction, rope or fence off the area selected for the infiltration basin. Never allow construction equipment to drive across the area intended to serve as the infiltration basin.

Never use infiltration basins as temporary sediment traps for construction activities.

To limit smearing or compacting soils, never construct the basin in winter or when it is raining. Use light earth-moving equipment to excavate the infiltration basin because heavy equipment compacts the soils beneath the basin floor and side slopes and reduces infiltration capacity. Because some compaction of soils is inevitable during construction, add the required soil amendments and deeply till the basin floor with a rotary tiller or a disc harrow to a depth of 12 inches to restore infiltration rates after final grading.

Use proper erosion/sediment control during construction. Immediately following basin construction, stabilize the floor and side slopes of the basin with a dense turf of water-tolerant grass. Use low maintenance, rapidly germinating grasses, such as fescues. Do not sod the basin floor or side slopes. After the basin is completed, keep the basin roped or fenced off while construction proceeds on other parts of the site. Never direct construction period drainage to the infiltration basin. After construction is completed, do not direct runoff into the basin until the bottom and side slopes are fully stabilized.

Maintenance

Infiltration basins are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Installing the required pretreatment BMPs will significantly reduce maintenance requirements for the basin.

The Operation and Maintenance Plan required by Standard 9 must include inspections and preventive maintenance at least twice a year, and after every time drainage discharges through the high outlet orifice. The Plan must require inspecting the pretreatment BMPs in accordance with the minimal requirements specified for those practices and after every major storm event. A major storm event is defined as a storm that is equal to or greater than the 2-year, 24-hour storm (generally 2.9 to 3.6 inches in a 24-hour period, depending in geographic location in Massachusetts).

Once the basin is in use, inspect it after every major storm for the first few months to ensure it is stabilized and functioning properly and if necessary take corrective action. Note how long water remains standing in the basin after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging (such as upland sediment erosion, excessive compaction of soils, or low spots).
Thereafter, inspect the infiltration basin at least twice per year. Important items to check during the inspection include:

- Signs of differential settlement,
- Cracking,
- Erosion,
- Leakage in the embankments
- Tree growth on the embankments
- Condition of riprap,
- Sediment accumulation and
- The health of the turf.

At least twice a year, mow the buffer area, side slopes, and basin bottom. Remove grass clippings and accumulated organic matter to prevent an impervious organic mat from forming. Remove trash and debris at the same time. Use deep tilling to break up clogged surfaces, and revegetate immediately.

Remove sediment from the basin as necessary, but wait until the floor of the basin is thoroughly dry. Use light equipment to remove the top layer so as to not compact the underlying soil. Deeply till the remaining soil, and revegetate as soon as possible. Inspect and clean pretreatment devices associated with basins at least twice a year, and ideally every other month.

References:

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Center for Watershed Protection, http://www.stormwatercenter.net/Manual_Builder/Performance%20Criteria/Infiltration.htm

Center for Watershed Protection, Stormwater Management Fact Sheet, Infiltration Basin, http://www.stormwatercenter.net/Assorted%20Fact%20Sheets/Tool6_Stormwater_Practices/Infiltration%20Practice/Infiltration%20Basin.htm

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Leaching Catch Basins



Description: A leaching catch basin is pre-cast concrete barrel and riser with an open bottom that permits runoff to infiltrate into the ground. There are two configurations:

1. Stand-alone barrel/riser and
2. Barrel/riser combined with a deep sump catch basins that provides pretreatment.

80% TSS removal is awarded to the deep sump catch basin/leaching catch basin pretreatment combination provided the system is off-line.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	May provide some peak rate attenuation if sufficient number of leaching catch basins are provided to control 10-year storm
3 - Recharge	Provides groundwater recharge
4 - TSS Removal	80% TSS removal providing a deep sump catch basin is used for pretreatment and provided it is designed to be off-line
5 - Higher Pollutant Loading	May be used if 44% of TSS is removed with a pretreatment BMP prior to infiltration. For land uses that have the potential to generate runoff with high concentrations of oil and grease, an oil grit separator or equivalent may be required for pretreatment prior to discharge to the leaching catch basin. Infiltration must be done in compliance with 314 CMR 5.00.
6 - Discharges near or to Critical Areas	Not suitable except as terminal treatment for discharges to or near cold-water fisheries.
7 - Redevelopment	May be a good retrofit for sites with existing catch basins

