DOCUMENT A00840

MASSACHUSETTS
Department of Environmental Protection

Water Quality Certificate Application

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Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Monica Tibbits-Nutt, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

massDOT
Massachusetts Department of Transportation
Highway Division

April 6, 2025
Heidi Davis
Massachusetts Department of Environmental Protection
Wetlands Program
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Water Quality Certification Application:
Reconstruction of Route 38 (Main Street)
From Route 62 to the Woburn City Line
Including Replacement of Bridge No. W-38-011,
Route 38 over Maple Meadow Brook
Wilmington, MA MassDOT Project 608051
BRP WW 09 Minor Dredging Projects
BRP WW 10 Major Fill/Excavation Projects

Dear Ms. Davis,

The Massachusetts Department of Transportation – Highway Division (MassDOT) is submitting this Water Quality Certification application for Major Fill/Excavation (BRP WW 10) and Dredge (BRP WW 08) for the proposed Reconstruction of Route 38 (Main Street) from Route 62 to the Woburn city line including replacement of Bridge No. W-38-011, Route 38 over Maple Meadow Brook.

The proposed project will permanently impact approximately 2,380 square feet, and temporary impacts to 710 square feet of Waters of the United States; the project will also result in permanent impacts to 3,292 square feet and temporary impact to 2,842 square feet of vegetated wetlands. Additionally, dredging of 715 Cubic Yards, and filling of 715 Cubic Yards is required for the proposed work within the channel of Maple Meadow Brook and the Unnamed Intermittent Stream. Therefore, this project requires a 401 Water Quality Certification (WQC) and authorization under Section 404 of the Clean Water Act (CWA).

A Notice of Intent has been submitted to the Wilmington Conservation Commission under the Wetlands Protection Act for the roadway work associated with the project. An Order of Conditions (OOC) for the project (DEP File No. 344-1566) will be forthcoming by the Wilmington Conservation Commission.

The bridge replacement is the functional equivalent and in similar alignment to the existing bridge. This 401 WQC is being filed for the entire Reconstruction of Route 38 project, between Route 62 to the Woburn City Line, including the Replacement of Bridge No. W-38-011 which falls under the MassDOT bridge exemption as specified in the 2014 Transportation Bond Bill. A Pre-Construction Notification application will be submitted to the Army Corps for authorization under Section 404 of the Clean Water Act, GP No. 23 (Linear Transportation Projects and Wetland/Stream Crossings), for impacts associated with both roadway and bridge replacement work.

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
mass.gov/massdot

A pre-application meeting for this project was held with the Massachusetts Department of Environmental Protection (MassDEP) and the Army Corps of Engineers on January 10, 2025. The project proponent hereby certifies that all information contained herein is true, accurate, and complete to the best of my knowledge and belief. The project proponent hereby requests that the certifying authority review and take action on this CWA 401 certification request within the applicable reasonable period of time.

If you require any additional information regarding the subject project, please contact me at (857) 268-1729 or by email at erica.n.larner@dot.state.ma.us.

Sincerely,

Erica Larner
Wetlands & Water Resources Coordinator
MassDOT Highway Division, Environmental Services

Cc: Eamon Kernan, PM, MassDOT
Dan Vasconcelos, United States Army Corps of Engineers
Ryan Hale, MassDEP
Melissa Lenker, Wetlands and Water Resources Supervisor, MassDOT
Wilmington Conservation Commission

Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Monica Tibbits-Nutt, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

massDOT
Massachusetts Department of Transportation
Highway Division

April 6, 2025

Dan Vasconcelos
Regulatory Division
Department of the Army
New England District, Corps of Engineers
696 Virginia Road
Concord, MA 01742

RE: Pre-Construction Notification Application
Reconstruction of Route 38 (Main Street)
From Route 62 to the Woburn City Line
Including Replacement of Bridge No. W-38-011,
Route 38 over Maple Meadow Brook
Wilmington, MA MassDOT Project 608051

Dear Mr. Vasconcelos,

The Massachusetts Department of Transportation – Highway Division (MassDOT) is submitting this Pre-Construction Notification Application for the proposed Reconstruction of Route 38 (Main Street) from Route 62 to the Woburn city line including replacement of Bridge No. W-38-011, Route 38 over Maple Meadow Brook.

The proposed project will permanently impact approximately 2,380 square feet, and temporary impacts to 710 square feet of Waters of the United States; the project will also result in permanent impacts to 3,292 square feet and temporary impact to 2,842 square feet of vegetated wetlands. Additionally, dredging of 715 Cubic Yards, and filling of 715 Cubic Yards is required for the proposed work within the channel of Maple Meadow Brook and the Unnamed Intermittent Stream. Therefore, this project requires a 401 Water Quality Certification (WQC) and authorization under Section 404 of the Clean Water Act (CWA), for impacts associated with both roadway and bridge replacement work. The project is expected to qualify under MAGP No. 23 (Linear Transportation Projects and Wetland/Stream Crossings). A WQC for Minor Dredging (WW BRP 09) and Major Fill/Excavation (WW BRP 10) is being filed concurrently with MassDEP.

A pre-application meeting for this project was held with the Massachusetts Department of Environmental Protection (MassDEP) and the Army Corps of Engineers on January 10, 2025.

If you require any additional information regarding the subject project, please contact me at (857) 268-1729 or by email at erica.n.larner@dot.state.ma.us.

Sincerely,

Erica Larner
Wetlands & Water Resources Coordinator

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MassDOT Highway Division, Environmental Services

Cc: Eamon Kernan, PM, MassDOT
Heidi Davis, MassDEP
Ryan Hale, MassDEP
Melissa Lenker, Wetlands and Water Resources Supervisor, MassDOT
Wilmington Conservation Commission

Attachments: 404 PCN Application

JOINT APPLICATION FOR 401 WATER QUALITY CERTIFICATION
AND 404 PRE-CONSTRUCTION NOTIFICATION

Reconstruction of Route 38 (Main Street) From Route 62 to the Woburn City Line Including Replacement of Bridge No. W-38-011, Route 38 over Maple Meadow Brook Wilmington, Massachusetts

MassDOT Contract No. 608051

Prepared for

Massachusetts Department of Transportation

April 10, 2025

Prepared by

GREEN
A Lochner Company

Building Strong Client Relationships Through Engineering Excellence

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WATER QUALITY CERTIFICATION AND ACOE PCN FORMS

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs

Department of Environmental Protection
100 Cambridge Street 9th Floor Boston, MA 02114 • 617-292-5500

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

WW26 - Combined Licenses/Permits for Waterways and Water Quality Certification Application

Permittee Information

Name: Erica Larner
Phone: (857) 268-1729
Address: 10 PARK PLAZA, ROOM 7360 (MASSDOT HIGHWAY DIVISION)
BOSTON, MA 02116

Permittee Company Information

Name: Green International Affiliates, Inc.
Oxana Fartushnaya
Phone: (978) 923-0400
Address: 100 AMES POND DRIVE, SUITE 200
TEWKSBURY, MA 01876

Application Submitter Information

Name: JOSHUA WARD
Phone: (978) 923-0400
Address: 100 AMES POND DR., SUITE 200
TEWKSBURY, MA 01876

Location Information

Maple Meadow Brook, Unnamed Intermittent Stream
0 ROUTE 38 WILMINGTON, MA 01877
Latitude: 42.537482
Longitude: 71.160633

Pre-Consultation Information

Have you consulted with MassDEP about the combined application process?	Yes
Date you consulted with MassDEP	01/10/2025

Application Information

Please select the 401 Water Quality Certification for Dredging Application (if applicable)	WW08 - 401 Minor Dredging - Minor < 5000 cubic yards
Please select the 401 Water Quality Certification for Fill/Excavation Application (if applicable)	WW10 - 401 Major Fill and Excavation - Major >= 5000 square feet

Other Primary Location Info

Parcel ID	N/A
Municipality	WILMINGTON

Project Location Info

Will the project occur in multiple municipalities?	No

Additional Project Sites

Municipality	Description
WILMINGTON	Maple Meadow Brook, 42.537482, -71.160633
WILMINGTON	Unnamed Intermittent Stream, 42.544003, -71.170888

Pre-Application Information

Has the DEP Agency specified that you are exempt from this process?	No
Has the project's Sampling Analysis Plan been approved by the DEP Agency? If yes, please attach a document 'DEP Sampling Analysis Plan' in the document section.	Yes

Project Information

Project Name	Reconstruction of Route 38 (Main Street), from Route 62 to the Woburn City Line, Wilmington, MA (MassDOT Project No. 608051)
Have you completed the Public Notice as per 314 CMR 9.00? If yes, please attach a completed ‘Proof of Public Notice’ document in the document section.	No
Will the proposed project occur in any wetlands or waters designated as 'Outstanding Resource Waters'?	No