Advantages/Benefits:

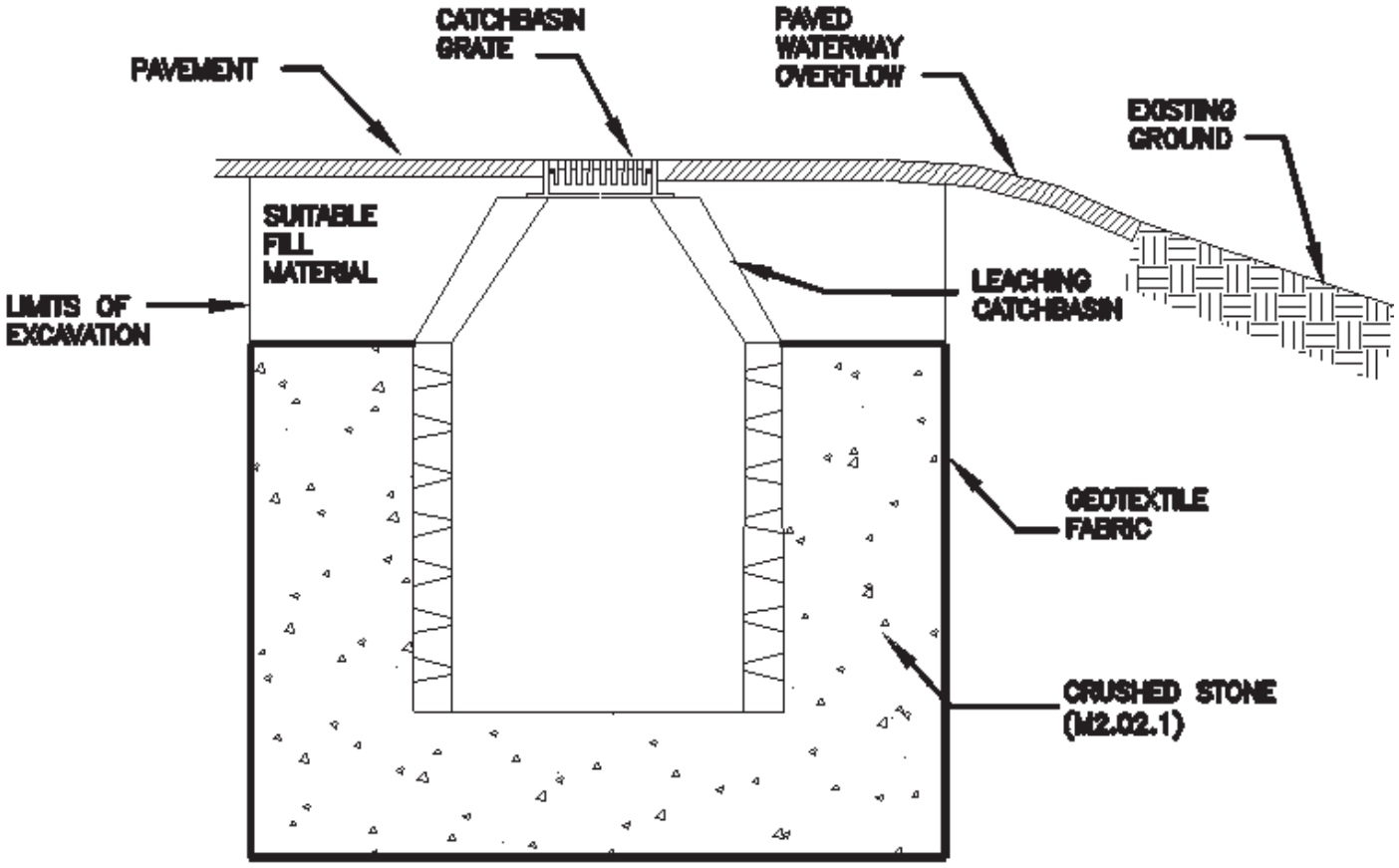
- Provide groundwater recharge.
- Remove coarse sediment

Disadvantages/Limitations:

- Need frequent maintenance. Can become a source of pollutants via resuspension if not properly maintained.
- Cannot effectively remove soluble pollutants or fine particles.
- Do not provide adequate treatment of runoff unless combined with deep sump catch basin
- Entrapment hazard for amphians and other small animals.