Identify the loss, or alteration, in square feet for Land under water	3090
Identify the loss, or alteration, in square feet for Other Resources	6134

Material to be Dredged

Briefly describe in general the proposed project or activity, including the purpose and intended use of the project, and the duration of the work within any waterbody	This Joint Application for 401 Water Quality Certification (WQC) and 404 ACOE Pre Construction Notification (PCN) has been prepared on behalf of the Massachusetts Department of Transportation, Highway Division (MassDOT) for the Reconstruction of Route 38 (Main Street) in the Town of Wilmington from Route 62 to the Woburn city line for a total project length of approximately 2.1 miles (MassDOT Project No. 608051). The project will also include the replacement of Bridge No. W-38-011 carrying Route 38 over Maple Meadow Brook. The Town of Wilmington will fund water system improvements along part of the corridor, while the rest of the project is being funded by MassDOT. The purpose of the project is to improve the roadway infrastructure, reduce traffic back-ups on entering side streets, improve the existing drainage system, and provide increased safety for all roadway users, including drivers, bicyclists and pedestrians; and thereby promote the commercial and residential development along the Route 38 corridor. Roadway reconstruction and safety improvement along Route 38's present alignment and intersections are required to reduce the number of accidents that presently occur at the main cross street intersections. The replacement of the existing Bridge No. W-38-011, which carries Route 38 over Maple Meadow Brook, is needed due to its structural deficiency, age and due to scour making it difficult to locate the bridge abutments. The proposed project will permanently impact approximately 2,380 square feet, and temporarily impact 710 square feet of Waters of the United States; the project will also result in permanent impacts to 3,292 square feet and temporary impact to 2,842 square feet of vegetated wetlands. Additionally, dredging of 715 Cubic Yards, and filling of 715 Cubic Yards is required for the proposed work within the channel of Maple Meadow Brook and the Unnamed Intermittent Stream. Therefore, this project requires a 401 Water Quality Certification (WQC) and authorization under Section 404 of the Clean Water Act (CWA). A Notice of Intent has been submitted to the Wilmington Conservation Commission under the Wetlands Protection Act for the roadway work associated with the project. An Order of Conditions (OOC) for the project (DEP File No. 344-1566) will be forthcoming by the Wilmington Conservation Commission. In accordance with the Massachusetts Transportation Bond Bill of 2014, a portion of the project between approximate Sta. 252+50 to Sta. 255+00 associated with the replacement of the Bridge No. W-38-011, carrying Route 38 over Maple Meadow Brook, is exempt from review under the Massachusetts Wetlands Protection Act (M.G.L. c.131 §40) and its implementing regulations (310 CMR 10.00), Massachusetts Environmental Policy Act Regulations (301 CMR 11.00) and the Chapter 91 Waterways Regulations (310 CMR 9.00). The bridge replacement is the functional equivalent and in similar alignment to the existing bridge. This 401 WQC is being filed for the entire Reconstruction of Route 38 project, from Route 62 to the Woburn City Line, including the Replacement of Bridge No. W-38-011. A Pre-Construction Notification application will be submitted to the Army Corps for authorization under Section 404 of the Clean Water Act, GP No. 23 (Linear Transportation Projects and Wetland/Stream Crossings), for impacts associated with both roadway and bridge replacement work. This project consists of maintenance and improvement of an existing roadway (including widening of less than a single lane, improvements to existing drainage systems and repaving). As the proposed project is a roadway project, which is increasing in impervious area by less than one lane, it is therefore categorized as a "Redevelopment Project" under the Massachusetts Stormwater Management Standards. This project has been designed to meet the Massachusetts Stormwater Management Standards to the maximum extent practicable.
Proposed Start Date	11/15/2025
What is the expected frequency of maintenance dredging of this project?	N/A

Length of the proposed project (If applicable, please include the maximum and minimum)	185' (total sum for culvert and bridge)
Width of the proposed project (If applicable, please include the maximum and minimum)	3.5' (minimum); 59' (maximum)
Depth of the proposed project (If applicable, please include the maximum and minimum)	8' (maximum)
Volume of the proposed project(Cubic yards)	715 CY
Type of proposed project	Improvement dredging
Briefly describe the physical dredging operation (such as., dredging methods), the method of release of the dredged material into the disposal site, and the name of the contractor if other than the applicant. (Please attach a detailed document - "Dredging and Disposal Operation" in the document section of the application)	Construction means and methods will ultimately be determined by the project contractor. Excess material will be disposed of at the State designated disposal upland site as needed. There will be no ocean disposal.
Briefly describe all measures designed to avoid and minimize adverse impacts of the project on aquatic life and the aquatic ecosystem. Where impacts cannot be avoided or minimized, what mitigation measures are proposed? (If necessary, please attach a document - "Performance Standard to avoid and minimize and mitigate impact" in the document section of the application)	The extent of dredging will not exceed that reasonably necessary to accommodate the need for substructure replacement. The design and timing of dredging and dredged material disposal activity will minimize impacts on aquatic life and the aquatic ecosystem to the maximum extent feasible. The disturbed areas will be restored upon completion of construction. A natural streambed will be restored as part of the structure replacements. Channel armoring for scour protection will be fully covered with a layer of natural streambed material. The reestablished natural streambed will match existing invert elevations. For work within the water, a floating silt fence will be installed surrounding each segment of work to capture any potential debris resulting from the proposed substructure work. The floating silt fence will remain in place surrounding the sections of work until the work being performed in each segment is complete, and then the slit fence will be removed and reset for the next work zone. During construction, sediment control barriers will be installed on both sides of the structures to protect the adjacent resource areas. The erosion controls will be maintained in good condition until on-site soils are stabilized.
Does the proposed project have any past history of chemical or oil spills of discharge?	Yes
Does the proposed project have any past history of Upstream or on-site industrial or municipal discharge within 1,000 feet of the proposed project?	No
Does the proposed project have any past history of chronic pollutant loading from port or harbor use and/or other sources of pollutants? (eg. CSO or POTW discharges)	No

Please provide as much historical information as you have, including dates, amounts, concentrations, etc. of such spills or discharge. If necessary, please attach a document - "Due diligence Review".	See "Due Diligence Review" document in the Attachments. Soil to be removed from the project area shall not be assumed to be uncontaminated and must be evaluated prior to off-site management for potential contamination with hazardous materials. Quantities for soil disposal are based on the project design, existing knowledge of soil contamination in the project area, the presence of known risk factors for soil contamination in the project area, and the designer's best professional judgment. Any stockpiling of soil must be performed in compliance with Policy Directive P-22-001, Off-Site Stockpiling of Soil from MassDOT Construction Projects. This directive limits the allowable locations for off-site stockpiling of soil generated during MassDOT projects and includes various requirements that must be satisfied by the contractor prior to off-site stockpiling.

Proposed Ocean Site

Location of proposed disposal site and its physical boundaries	When suitable, dredged materials will be reused as structural fill on site to the maximum extent practicable. Excess material will be disposed of at the State designated disposal upland site as needed. There will be no ocean disposal.
Has the site been designated by the State or E.P.A. as a dredge disposal site?	No
If no, give a brief description of the characteristics of the proposed disposal site and an explanation as to why no currently designated site is feasible for this project.	The extent of dredging will not exceed that reasonably necessary to accommodate the need for replacing the bridge and culvert crossing. The design and timing of dredging and dredged material disposal activity will minimize impacts on aquatic life and the aquatic ecosystem to the maximum extent feasible. The disturbed areas will be restored upon completion of construction. All structures will have natural stream bottoms to restore existing conditions.
Is the anticipated disposal site located within a designated ocean sanctuary as established by federal law or G.L.c. 132A, sec. 13?	No

Disposal/Dewatering Land Site

Location of proposed disposal and dewatering sites and physical boundaries	Dewatering of excavated stream bed materials shall take place on an impervious surface within or near the project site. Material will be stockpiled at the construction staging area and reused as fill when suitable. Areas of temporary storage and dewatering of excavated riverbed materials should only be in use for the duration of this project. It is expected that much of the material will be re-used at the site as fill. The dewatering site will not be used for any future project. It will be the Contractor's responsibility to design, install, operate, and remove the temporary dewatering measures. The Contractor will be expected to perform this work in accordance with MassDOT Special Provisions for Control of Water for each structure. The Contractor must treat dewatering discharges, prior to outletting these flows to local waterways, for removal of sediments. This will be done by use of sediment tanks, fractionalization tanks, sediment basins, or other approved means, sized to handle anticipated flows pumped from the work areas for the footings. Outlets from these treatment measures will discharge onto splash pads or other measures that will prevent concentrated flows that could erode bank soils or streambed materials enroute to the receiving watercourse.