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS) — 80% if combined with deep sump catch basin and if designed to be off-line
- Nutrients (Nitrogen, phosphorus) — Insufficient data
- Metals (copper, lead, zinc, cadmium) — Insufficient data
- Pathogens (coliform, e coli) — Insufficient data



adapted from the MassHighway Department

Maintenance

Activity	Frequency
Inspect units and remove debris	Inspect annually or more frequently as indicated by structure performance
Remove sediment	When the basin is 50% filled
Rehabilitate the basin if it fails due to clogging	As needed

Special Features:

Use as off-line device

LID Alternative:

Reduce pervious areas
Bioretention areas and rain gardens

Leaching Catch Basins

Planning Considerations
Use leaching catch basins as off-line devices in areas with highly permeable soils. Provide for the safe overflow from these devices in severe storm events, or in the event of clogging of the soils surrounding the device. Because leaching catch basins discharge runoff to groundwater, do not use them in areas of higher potential pollutant loadings (such as gas stations) without adequate pretreatment such as an oil grit separator.

Design
Leaching catch basins are typically set in an excavation lined with a geotextile liner to prevent fine soil particles from migrating into the void spaces of the stone. The basin is placed on a pad of free-draining crushed stone, with the excavation around the basin back-filled with similar material. The base and barrel of the basin are perforated so that water entering the basin can enter the surrounding stone fill and infiltrate into the ground.

Use stone material with a void ratio of 0.39 or less. Make the depth to groundwater at least 2 feet below the bottom of the leaching catch basin. When designing structural components, design for dead and live loads as appropriate. Include provisions for overflows such as redundant devices and paved chutes.

The basin inlet cover is an important component. The openings must be no larger than 1 inch square to prevent coarse debris larger than 1 inch from entering the basin. The inlet grate must fit tightly into the underlying steel frame to prevent it from being dislodged by traffic. Do not weld the inlet grate to the underlying frame.

The riser section shall be mortared, grouted, gasketed, or otherwise sealed, to prevent exfiltration through the joint. Leaching catch basins shall contain no weep holes. Do not perforate the barrel section.

Make sure leaching catch basins contain no outlet pipes. The only pipe that is allowed in a leaching catch basin is an inlet pipe from an off-line deep sump catch basin paired with that leaching catch basin. Seal all pipe joints.

Construction
Install construction barriers around the excavation area to prevent access by pedestrians. Use diversions and other erosion control practices up-slope of the leaching catch basin to prevent runoff from entering the site before catch basins are complete. Stabilize the surrounding area and any established outlet. Put controls in place to prevent any drainage from being discharged to the leaching catch basin until the contributing drainage area is fully stabilized. Remove all temporary structures after the contributing drainage area and vegetation is stabilized.

Maintenance
- Inspect annually or more frequently as indicated by structure performance
- Remove sediment when the basin is 50% filled.
- Rehabilitate the basin if it fails due to clogging

Adapted from:
MassHighway. Storm Water Handbook for Highways and Bridges. May 2004.

BMP Accessories: Level Spreaders, Check Dams, Outlet Structures, Catch Basin Inserts

BMP accessories are not BMPs themselves but are required to facilitate the operation and function of BMPs. This section presents four of the most common and important BMP accessories: level spreaders, check dams, outlet structures, and catch basin inserts.

Level Spreaders

Description

A level spreader receives concentrated flow from channels, outlet structures, or other conveyance structures, and converts it to sheet flow where it can disperse uniformly across a stable slope. A level spreader is not a pollutant reduction device. It improves the efficiency of other BMPs, such as vegetated swales, filter strips, or infiltration systems that depend on sheet flow to operate properly.



Applicability and Planning Considerations

Level spreaders are used in wide, level areas where concentrated runoff occurs. They should be placed on undisturbed soil that has been stabilized with vegetation. Disturbed soils are more erodible. If the spreader is not absolutely level, flow will concentrate at the low point and may worsen erosion problems. Flows to the level spreader should be relatively free of sediment, or the level spreader could be quickly overwhelmed by sediment and lose its effectiveness.

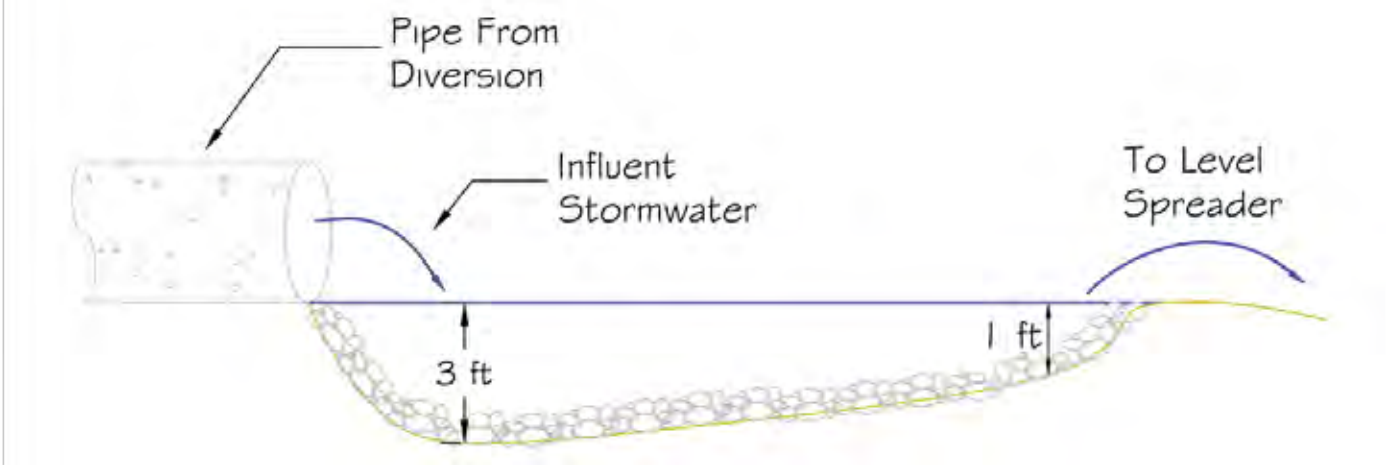
Design and Construction

Level spreaders are usually made of rocks, lumber, or concrete. Typical depths of flow behind each spreader range from 6 to 12 inches.

Construct level spreaders to be absolutely level. Small variations in height of even 0.25 inches can cause water to quickly concentrate and create erosion problems. A 4-inch variation in ground elevation across the entire length of the level spreader can make level construction difficult.

The height of the spreader is based on design flow, allowing for sediment and debris deposition. Design the length of the spreader based on the 10-year design flow for the site or the sheet flow path width, whichever is greater. When designing for the 10-year design flow, use the following table:

Level Spreader



adapted from the North Carolina State University

Drainage Area	Minimum spreader length
1 acre	10 feet
2 acres	10 feet
3 acres	15 feet
4 acres	18 feet
5 acres	20 feet

The slope leading to the level spreader should be less than 1% for at least 20 feet immediately upstream, to keep runoff velocities less than 2 feet per second during the 10-year storm event. The slope at the outlet of the spreader should be 6% or less.

Maintenance

Inspect level spreaders regularly, especially after large rainfall events. Note and repair any erosion or low spots in the spreader.

Adapted from:
Idaho Department of Environmental Quality. Catalog of Stormwater BMPs for Cities and Counties, 209-210.
MassDEP, Massachusetts Nonpoint Source Pollution Management Manual, 2006.
http://www.mass.gov/dep/water/laws/policies.htm#storm
Additional Resources:
Hunt, W.F. et al. Designing Level Spreaders to Treat Stormwater Runoff. North Carolina State University, as presented at North Carolina Department of Transportation Level Spreader Workshop, February 19, 2001, Raleigh, NC.