Indicate drainage characteristics of dewatering and disposal sites from the results of test pits, borings, and percolation tests as applicable	Material will be stockpiled at a construction staging areas and reused as fill on site when found to be suitable.
How long are the dewatering and disposal sites estimated to be in use from this project?	Areas of temporary storage and dewatering of excavated river bed materials should only be in use for 2 construction seasons. It is expected that much of the material will be re-used at the site as fill if found to be suitable. The site will not be used for any future project.

Proposed Barge Site

Are you proposing dewatering of dredged sediment on a barge? If yes, please attach a document 'Plans for adequate containment' in the document section.	No

Grain Size Analysis

Number of Sieve	Percentage of total by weight passing
4	97.2
10	95
40	84.1
60	76.6
200	29.1
4	75.2
10	53.9
40	10.6
60	3.6
200	0.8

Chemical Analysis of Sediment

Average Concentration (In ppm)
9.51 (SS-1)
ND - 0.10 MRL (SS-1)
11.3 (SS-1)
8.5 (SS-1)
11.6 (SS-1)
0.013 (SS-1)
8.82 (SS-1)
21.6 (SS-1)
P, LC 0.00081 (SS-1)
Not Tested (SS-1)
Not Tested (SS-1)
19.0 (SS-1)
0.505 (SS-1)
Not Included (SS-1)
2.31 (SS-2)
ND – 0.10 MRL (SS-2)
11.4 (SS-2)
12.9 (SS-2)
18.9 (SS-2)
ND – 0.009 MRL (SS-2)
6.93 (SS-2)
66.2 (SS-2)
0.00078 (SS-2)
Not tested (SS-2)
Not tested (SS-2)
32.7 (SS-2)
1.11 (SS-2)
Not Included

Additional Information

Is your project subject to U.S. Army Corps of Engineers – Section 404 of Federal Clean Water Act? If yes, please attach a document 'USACE Authorization' in the document section.	Yes
USACE File Number	TBD - Pending
Is your project subject to Massachusetts Environmental Policy Act (MEPA)? If yes, application cannot be submitted until 1) the MEPA process is completed and 2) a Final certificate issued by MEPA is submitted to the “Document(s)” Tab. If no, please attach a document with justification that this project is not subject to MEPA review in the document section (including addressing the applicability of the MEPA review thresholds at 301 CMR 11.03)	Yes
MEPA File Number	TBD - Pending
Date of MEPA Certificate Issuance	05/23/2025
Is your project subject to Massachusetts Wetlands Protection Act?	Yes
MassDEP Wetlands File Number(s)	344-1566
Is the project going to impact Eelgrass bed? If yes, please attach a document 'Eelgrass Management Plan' in the document section.	No
Does this project contain an attached written Alternatives Analysis? If yes, please attach a document 'Alternatives Analysis' in the document section.	Yes
If yes, does this Alternatives Analysis screen all practicable alternatives to the proposed discharge that would have less adverse impact on the aquatic ecosystem?	Yes
Does this project require a license from the Federal Energy Regulatory Commission?	No
Is any of your proposed work exempt from the Massachusetts Wetlands Protection Act or taking place in a federal non-state wetland?	Yes
If yes, please provide additional information	The replacement of Bridge No. W-38-011 over Maple Meadow Brook is being permitted under the Bridge Exemption in the 2014 Transportation Bond Bill and as such is exempt from review under the Wetlands Protection Act Regulations (310 CMR 10.00), Massachusetts Environmental Policy Act Regulations and the Chapter 91 Waterways Regulations (310 CMR 9.00).

Statement and Disclosures

Proposed dredging activity or dredged material management might occur within Rare Species Habitat as defined at 314 CMR 9.02.
By checking this box, you agree that you have consulted with the Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife.
Please attach a 'NHESP Determination Letter or Conservation Management Permit' in the document section.

Any in-water activity may effect fish or shellfish, spawning and/or habitat.
By checking this box, you agree that you have consulted with Massachusetts Division of Marine Fisheries (DMF) and/or Massachusetts Division of Fisheries and Wildlife (DFW) about Time of Year Restriction (TOY).
Please attach Consultation Letter from DMF and/or DFW in the document section.

Project Information

Project Name	Reconstruction of Route 38 (Main Street), from Route 62 to the Woburn City Line, Wilmington, MA (MassDOT Project No. 608051)

Proposed Activity

This Joint Application for 401 Water Quality Certification (WQC) and 404 ACOE Pre Construction Notification (PCN) has been prepared on behalf of the Massachusetts Department of Transportation, Highway Division (MassDOT) for the Reconstruction of Route 38 (Main Street) in the Town of Wilmington from Route 62 to the Woburn city line for a total project length of approximately 2.1 miles (MassDOT Project No. 608051). The project will also include the replacement of Bridge No. W-38-011 carrying Route 38 over Maple Meadow Brook. The Town of Wilmington will fund water system improvements along part of the corridor, while the rest of the project is being funded by MassDOT.

The purpose of the project is to improve the roadway infrastructure, reduce traffic back-ups on entering side streets, improve the existing drainage system, and provide increased safety for all roadway users, including drivers, bicyclists and pedestrians; and thereby promote the commercial and residential development along the Route 38 corridor. Roadway reconstruction and safety improvement along Route 38's present alignment and intersections are required to reduce the number of accidents that presently occur at the main cross street intersections. The replacement of the existing Bridge No. W-38-011, which carries Route 38 over Maple Meadow Brook, is needed due to its structural deficiency, age and due to scour making it difficult to locate the bridge abutments.

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A Notice of Intent has been submitted to the Wilmington Conservation Commission under the Wetlands Protection Act for the roadway work associated with the project. An Order of Conditions (OOC) for the project (DEP File No. 344-1566) will be forthcoming by the Wilmington Conservation Commission.

In accordance with the Massachusetts Transportation Bond Bill of 2014, a portion of the project between approximate Sta. 252+50 to Sta. 255+00 associated with the replacement of the Bridge No. W-38-011, carrying Route 38 over Maple Meadow Brook, is exempt from review under the Massachusetts Wetlands Protection Act (M.G.L. c.131 §40) and its implementing regulations (310 CMR 10.00), Massachusetts Environmental Policy Act Regulations (301 CMR 11.00) and the Chapter 91 Waterways Regulations (310 CMR 9.00). The bridge replacement is the functional equivalent and in similar alignment to the existing bridge.

This 401 WQC is being filed for the entire Reconstruction of Route 38 project, from Route 62 to the Woburn City Line, including the Replacement of Bridge No. W-38-011. A Pre-Construction Notification application will be submitted to the Army Corps for authorization under Section 404 of the Clean Water Act, GP No. 23 (Linear Transportation Projects and Wetland/Stream Crossings), for impacts associated with both roadway and bridge replacement work.
This project consists of maintenance and improvement of an existing roadway (including widening of less than a single lane, improvements to existing drainage systems and repaving). As the proposed project is a roadway project, which is increasing in impervious area by less than one lane, it is therefore categorized as a "Redevelopment Project" under the Massachusetts Stormwater Management Standards. This project has been designed to meet the Massachusetts Stormwater Management Standards to the maximum extent practicable.

Project Type

Industrial	
Utility	
Real Estate Subdivision	
Institutional	
Other	Yes
Please provide additional information for the selection of your project major type	Transportation Improvement Project

Proposed Areal Extent Info

Bordering Vegetated Wetland (sqft)	6134
Isolated Vegetated Wetland (sqft)	0
Non-tidal Land Under Water (sqft)	3090
Salt Marsh (sqft)	0
Land Under the Ocean (sqft)	0
Intertidal Zone (sqft)	0
Total cumulative loss (sqft)	9224

Compliance with 314 CMR 9.00

Does the proposed project meet the definition of a Single and Complete Project at 314 CMR 9.02?	Yes
Does the proposed project include "multi-phased activities"?	Yes
Does the proposed project meet the definition of an Ecological Restoration Project?	No
Have you completed the Public Notice as per 314 CMR 9.05(3)? If yes, please attach a completed 'Proof of Public Notice' document in the document section.	No
Does the required Alternatives Analysis screen all practicable alternatives to the proposed discharge that would have less adverse impact on the aquatic ecosystem?	Yes
Does this proposed project meet the definition of Water-Dependent at 314 CMR 9.02?	Yes
Is the proposed project restricted to access to one dwelling unit?	No
Will the cumulative discharges of dredged or fill material to Waters of the United States within the Commonwealth exceed 1 acre in areal extent?	No

Report the areal extent, as expressed in square feet, of all proposed restoration or replication of Bordering Vegetated Wetlands and/or Isolated Vegetated Wetlands	3,510
Will any proposed discharges of dredged or fill material or any proposed restoration or replication occur within Rare Species Habitat as defined at 314 CMR 9.02?	No
Will the proposed project include or consist of the construction of a new non-tidal crossing of any Land Under Water?	No
Will the proposed project include or consist of the construction of a new tidal crossing of any Land Under Water?	No
Will the proposed project include or consist of the repair, replacement, and/or expansion of an existing non-tidal crossing of any Land Under Water?	Yes
If yes, will such repair, replacement, and/or expansion of an existing crossing comply with the Massachusetts River and Stream Crossing Standards (March 8, 2012) to the maximum extent practicable (see Practicable at 314 CMR 9.02)?	Yes
Will the proposed project include or consist of the repair, replacement, and/or expansion of an existing tidal crossing of any Land Under Water?	No
Does the proposed project include any amount of discharges of dredged or fill material to any Outstanding Resource Water?	No
Will any proposed "discharge of dredged or fill materials" occur within any certified Vernal Pool (as defined at 314 CMR 9.02)?	No

Additional Information

Is your project subject to Massachusetts Environmental Policy Act (MEPA)?	Yes
MEPA File Number (if available)	TBD - Pending
Date of MEPA Certificate Issuance (if available)	05/23/2025
Is your project subject to Massachusetts Wetlands Protection Act?	Yes
MassDEP Wetlands File Number(s) (if available)	344-1566
Is your project subject to Massachusetts Public Waterfront Act?	No

Is your project subject to Massachusetts Historical Commission?	Yes
MHC File Number (if available)	Section 106 consultation was completed in October 2023
Date of MHC Determination Letter (if available)	10/11/2023
Is your project subject to Massachusetts Bureau of Underwater Archeological Resources?	Yes
BUAR File Number (if available)	Section 106 consultation was completed in October 2023
Is your project subject to U.S. Army Corps of Engineers – Section 404 of Federal Clean Water Act?	Yes
USACE File Number (if available)	TBD - Pending

List of Documents

Documents

Required Documents:
1. Alternatives Analysis
2. Characteristics of the proposed ocean disposal site
3. Chemical Analysis of Sediment
4. Consultation Letter from DMF and/or DFW
5. DEP Sampling Analysis Approval
6. Dredging and Disposal Operation
7. Grain Size Analysis
8. MEPA Certificate
9. NHESP Determination Letter or Conservation Management Permit
10. Plans for adequate containment during dewatering on a barge
11. Project Narrative
12. Project Plan Set
13. Site Plans
14. USGS Quadrangle Map

Special Fee Provision

Exemption	Yes
Exemption Type	State Agency (only applicable if fee < or = to $100)
Exclusion (special agreement or policy)	
Substitution (ASP/IRP)	
Double Fee for Enforcement	
Hardship payment extension request	

Attachments

Name	Description	Type	Latest Updated
13. USGS Quadrangle Map - 608051 Wilmington Route 38.pdf	USGS Quadrangle Map	USGS Quadrangle Map	04/10/2025
6. Dredging & Disposal Operation - 608051 Wilmington.pdf	Dredging & Disposal Operation	Dredging and Disposal Operation	04/10/2025
4. DFW consultation - 608051 Wilmington.pdf	DFW consultation	Consultation Letter from DMF and/or DFW	04/10/2025
9. Dewatering on a barge - 608051 Wilmington.pdf	Dewatering on a barge	Plans for adequate containment during dewatering on a barge	04/10/2025
1. Alternatives Analysis - 608051 Wilmington.pdf	Alternatives Analysis	Alternatives Analysis	04/10/2025
3. Chemical Analysis of Sediment - 608051 Wilmington.pdf	Chemical Analysis of Sediment	Chemical Analysis of Sediment	04/10/2025
5. DEP Approved Sediment Sampling Plan - 608051 Wilmington.pdf	DEP Sampling Analysis Approval	DEP Sampling Analysis Approval	04/10/2025
7. Grain Size Analysis - 608051 Wilmington.pdf	Grain Size Analysis	Grain Size Analysis	04/10/2025
8. MEPA Certificate - 608051 Wilmington.pdf	MEPA Certificate	MEPA Certificate	04/10/2025
13. Site Plans - see 12 - 608051 Wilmington Route 38.pdf	Site Plans	Site Plans	04/10/2025
Due Diligence Review - 608051 Wilmington.pdf	Due Diligence Review	Due diligence Review	04/10/2025
10. Project Narrative - 608051 Wilmington.pdf	Project Narrative	Project Narrative	04/10/2025
9. NHESP Determination - 608051 Wilmington.pdf	NHESP Determination	NHESP Determination Letter or Conservation Management Permit	04/10/2025
Attachment H - 608051_Wilmington_WQC ACOE Submission Plans_PART 1.pdf	Project Plan Set (Part 1 of 2)	Project Plan Set	04/10/2025
2. No ocean disposal - 608051 Wilmington.pdf	No ocean disposal	Characteristics of the proposed ocean disposal site	04/10/2025
Attachment H - 608051_Wilmington_WQC ACOE Submission Plans_PART 2.pdf	Project Plan Set (Part 2 of 2)	Project Plan Set	04/10/2025

Application Contacts

Name	Organization Name	Contact Person	Telephone #	Contact Type	Email
JOSHUA, WARD	n/a	n/a	(978) 923-0400	Application Prepared By	jward@greenintl.com
OXANA, FARTUSHNAYA	n/a	n/a	(978) 843-5276	Application Prepared By	ofartushnaya@greenintl.com

Certification Information

Individual
JOSHUA WARD
100 AMES POND DR., SUITE 200
TEWKSBURY, MA 01876
United States

Telephone #: (978) 923-0400
E-mail: jward@greenintl.com

I certify that I have read and understand the instructions that accompany this application and that the statements made as part of this application are true, complete, and correct and that no material information has been omitted. By checking the box below, I understand and agree that I am electronically signing and filing this application.

U.S. Army Corps of Engineers (USACE), New England District (NAE)

PRE-CONSTRUCTION NOTIFICATION (PCN)

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332.

Principal Purpose The information provided will be used in evaluating activities under Pre-Construction Notification procedures within New England.

Routine Uses This information may be shared with other federal, state, and local government agencies during the application review process. Submission

Disclosure of requested information is voluntary. However, if information is not provided the PCN application cannot be fully evaluated nor can USACE render a permit decision.

Instructions The applicant must complete ALL required sections of this document before their submission to USACE. The PCN submission to USACE shall include one set of drawings which show the location and character of the proposed activity, statements that address each required field below, and documentation that supports each field (e.g., emails, letters, description/narrative, phone calls, surveys, reports, etc.). Electronic submissions to the following address are strongly preferred: cenae-r-ma@usace.army.mil. The email subject line shall contain the following: General Permit #, PCN, City/Town, and date submitted. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY USACE)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME
First - Erica Middle - Last - Larner
Company - Massachusetts Department of Transportation -
E-mail Address - erica.n.larner@dot.state.ma.us

8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Oxana Middle - Last - Fartushnaya
Company - Green International Affiliates
E-mail Address - ofartushnaya@greenintl.com

6. APPLICANT'S ADDRESS:
Address- 10 Park Plaza, Room 7360
City - Boston State - MA Zip - 02116 Country - US

9. AGENT'S ADDRESS:
Address- 100 Ames Pond Drive, Suite 200
City - Tewksbury State - MA Zip - 0187 Country - US

7. APPLICANT'S PHONE NOs. with AREA CODE

a. Residence	b. Business	c. Fax	d. Mobile
N/A	857-268-1729	N/A	N/A

10. AGENT'S PHONE NOs. with AREA CODE

a. Residence	b. Business	c. Fax	d. Mobile
N/A	978-923-040	N/A	N/A

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Oxana Fartushnaya to act on my behalf as my agent in the processing of this general permit PCN application and to furnish, upon request, supplemental information in support of this general permit PCN application.

Erica N. Larner Digitally signed by Erica N. Larner Date: 2025.04.10 11:03:58 -04'00'

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)

Reconstruction of Route 38 (Main Street) from Route 62 to the Woburn City Line in Wilmington, Massachusetts
Including Replacement of Bridge No. W-38-011, Route 38 over Maple Meadow Brook
MassDOT Project No. 608051

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)
Maple Meadow Brook & Unnamed Intermittent Stream

14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
Route 38 from Route 62 to the Woburn City Line
City: Wilmington State: MA Zip: 01887

15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)
Latitude: 42°32'14.48" °N Longitude: 71°9'37.61" °W

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID: N/A Municipality: Wilmington

Section: N/A Township: N/A Range: N/A

17. DIRECTIONS TO THE SITE.

The project site begins on Route 38 (Main Street) at the intersection of Route 38 and Route 62 within the Wilmington Town center. The project site continues south along Route 38 for approximately 2.1 miles before terminating at the Woburn Town line, just past the intersection of Route 38 and Border Avenue.