Check Dams

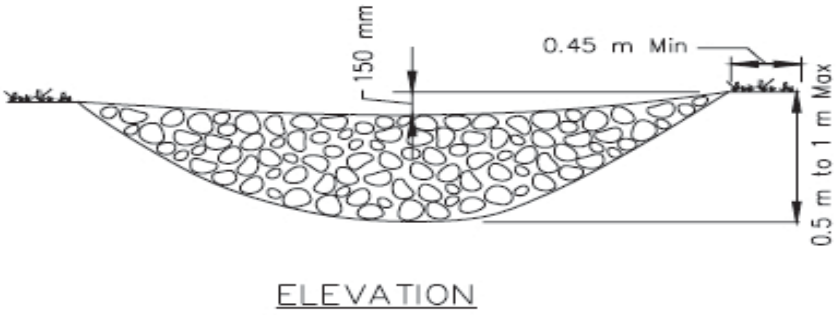
Description

A check dam is a small dam constructed across a drainage ditch, swale, or channel to lower the velocity of flow. Reduced runoff velocity reduces erosion and gullying in the channel and allows sediments to settle out. A check dam may be built from stone, sandbags (filled with pea gravel), logs, or concrete. Check dams are relatively easy and inexpensive to construct. Permanent check dams should be constructed from stone or concrete. Sandbag dams filled with pea gravel or logs are suitable only as temporary practices. Never use a filter fence or a hay bale as a check dam, either on a temporary or permanent basis.

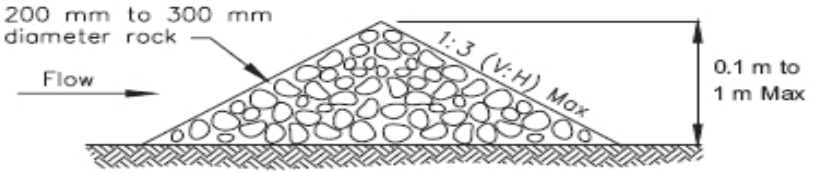


Applicability

Use check dams where temporary channels or permanent channels are not yet vegetated, channel lining is infeasible, where velocity checks are needed, or to induce stormwater exfiltration into the ground within a BMP such as a dry water quality swale. Check dams may also be used as a temporary or emergency measure to limit erosion by reducing flow in small open channels. Other uses for



ELEVATION



TYPICAL ROCK CHECK DAM SECTION

CHECK DAM
NOT TO SCALE

adapted from Caltrans Stormwater Handbooks

check dams include:

- To reduce flow in small temporary channels that are presently undergoing degradation,
- Where permanent stabilization is impractical due to the temporary nature of the problem,
- To reduce flow in small eroding channels where construction delays or weather conditions prevent timely installation of non-erosive liners.

Check dams can be installed in small open channels that drain 10 acres or less, or channels where stormwater velocities exceed 5 feet per second. Note that some BMPs such as grass channels require flows to not exceed 1 foot per second for the water quality volume. Check dams cause water to pond. Under low-flow situations, water ponds behind the structure and then slowly seeps through the check dam and/or exfiltrates into the underlying soil, depending on the soil permeability. Under high-flow situations, water flows over and/or through the structure.

Advantages

- Inexpensive and easy to install.
- Reduces velocity and may provide aeration of the water.
- Prevents gully erosion from occurring before vegetation is established, and also causes a high proportion of the sediment load in runoff to settle out.
- In some cases, if carefully located and designed, check dams can remain as permanent installations with very minor regrading, etc.
- They may be left as either spillways, in which case accumulated sediment would be graded and seeded, or as check dams to capture sediment coming off that site.
- They must be constructed in dry water quality swales to reduce velocity and induce exfiltration.

Disadvantages

- May kill grass linings in channels if the water level remains high after rainstorms or if there is significant sedimentation.
- Clogging by leaves in the fall may be a problem.
- Should not be used in live streams
- Promotes sediment trapping but resuspension can occur during subsequent storms
- Require extensive maintenance following high velocity flows
- Should not be made from straw bales or silt fences

Design

Install check dams at a distance and a height to allow small pools to form behind them. Install the first check dam about 15 feet from the outfall device and at regular intervals after that, depending on slope and soil type. In multiple check dam installations, design the system so that backwater from the downstream check dam reaches the toe of the next upstream dam. High flows (typically a 2-year or larger storm) should flow over the check dam without increasing upstream flooding or damaging the dam. Form check dams by hand or mechanically. Never dump rock directly into the channel or swale. Rock check dams should consist of well-graded stone consisting of a mixture of rock sizes.

When used in dry water quality swales, the height of the check dam shall be no less than the elevation associated with the Water Quality Volume (1/2 inch or 1-inch times contributing impervious surface).