18. IDENTIFY THE SPECIFIC GENERAL PERMIT(S) YOU PROPOSE TO USE:

GP No. 23 (Linear Transportation Projects and Wetland/Stream Crossings)

19. DESCRIPTION OF PROPOSED GENERAL PERMIT ACTIVITY (*see instructions*)

Permanent disturbance of 3,292 SF of VW caused by proposed roadway and drainage improvements. Permanent disturbance of 2,380 SF of LUW/WOTUS mainly caused by bridge and culvert replacements, scour countermeasures as well as other drainage improvements. Temporary disturbance of 2,842 SF of VW is required for erosion sediment controls and access to construct the proposed improvements. Temporary disturbance of 710 SF of LUW/WOTUS is required for control of water, sediment controls

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)

Impacts to WOTUS were minimized to the MEP. E&S controls to be installed during construction (both sedimentation barriers around the work areas and a floating silt fence in the brook). Wetland replication (3,510SF to replace the 3,292 SF of VWs permanently impacted); temporary impacted areas will be restored. Streambed and adjacent banks will be restored. Stormwater mitigation measures are also proposed.

21. PURPOSE OF GENERAL PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)

The purpose of the project is to improve the roadway infrastructure, reduce traffic back-ups on entering side streets, improve the existing drainage system, replace and repair existing culverts and bridges, and provide increased safety for roadway users. Replacement of the existing Bridge No. W-38-011, which carries Route 38 over Maple Meadow Brook, is needed due to its structural deficiency, age and due to scour making it difficult to locate the bridge abutments.

22. Quantity of Wetlands, Streams, or Other Types of Waters Directly Affected by Proposed General Permit Activity (*see instructions*)

Area (square feet)	Length (linear feet)	Volume (cubic yards)	Duration	Purpose
3,292	n/a		Permanent	VW impacts
2,380	n/a	715 (d) / 715 (f)	Permanent	LUW/WOTUS impacts [(d)=dredge; (f)=fill)]
2,842	n/a		Temporary	VW impacts
710	n/a		Temporary	LUW/WOTUS

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other GP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project on any related activity (*see instructions*)

Section 401 Water Quality Certification for Minor Dredging and Major Fill and and Excavation Projects
MEPA Review, WPA Order of Conditions (except the portion of the project required to replace the Bridge No. W-38-011, which is exempt from review under MEPA, Wetlands Protection Act and Chapter 91 Public Waterfront Act under under the 2014

24. If the proposed activity will result in the loss of aquatic resources that exceed those identified in the New England District Compensatory Mitigation Thresholds, explain how the compensatory mitigation requirement will be satisfied. (*see instructions*)

N/A

25. Is Any Portion of the General Permit Activity Already Complete? [ ] Yes [X] No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed GP activity or utilize the designated critical habitat that might be affected by the proposed GP activity. (*see instructions*)

The project area is located within mapped Northern Long-eared Bat (Endangered) and Tricolored bat (Proposed Endangered) habitat. The attached USFWS NLAA Concurrence Verification letter dated 10/10/2024 demonstrates coordination with USFWS. AMMs for NLEB and Tricolored Bat (Proposed Endangered) will be included in the Contract documents.

27. List any historic properties that have the potential to be affected by the proposed GP activity or include a vicinity map indicating the location of the historic property or properties. Attach relevant project information, along with any responses received from project notifications to this submittal. (*see instructions*)

The project is unlikely to affect significant historical or archaeological resources (see attached Section 106/CRU coordination materials)

28. For a proposed GP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

N/A - There are no Wild and Scenic Rivers within 0.25 miles of the project area.

29. If the proposed GP activity also requires permission from the USACE pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the USACE district having jurisdiction over that project? [ ] Yes [X] No

If "yes", please provide the date your request was submitted to the USACE District:

30. Does the activity require a 401 Water Quality Certification (WQC)? If so, specify the type of 401 WQC that is required (general or individual). In cases where an individual 401 WQC is required, provide the date the 401 WQC certification request was submitted to the certifying authority and their contact information.

General 401 Water Quality Certification for Minor Dredging and Major Fill

31. If the terms of the GP(s) you want to use require additional information to be included in the PCN (i.e. sampling and analysis plan), please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

N/A

32. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Erica N. Larner Digitally signed by Erica N. Larner Date: 2025.04.10 11:04:14 -04'00'		Oxana Fartushnaya Digitally signed by Oxana Fartushnaya Date: 2025.04.10 10:48:22 -04'00'	
SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The Pre-Construction Notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

1.0 INTRODUCTION AND OVERVIEW

This Joint Application for 401 Water Quality Certification (WQC) and 404 ACOE Pre-Construction Notification (PCN) has been prepared on behalf of the Massachusetts Department of Transportation, Highway Division (MassDOT) in conjunction with Town of Wilmington for the proposed reconstruction of the existing Route 38 (Main Street) roadway between the intersection of Route 38 and Route 62 to the Woburn city line for a total project length of approximately 2.1 miles (MassDOT Project No. 608051). A new water system is proposed along a portion of the project corridor. The Town of Wilmington will fund water system improvements, while the rest of the project is being funded by MassDOT. The project will also include the replacement of Bridge No. W-38-011 carrying Route 38 over Maple Meadow Brook.

The proposed work within Waters of the United States requires a Clean Water Act Section 401 Water Quality Certification pursuant to 314 CMR 9.04(1) since the combined projects will result in cumulative permanent and temporary impacts to Vegetated Wetlands (VW) and Land Under Water (LUW)/Waters of the United States (WOTUS), excess of 5,000 square feet and dredging over 100 cubic yards below the Ordinary High Water (OHW) mark of Maple Meadow Brook. The proposed work under this project involves discharge of the fill materials within the Waters of the United States under the jurisdiction of the U.S. Army Corps of Engineers (USACE) and Section 404 of the Clean Water Act. Therefore, this Joint Application for 401 Water Quality Certification for Minor Dredging and Major Fill/Excavation and 404 Pre-Construction Notification is being submitted to the Department of Environmental Protection (DEP) in association with this project. A filing of a Pre-Construction Notification (PCN) Form in accordance with Section 404 with the U.S. Army Corps of Engineers under GP 23 will also occur concurrently with the Section 401 WQC filing.

In accordance with the Massachusetts Transportation Bond Bill of 2014, a portion of the project between approximate Sta. 252+50 to Sta. 255+00 associated with the replacement of the Bridge No. W-38-011, carrying Route 38 over Maple Meadow Brook, is exempt from review under the Massachusetts Wetlands Protection Act (M.G.L. c.131 §40) and its implementing regulations (310 CMR 10.00), Massachusetts Environmental Policy Act Regulations (301 CMR 11.00) and the Chapter 91 Waterways Regulations (310 CMR 9.00).

The overall project outside of the segment between approximately Sta. 252+50 to Sta. 255+00 associated with the replacement of the Bridge No. W-38-011 is subject to the Massachusetts Wetlands Protection Act (WPA) Regulations and its implementing regulations 310 CMR 10.00 for work within Bordering Vegetated Wetlands (BVWs), Land Under Water (LUW), Inland Bank, Bordering Land Subject to Flooding (BLSF), the 200-foot Riverfront Area, and the 100-foot Buffer Zones. An Order of Conditions (OOC) for the project (DEP File No. 344-1566) will be forthcoming by the Wilmington Conservation Commission.

In addition, the proposed work exceeds the activity thresholds described in *301 CMR 11.03(3)(b)1(d): alteration of 5,000 or more sf of bordering or isolated vegetated wetlands* and *301 CMR 11.03(3)(b)1(f): 301 CMR 11.03(3)(b)1(f): alteration of ½ or more acres of any other wetlands*. Consequently, an Environmental Notification Form is being filed to initiate project review under MEPA by the Executive Office of Energy and Environmental Affairs (EEA). Since the project is also located within a one-mile radius of an Environmental Justice (EJ) population, the project also requires an Environmental Impact Report (EIR) based on the updated MEPA requirements issued in January 2022.

This project consists of maintenance and improvement of an existing roadway (including widening of less than a single lane, improvements to existing drainage systems and repaving). As the proposed project is a roadway project, which is increasing in impervious area by less than one lane, it is therefore categorized as a "Redevelopment Project" under the Massachusetts Stormwater Management Standards. This project has been designed to meet the Massachusetts Stormwater Management Standards to the maximum extent practicable. A Stormwater Management Report is attached in Attachment I demonstrating the compliance of the project with the ten state stormwater standards.

The project will avoid, minimize, and mitigate all impacts to the environment to the maximum extent practicable. Listed below are some of the proposed mitigation measures which will protect and enhance the existing project site:

- Erosion and sedimentation controls are proposed to protect the adjacent resource areas/WOTUS
- Replication of impacted vegetated wetlands at an approximate ratio of slightly greater than 1:1 is proposed

Streambed restoration for both stream crossing structures to be replaced as part of this project

- Bank stabilization at the location of the proposed Bridge No. W-38-011 replacement
- Implementation of stormwater management including three proposed infiltration Stormwater Control Measures (SCMs) and drainage improvements, including deep sump catch basins with hoods, new drain manholes, as well as replacement of existing drainage outfalls
- Tree restoration efforts in selected areas
- Control of invasive plants during construction activities and prior to any clearing or site disturbance.

All mitigation activities will be conducted in accordance with special provisions included in the Contract (also included in Attachment F).

2.0 PROJECT NEED

The purpose of the overall Reconstruction of Route 38 project is to improve the roadway infrastructure, reduce traffic back-ups on entering side streets, improve the existing drainage system, and provide increased safety for all roadway users, including drivers, bicyclists and pedestrians; and thereby promote the commercial and residential development along the Route 38 corridor. Roadway reconstruction and safety improvement along Route 38's present alignment and at the intersections are required in order to reduce the number of accidents that presently occur at the main cross street intersections. The replacement of the existing Bridge No. W-38-011, which carries Route 38 over Maple Meadow Brook, is needed due to its structural deficiency, age and due to scour making it difficult to locate the bridge abutments.

3.0 EXISTING CONDITIONS

3.1 Property Information

Route 38 (Main Street) is an Urban Principal Arterial, located west of Interstate 93 and east of Route 3A, generally providing northwest and southeast movement between the towns of Tewksbury, Wilmington, Woburn, Winchester and Medford. The Route 38 project segment to be reconstructed and improved runs from Route 62 (Burlington Avenue/Church Street) in Wilmington, MA to the Woburn city line for an approximate project length of 2.1 miles. Main Street is located within a public right-of-way which is generally around 46 feet wide but widens around curves at the intersections. Pavement widths generally vary from approximately 30 to 34 feet. There is a sidewalk present on each corner of the Route 38/Route 62 intersection, along the eastern side of Route 38 between the intersections with Route 62 and Route 129, and on the western side of Route 38 near the Route 129 intersection. The sidewalks at the signalized intersections are approximately 5.5 feet wide, in fair condition, and in some cases do not comply with ADA/AAB requirements. The sidewalks are typically not ADA/AAB-compliant elsewhere, and there are no pedestrian accommodations along the majority of the corridor. The pedestrian signal phase clearance time at the Route 38 and Route 62 intersection is shorter than MUTCD-compliance. The travel lanes are generally 12-14 feet wide with shoulders between 2 and 5 feet. The pavement is in fair condition, and there is moderate pavement cracking throughout the project length. There are no bicycle accommodations on the roadway other than bicycle detection at signalized intersections, and limited pedestrian accommodations. Bicyclists currently must ride within the vehicle lanes or on the sidewalks, resulting in safety concerns. The average daily traffic to the roadway is 12,490 vehicles per day. The closest location to the bridge where a traffic count was performed (in October 2016) was 700 feet south of the Route 38 and Cross Street intersection. There are multiple existing underground and overhead utilities along the existing Route 38 within the project limits. There are several existing underground utilities at the project site, including gas, water, sewer, and drainage. In addition, there are a number of above ground utilities present at the project site which include many overhead wires and utilities poles throughout the project.

The existing Bridge No. W-38-011 carries Route 38 over Maple Meadow Brook, a perennial stream which flows southwest to northeast in the vicinity of the project. The bridge was originally constructed in 1911 and rehabilitated in 2000. The existing structure consists of a single span reinforced concrete slab with a bituminous wearing surface, supported by stone masonry abutments; two steel I-beams that previously supported railroad tracks are embedded in the concrete slab. The existing structure has a clear span of 11.7’, which was confirmed in the field during the April 24, 2023 inspection by Green International Affiliates, Inc. The total structure length of 19’-2”. The structure has an out-to-out width of 43’-0”, a curb-to-curb width of 36’-5” and carries two (2) lanes that are approximately 12’-0” wide with shoulders varying from 1’-0” to 2’-0” wide and no sidewalks. Upstream of the bridge, there is moderate debris accumulation and tree branches partly restricting the channel flow. Downstream of the bridge there are remnants of a stone and concrete structure, which has caused a heavy buildup of debris restricting the channel flow.

The existing 3.5-foot wide and 1.5-foot-tall culvert at approximate Sta. 218+00 conveys an unnamed intermittent stream beneath Route 38. This 46-foot-long culvert is oriented south to north and does not have a year-round flow; it is also partially obstructed with sediment and debris. The MBTA tracks run parallel to Main Street on the western side of Route 38. This culvert’s inlet on the western side of Route 38 is located downstream of another 2.5’ x 2.5’ box culvert that conveys the unnamed intermittent stream

beneath the MBTA railroad tracks. On the eastern side of route 38, this intermittent stream outfalls into a Vegetated Wetland (A-series).

3.2 Description of Water Bodies Adjacent to Project Site

Protected wetland resource areas exist adjacent to the project area (see Attachment D – Wetland Summary Report and Attachment A - Figure 3 for details).

A delineation of the wetland boundaries in the vicinity of the Route 38 project site was completed by Lucas Environmental on May 21 and 22, December 3, 2020. The site was revisited on June 6, 2023, to review and update the wetland delineation based on current site conditions at that time. The wetland resource area boundary delineations were conducted in accordance with the methodology outlined in the Regulations 310 CMR 10.55 and the DEP handbook D*elineating Bordering Vegetated Wetlands Under Massachusetts Wetlands Protection Act*. Hydrophytic vegetation was based upon the *US Fish and Wildlife Service National List of Plant Species That Occur in Wetlands*, as well as all plant species listed in the Act. Wetland hydrology includes hydric soils, which were determined based upon the interagency document *Field Indicators for Identifying Hydric Soils in New England*. This methodology is consistent with the three-parameter approach required for the delineation of federal wetlands as outlined in the Corps of Engineers *Wetland Delineation Manual*. There is one (1) perennial stream (Maple Meadow Brook) and one Unnamed Intermittent Stream crossing Route 38 within the project area. The wetlands are identified as Wetlands "A" through "J" series and are depicted on Figure 3, Environmental Constraints Map, and are described in further detail in Attachment D – Wetland Summary Report. Most Vegetated Wetlands (VWs) and streams on site belong to the Ipswich River headwaters, a subwatershed of the Ipswich River watershed. Approximately 200 feet of the southernmost limit of the project is located within the Aberjona River subwatershed, a subwatershed of the Mystic River watershed.

According to the 2022 Integrated List of Waters, Maple Meadow Brook (Waterbody ID MA92-04) is listed as a Massachusetts Category 5 Waters with causes of impairment being dewatering and dissolved oxygen. Maple Meadow Brook is not listed as a DFW Coldwater Fishery.

Per the Flood Insurance Rate Maps (FIRM) for the Town of Wilmington, Massachusetts, Middlesex County, Panels 25017C0291E, 25017C0292E, 25017C0293E, and 25017C0294E, dated 06/04/2010, a portion of the project that includes the Route 38 crossing over Maple Meadow Brook, is located within the 100-year flood plain. The flood plain areas are shown on Figure 4 – FEMA Map. The Flood Insurance Study, by the Federal Management Agency and last revised on July 6, 2016, includes a detailed study of the project area, showing the 100-year floodplain elevations in the project vicinity. Maple Meadow Brook has a 100-year flood elevation of 82.9 feet upstream and 81.5 feet downstream of Route 38 (NAVD 88). However, the Hydraulic Study performed for the project determined a Base Flood Elevation (BFE) of 84.09 feet (NAVD88) upstream of Bridge No. W-38-011. The Ordinary High Water (OHW) elevation was determined to be 77.78 feet (NAVD88).

Per MassGIS online data mapping, there are no Outstanding Resource Waters (ORW) within or adjacent to the project limits. There are no cold-water fisheries located adjacent to or within the project area (See Figure 3). The entire project is located within a Zone II, which is considered a "stormwater critical area" as defined in the Massachusetts Stormwater Handbook.

The existing site can be analyzed as twenty-seven (27) watershed areas that contribute runoff to twenty-one (21) discharge points. The existing drainage system on the roadways within the project limits includes "country drainage" (i.e. no curb), where the runoff sheet flows off the pavement into the pervious shoulder, roadside ditches, or private front yards. There are lengths of bituminous berm gutter, where the road runoff flows as concentrated flow to catch basins, or to a point where the berm discontinues, and the runoff flows onto adjacent wetland or wooded areas as shallow concentrated flow.