Exercise care in designing the ends of a check dam to ensure that it is long enough and adequately anchored to prevent ponded water from scouring the soil at the ends, and flowing around the dam.

Some check dam designs may require weirs. For example, if the same check dam is used for water quality treatment (for the water quality volume), and to lag the peak rate of runoff (for the velocity associated with runoff from the 2-year storm), a weir must be included as part of the check dam design. In instances where a permanent check dam is to be used for both water quality treatment and lag peak flows with a weir, use a durable material such as concrete. If the check dam is constructed from stone such as pea gravel, the weir would most likely lose its shape when higher velocities occur.

Maintenance

Inspect check dams after every significant rainfall event. Repair damage as needed. Remove sediment as needed.

Adapted from:

Caltrans, Storm Water Quality Handbooks. Section 4. SC-4 P.

MassDEP, Massachusetts Nonpoint Source Pollution Management Manual, 2006.

http://www.mass.gov/dep/water/laws/policies.htm#storm

OUTLET STRUCTURES

Description

Outlets of BMPs are devices that control the flow of stormwater out of the BMP to the conveyance system.

Outlet Protection Design in Relation to Receiving Wetlands

This section describes the various types of common outlets such as flared end structures, risers, single-stage outlets, and multi-stage outlets. Considerations include setting back the outlet from a brook, providing appropriate energy dissipation, and orientating the outlet to reduce scour effects on the opposite bank.

Alignment of Outlets into Regulatory Streams

The Wetlands and 401 regulations require that stormwater treatment be provided prior to discharge into wetland resource areas such as vegetated wetlands (BVW, IVW, salt marshes), land under water (streams, lakes, rivers, ponds, ocean), and other resource areas, except for Riverfront Areas ILSF, BLSF, and land subject to coastal zone flowage, where such practices may be sited, provided the structures meet the performance standards specified in the Wetland regulations applicable to all projects.

The impact of new pipe outfalls on wetlands can be significantly reduced by locating the outfall point back from the receiving stream, using a flared-end structure, installing riprap or bio-engineered splash pad, and either digging a channel from the outfall to the stream or designing the splash pad to act as a level spreader to sheet the discharged stormwater to the stream.

In addition to not placing the outfall and energy dissipation in a wetland resource area such as a BVW or LUW, care must be exercised in the outlet design to ensure its orientation is such to reduce scour at the entry point and opposite bank. The preferred approach is to end the outlet pipe at a headwall or flared-end structure with a riprap or bio-engineered splash pad, discharging to a manmade drainage swale that is aligned at no more than a 45 degree angle to a stream channel. Design the outlet point and riprap or bio-engineered splash pad to reduce the energy sufficiently to eliminate a need to install riprap on the bank opposite the outfall point to protect it from scour.



References for BMP Accessories:

Note that sections of the Massachusetts Stormwater Update were adapted from a variety of manuals, checklists and other references in the public domain previously developed by other states and federal agencies, including:

Caltrans, Storm Water Quality Handbooks. 2003. (http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm)

Connecticut Department of Environmental Protection. Connecticut Stormwater Quality Manual. 2004. (http://dep.state.ct.us/wtr/stormwater/strmwtrman.htm)

Idaho Department of Environmental Quality. Catalog of Stormwater BMPs for Cities and Counties. March 2003. (http://www.google.com/u/DEQ?q=stormwater&domains=www.deq.idaho.gov&sitesearch=www.deq.idaho.gov)

Maine Department of Environmental Protection. Maine Stormwater Best Management Practices Manual. January 2006. (http://www.maine.gov/dep/blwq/docstand/stormwater/stormwaterbmps/index.htm)

Maryland Department of the Environment. Maryland Stormwater Design Manual, Volumes I and II, October 2000. (http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.asp)

New Jersey Department of Environmental Protection. New Jersey Stormwater Best Management Practices Manual. April 2004. http://www.state.nj.us/dep/stormwater/bmp_manual2.htm

U.S. Department of Transportation. Federal Highway Administration. Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring. (Undated). (http://www.fhwa.dot.gov/environment/ultraurb/index.htm)

U.S.Environmental Protection Agency. Office of Research and Development. The Use of Best Management Practices (BMPs) in Urban Watersheds. EPA/600/R-04/184. September 2004.