4.0 PROPOSED CONDITIONS

The project proposes to reconstruct the existing two-lane two-way road to achieve generally two 11-foot lanes and two 5-foot bike lanes along the project corridor. The 5'-6" sidewalk will be added on one, or both sides of the roadway depending on location. There will be two 11-foot southbound travel lanes and a 2-foot shoulder for 900 feet south of the Route 62 and Route 38 intersection. The project will also incorporate improvements to the existing closed drainage system, including headwall and culvert replacement, and a new water system along Route 38 from Route 62 to Eames Street. The project also proposes to add bicycle accommodations, improve pedestrian accommodations, and install traffic signal improvements along the Route 38 (Main Street) corridor. The project will upgrade the signage and pavement markings to improve driver safety along the project corridor. New signage and pavement markings also will be provided to enhance safety for bicyclists on the widened roadway. Bicycle access and pedestrian access will be improved along the entire project corridor to and from the MBTA Wilmington commuter rail station and the recently constructed Yentile Farm recreational facility. This roadway upgrade will require full-depth reconstruction of the existing Route 38 pavement from Route 62 to Eames Street. Micromilling and resurfacing will be proposed along Route 38 from Eames Street to the Woburn City Line.

Improvements at the intersection of Route 38 and Route 62 (Burlington Avenue and Church Street) will include re-striping to provide additional turning lanes for the northern, southern, and western legs of the intersection, adding bicycle detection, tree removal and the pruning and trimming of trees and reconstructing the traffic signal, as well as a new retaining wall along the MBTA tracks south of this intersection. These improvements will result in less congestion along the corridor, and significantly lower delays and queues at the intersection. The project will only include pavement resurfacing and minor pavement widening and drainage improvements at the intersection of Route 129 (Lowell Street) because this section of Route 38 was reconstructed approximately 15 years ago. The project will also include a traffic signal at the intersection of Route 38 with Cross Street and Butters Row. This signalization will provide more orderly traffic control for vehicles, pedestrians, and bicyclists. The side street approaches at this intersection are proposed to be realigned to provide improved sight distances and geometry. The improvements will add a left turn lane from northbound Route 38 to Butters Row. Realignments of Eames Street and Old Main Street are also proposed to improve safety. In all, these improvements will result in enhanced safety for all roadway users including bicyclists, pedestrians, and vehicles.

The portion of the project between approximately Sta. 252+50 to Sta. 255+00 on Route 38 is associated with the replacement of the existing Bridge No. W-38-011 carrying Route 38 over Maple Meadow Brook. The project will replace the existing 36'-5" single-span three-sided frame bridge with a new single-span structure featuring a curb-to-curb width of 32'-0" to maintain channel continuity. The new substructures will consist of a single-span arrangement with cast-in-place footings on micropiles. The newly constructed footings will be offset from the existing abutment footprints, increasing the span length to approximately

12’. The new superstructure will be comprised of nine (9) three-sided precast concrete frame segments with varying fill and a 3-inch bituminous concrete wearing surface. Eight (8) frame segments will be 4’-6” wide, while one (1) frame segment will be 4’-8” wide. The exterior frame segments will be cast as one unit with the headwall/bridge rail base. Box culverts and corrugated metal pipes were not considered due to unfavorable soil conditions and the potential for significant channel impacts. The proposed bridge will have a 2% longitudinal slope and a 2% cross-section slope on either side of the crown.

A hydraulic evaluation by Green International Affiliates, Inc. for MassDOT was performed for this site in March 2025. The evaluation determined that proposed site improvements and the bridge replacement will neither result in any increase in flood elevations within the community during the occurrence of Maple Meadow Brook’s base flood discharge, nor necessitate any revision to the river’s existing floodway delineation in proximity to the project location and thereby meets applicable NFIP base floodplain development performance standards. Per the MassDOT LRFD Bridge Manual, for bridge replacements, 2 feet of freeboard is optimal between the hydraulic design flood water surface elevation and the proposed superstructure low chord. If the existing low chord elevation of 78.93’ is maintained, the target water surface under the design flood event should be 76.93’. Given roadway profile, the surrounding residential, commercial, and industrial areas, and the bridge structure type as constraints, the bridge low chord cannot be raised to meet the required 2’ of freeboard. A freeboard waiver letter will be required. The 10-year design flood event elevation at the bridge is 80.05’ and the Ordinary High Water (OHW) elevation is 77.78’. The project hydraulic model indicates that proposed bridge replacement will safely convey the 10-year design flood event.

In coordination with MassDOT and in compliance with state regulations, pedestrian access must be maintained throughout all phases of construction at the Maple Meadow Brook Bridge. Due to the bridge’s limited width and extensive subsurface utility relocation, phasing the replacement while accommodating pedestrians is not feasible. Therefore, a temporary 4-foot-wide pedestrian bridge will be installed west of the existing bridge, along with a temporary walkway that meets ADA requirements to connect the bridge approaches with 5-foot by 5-foot turning areas. Once the new Maple Meadow Brook Bridge is complete to provide safe pedestrian access, the temporary bridge and walkway will be removed, and the site will be restored to its original condition.

The culvert at Sta. 218+00 which carries an unnamed intermittent stream beneath Route 38 will be removed and replaced. The existing 3.5’ x 1.5’ box culvert will be replaced with a 56-foot long 3’x3’ reinforced concrete culvert. The proposed 3’x3’ box culvert will have 1’ of fill comprised of natural stream bed material and stone for pipe end.

Dredged or excavated materials that are determined to meet specification requirements for structural fill will be used to the maximum extent possible as backfill. The dredged material will be stockpiled and either remain on site in paved, barricaded staging areas or moved to nearby off-site staging areas by truck. Potential off-site staging and laydown areas include Old Main St and Wilmington Dog Park. Official designated staging and laydown areas are to be determined by contractor means and methods.

It is anticipated that a NPDES Construction General Permit (CGP) will be required for the project; therefore, where dewatering is required, all pumped effluent will be done in compliance with the dewatering requirements within the CGP. Additionally, the Contractor will be expected to perform dewatering in accordance with MassDOT Special Provisions for Control of Water for each structure (see

Attachment F). The Contractor must treat dewatering discharges, prior to outletting these flows to local waterways, for removal of sediments. Outlets from these treatment measures will discharge onto splash pads or other measures that will prevent concentrated flows that could erode bank soils or streambed materials enroute to the receiving watercourse.

The project will not result in any impacts to the sewer or water utilities present throughout the site; however, the project will include a variety of drainage improvements. In order to install the proposed sidewalk and other ADA compliant pedestrian improvements throughout the project, several utility poles and overhead wires will be relocated.

The proposed stormwater management analysis can be analyzed as twenty-seven (27) watershed areas contributing runoff to twenty-one (21) discharge points, which are the same under existing conditions. The limits of the overall watershed and discharge points of analysis are the same in proposed and existing conditions. The proposed drainage improvements include installation of new deep sump catch basins with hoods, new drain manholes, replacement of existing drainage outfalls, as well as three proposed infiltration Stormwater Control Measures (SCMs) to mitigate the increase in peak rates of runoff. While curbing will be added in sections of the roadway that used to sheet flow away from the project, the new drainage systems will maintain the historic drainage patterns, distributing runoff to the existing discharge points. The project also provides a modified drainage collection system to address the changes caused by the proposed road improvements as well as protecting the nearby downstream watershed and the environment.

Clearing and grabbing will be required for this project. As part of the subject project's tree restoration efforts, several locations within the project limits have been designated for replanting to mitigate the removal of trees affected by construction. All proposed trees and plantings will be within the public right of way.

Control of invasive plants is proposed to begin immediately with the initiation of construction activities and prior to any anticipated clearing or site disturbance. This work will be performed in accordance with MassDOT specifications for Invasive Plants Management.

5.0 ANTICIPATED CONSTRUCTION SEQUENCE

Construction phasing for the Route 38 (Main Street) project will ultimately be determined by the project contractor. The construction phasing is assumed to generally be as follows:

1. Coordination with private utility companies for utility relocations.
2. Installation of sediment and erosion control measures.
3. Tree removal and the pruning and trimming of trees in sections along Route 38.
4. Construction of new catch basins, drainage improvements and culvert replacements/extensions in sections along Route 38.
5. Construction of improvements to the existing water system.
6. Traffic Management throughout construction.
7. Clearing and rough grading along Route 38 including areas for wetland replication and flood storage compensation areas.
8. Construction of the stormwater SCMs.
9. Installation of temporary pedestrian bridge over Maple Meadow Brook and support of excavation.