Vermont Agency of Natural Resources. The Vermont Stormwater Management Manual. April 2002. (http://www.vtwaterquality.org/stormwater.htm)

Catch Basin Inserts

Description

Catch Basin Inserts are a BMP accessory recently developed to add filtering efficiency to traditional catch basins. These proprietary BMPs are capable of removing a range of pollutants, from trash and debris to fine sediments and oil/grease and metals depending upon the filtering medium used. They typically have three components:

- an insert that fits in into the catch basin
- absorbent material (can be a single unit or a series of filters)
- a housing to hold the absorbent material



Applicability and Planning Considerations

Catch Basin Inserts can be useful for specialized applications, such as targeting specific pollutants other than TSS, at Land Uses with Higher Potential Pollution Loads, for oil control at small sites, for retrofits of existing catch basins with no or undersized sumps, to add TSS capability to areas with higher sediment loading, or to improve existing conditions at size-constrained sites (e.g., catch basins near bathing beaches).

If using a proprietary Catch Basin Insert, the manufacturer's specifications must be followed, which may include modifications to the catch basin. Such modifications may include a high flow bypass or other feature to handle clogging or larger storm events.

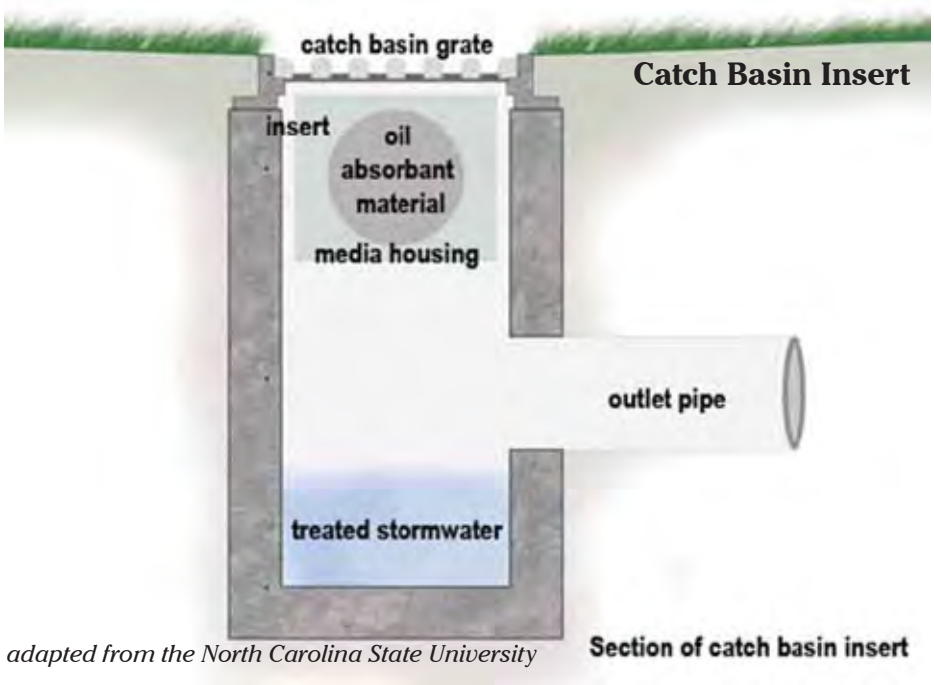
Catch Basin Inserts are typically designed for and used for smaller volume applications. Additionally, larger sized sediment can clog and significantly reduce the effectiveness of some Catch Basin Insert filtering media. Therefore it is important to ensure that flow rates, sediment removal, and the frequency of inspection and maintenance are evaluated.

Design and Construction

Since Catch Basin Inserts are usually proprietary devices, the manufacturer should be asked to ensure that the device will work in the type of catch basin in which it is installed. Flow characteristics and sediment loading should be evaluated and any resulting modifications to the catch basin made before installation of the insert.

Maintenance

Inspect Catch Basin Inserts per the manufacturer's schedule, and especially after large rainfall events. Whoever is responsible for maintenance should explicitly agree to conduct the maintenance per the manufacturer's recommendation and to lawfully dispose of the cleanings or used filtration media.



adapted from the North Carolina State University

Appendix C

Stormwater Management Review Reports

Name:	Date:	
General Notes/Comments: (Describe weather and general drainage system conditions)		
Structure	Current Condition	Maintenance Performed
Vegetative Filter Strip:		
Review (Grass height, sediment, and debris)		
Drainage Channels:		
Review (Vegetated condition, sediment, and debris)		
Grassed Channels:		
Review (Vegetated condition, sediment, and debris)		
Catch Basin/Manhole:		
Review (Overall structure conditions, hood, sediment depth, and debris)		
Leaching Basin:		
Review (Overall structure condition, sediment depth, and debris)		
Infiltration Trench:		
Review (Signs of effective operation, sediment, and debris)		
Infiltration Basins:		
Review (Grass height, sediment, debris, signs of effective operation)		
Proprietary Separator:		
Review (Oil depth and debris)		
Outlets/Headwalls:		
Review (Structure integrity and debris)		
Pipes/Open Box Culvert:		
Review (structural integrity, silting, and clogging)		

APPENDIX G

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



1/15/2020

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): _____

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 H

U.S. Army Corps of Engineers Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: New Bedford Regional Airport City/County: New Bedford Sampling Date: 11/15/19

Applicant/Owner: New Bedford Regional Airport State: MA Sampling Point: DP-AW

Investigator(s): R. Sommers Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave

Slope (%): 0% Lat: see location description below Long: Datum:

Soil Map Unit Name: Freetown muck, 0 to 1 percent slopes NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	If yes, optional Wetland Site ID: Wetland Series A

Remarks: (Explain alternative procedures here or in a separate report.)

Data plot was conducted approximately 5 feet downgradient of Wetland Flag A-2.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓	No ____	Depth (inches): 6" (in pockets)
Water Table Present?	Yes ✓	No ____	Depth (inches): 0"
Saturation Present? (includes capillary fringe)	Yes ✓	No ____	Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: DP-AW

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	80	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	80	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1. Clethra alnifolia	20	Y	FAC
2. Cornus amomum	15	Y	FACW
3. Euonymus alatus	2	N	NL
4. Quercus rubra	5	N	FACU
5. Acer rubrum	15	Y	FAC
6.			
7.			
	57	= Total Cover	
Herb Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.	0		
		= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1. Rosa multiflora	5	Y	FACU
2.			
3.			
4.			
	5	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP-AW

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16"	10YR 2/1	100					muck	hydrogen sulfide odor

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ✓ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: New Bedford Regional Airport City/County: New Bedford Sampling Date: 11/15/19

Applicant/Owner: New Bedford Regional Airport State: MA Sampling Point: DP-AU

Investigator(s): R. Sommers Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): flat Local relief (concave, convex, none): none

Slope (%): 0% Lat: see location description below Long: Datum:

Soil Map Unit Name: Freetown muck, 0 to 1 percent slopes NWI classification: N/A (upland)

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	If yes, optional Wetland Site ID: ____
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ✓	Depth (inches): ____
Water Table Present?	Yes ____	No ✓	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ✓	No ____	Depth (inches): 14"

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: DP-AU

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Frangula alnus	5	Y	FAC
2. Acer saccharum	5	Y	FACU
3. Cornus amomum	2	N	FACW
4. Rubus ideaus	2	N	FACU
5. Prunus pensylvanica	3	N	FACU
6. Quercus rubra	10	Y	FACU
7. Lonicera tatarica / Berberis thunbergii	5 / 5	Y / Y	FACU / FACU
	37 = Total Cover		
Herb Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Rosa multiflora	10	Y	FACU
2. Celastrus orbiculatus	10	Y	UPL
3.			
4.			
	20 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP-AU

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-14"	10YR 2/2	100					SL	
14-17"	10YR 4/4	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
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[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No ✓

Remarks:

Attachment I

NHESP Proof of Mailing

Express

Align top of Fed

ORIGIN ID:AYEA (978) 897-7100
RHIANNA SOMMERS
EPSILON ASSOCIATES
3 CLOCK TOWER PLACE
SUITE 250
MAYNARD, MA 01754
UNITED STATES US

SHIP DATE: 22JAN20
ACTWGT: 1.00 LB MAN
CAD: 0804148/CAFE3311

BILL SENDER

TO NATURAL HERITAGE & ENDANGERED SPEC
DIVISION OF FISHERIES & WILDLIFE
1 RABBIT HILL ROAD

WESTBOROUGH MA 01581

REF: 5639

565C2/9F82/0582

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