10. Relocate overhead and underground existing utilities within bridge limits.
11. Demolition of existing Bridge No. W-38-011 over Maple Meadow Brook.
12. Construction of proposed Bridge No. W-38-011 over Maple Meadow Brook.
13. Removal of temporary pedestrian bridge over Maple Meadow Brook and support of excavation to restore existing ground.
14. Construction of the retaining wall south of the Route 38 and Route 62 Intersection.
15. Construction and installation of the sidewalk, curb ramps, and curbing in sections along Route 38.
16. Construction and installation of the proposed traffic signals equipment.
17. Demolition of pavement in sections along Route 38.
18. Milling of pavement where needed.
19. Roadway full depth construction, upgrading signage and pavement markings.
20. Construction of wetland replication area, installation of wetland replication area plantings and maintenance of plantings.
21. Construction of flood storage compensation area.
22. Installation of landscaping and grassed areas.
23. Maintaining wetland replication area: checking for plantings that are damaged or failing to thrive and adjusting/replacing plantings as recommended by Wetland Specialist.
24. Removal of sediment and erosion control measures and dispose of same.

Equipment that is likely to be utilized for this project includes dump trucks, flatbed trucks, front-end loader(s), backhoe(s), skid steer(s), excavator, hoe rams, drilling rigs, concrete pumpers, boom trucks, air hammers, air compressor(s), and a crane. Equipment can be parked on roadway pavements off-limits for construction staging purposes. Staging equipment in Vegetated Wetlands (VWs) or Land Under Water (LUW)/Waters of the United States (WOTUS) shall be prohibited.

6.0 IMPACTS TO WATERS OF THE UNITED STATES

The project's resource area impacts will occur in Vegetated Wetlands (VWs) and Land Under Water (LUW)/Water of the United States (WOTUS), resulting from both permanent and temporary construction taking place along Route 38 (Main Street). The resource areas adjacent to Route 38 along the project corridor are described in detail in Attachment D – Wetland Summary Report as well as shown on Figure 3 – Environmental Constraints Map in Attachment A to this Application.

To minimize the impacts to Vegetated Wetlands, proper erosion and sediment controls will be installed during construction. In addition to the minimum control measures included in the plan set, a Stormwater Pollution Prevention Plan (SWPPP) for construction activities will be prepared by the Contractor for the site in compliance with the EPA's Construction General Permit. It will include measures to minimize exposed soil areas through sequencing and temporary stabilization and establish a permanent vegetative cover or other forms of stabilization as soon as practicable.

6.1 Vegetated Wetland Impacts

There are Vegetated Wetlands (VW) adjacent to Route 38 along the project corridor. The full-depth roadway reconstruction, minor roadway widening in select areas to accommodate consistent shoulder/bike lanes and construction of new sidewalks, new drainage outfalls in select locations, the replacement of Bridge No. W-38-011 carrying Route 38 over Maple Meadow Brook, as well as raising the profile of Route 38 to tie into the realigned Butters Row, will result in permanent and temporary impacts to VWs along the project corridor.

Throughout the project area temporary disturbance to VWs will be required for installation of Erosion & Sediment Control BMPs as well as for installation of utility pole guy wire anchors at select locations. After the erosion controls have been removed, the VWs will be restored to preexisting conditions in accordance with MassDOT Wetland Restoration specifications.

Table 6.1 below summarizes the impacts to Vegetated Wetlands along the entire project corridor:

Table 6.1: VW Impacts

Resource Area	Permanent Impacts (SF)	Temporary Impacts (SF)
VW A (Sta. 218+00 East) Flags WF A-Series	192	88
VW C (Sta. 237+40 - 241+00 West) Flags WF C-Series	2,315	1,443
VW D (Sta. 236+00 - 240+00 East) Flags WF D-Series	270	655
VW E (Sta. 248+00 – 256+50 East) Flags WF E-Series	515	435
VW G (Sta. 253+50 – 260+00 West) Flags WF G-Series	0	221
Total	**3,292**	**2,842**

**See Impact Plans in Attachment H*

6.2 Land Under Water Impacts

All impacts to Land Under Water (LUW)/Waters of the United States (WOTUS) are associated with the perennial stream, Maple Meadow Brook, as well as an Unnamed Intermittent Stream crossing the project limits at approximate Sta. 218+00 near Dublin Avenue.

In total the proposed project activities will permanently impact 2,405 square feet of LUW/WOTUS and temporarily impact 224 square feet of LUW/WOTUS. The majority of the impacts are associated with the replacement of Bridge No. W-38-011 carrying Route 38 over Maple Meadow Brook, and the replacement of the culvert at Sta. 218+00 carrying Route 38 over the Unnamed Intermittent Stream. Additionally, the placement of rip rap at a new drainage outfall will result in minor temporary impacts (31 square feet) to LUW/WOTUS of Maple Meadow Brook at approximate Sta. 252+40.

Control of water is proposed for both locations. A natural streambed will be restored as part of the replacements of Bridge No. W-38-011 and the culvert at Sta. 218+00. Channel armoring for scour protection will be fully covered with a layer of natural streambed material, as shown on the plans. The reestablished natural streambed will match existing invert elevations. (please refer to Impact Plans and associated details in Attachment H for details)

The permanent and temporary impacts to LUW/WOTUS are summarized in Table 6.2 below:

Table 6.2: LUW/WOTUS Impacts

Resource Area	Permanent Impacts (SF)	Temporary Impacts (SF)	Dredge/Fill Volume (CY)
Unnamed Intermittent Stream at Sta. 218+00 (Flags BF1-100 & BF1-200 series)	262	164	65
Maple Meadow Brook at Sta. 252+40 to Sta. 255+00 (Flags BF2-200 & BF2-200 series)	2,118	546	650
Total	**2,380**	**710**	**715**

**See Impact Plans in Attachment H*

A total dredge/fill volume of 715 cubic yards is anticipated as part of the replacements of Bridge No. W-38-011 and the culvert at Sta. 218+00. For the proposed work undertaken at Bridge No. W-38-011, the substructure replacement, channel armoring work to mitigate existing scour holes and provide future scour protection, as well as the associated streambed restoration will require up to 650 cubic yards of material to be dredged from LUW/WOTUS within the Maple Meadow Brook. Minimal temporary impacts are associated with the installation of temporary abutments for the temporary pedestrian bridge. Additionally, 65 cubic yards of material will be dredged from LUW/WOTUS as part of the proposed culvert replacement at Sta. 218+00, conveying the Unnamed Intermittent Stream under Route 38. This includes work undertaken for the installation of the culvert body, channel armoring, and natural streambed material.

For the demolition and replacements of Bridge No. W-38-011 and the culvert at Sta. 218+00, floating sediment curtains will be available on-site if/when needed to be installed at downstream locations to collect any construction sediment that moves downstream from the work site. Any unintentional drops or spills of debris into either waterway or their streambeds will be removed therefrom immediately. All debris originating from the demolition of the portions of existing abutments and culvert will be legally disposed of off-site as construction debris. The proposed work will not change either stream's water carrying capacity and will not impact either ground water quality or surface water quality.

7.0 WETLAND REPLICATION/MITIGATION

The Project has been designed to minimize environmental impacts and mitigate damage to the environment to the maximum extent practicable. Measures to mitigate impacts resulting from the project activities have been developed throughout the planning and environmental review processes. A combination of erosion and sediment control BMPs will be installed and maintained for the duration of construction to protect the adjacent resource areas, as described in the approved plans.

7.1 Wetland Replication

The project has been designed to avoid wetland resource area impacts to the maximum extent practicable and will mitigate unavoidable resource area impacts in accordance with state regulations (Massachusetts Wetland Protection Act regulations at 310 CMR 10.55(4)(b), and the Massachusetts Department of Environmental Protection's ("MassDEP") "Massachusetts Inland Wetland Replication Guidelines"

(MassDEP, March 2002). Vegetated Wetland (VW) areas impacted by the construction activities will be replicated in accordance with the standards cited above. Project elements are incorporated into the proposed work that help minimize impacts to wetland resource areas.

To mitigate for total Vegetated Wetland (VW) losses (fill) of 3,292 square feet associated with the subject project, a wetland replication area is proposed adjacent to the wetland E-series east of the Maple Meadow Brook crossing of Route 38 as shown on the plans (approx. Sta. 256+50). The replication area will be adjacent to Wetland E, making the replication area hydrologically connected to the wetlands being impacted by the proposed project. The proposed location of the replication area was chosen to reduce impacts to the wetland vegetated buffer to the maximum extent possible. Much of the existing site of the proposed replication area is currently maintained as manicured lawn. Indigenous plant species are proposed to reestablish vegetation, as shown on the plans.

The wetland replication area will contain an area of approximately 3,510 square feet and will provide mitigation for the wetland losses at an approximate ratio of slightly greater than 1:1 in accordance with the MassDOT Specification 755.35., Inland Wetland Replication Area, which is included in Attachment F – Special Provisions. Adjacent disturbed upland areas will be loamed and seeded upon completion of construction. The wetland replication area plan, including a species list with proposed quantities, is included as part of Attachment H.

7.2 Streambed and Bank Impacts Mitigation

A natural streambed will be restored as part of the replacements of Bridge No. W-38-011 and the culvert at Sta. 218+00. Rip rap placed at both locations for scour protection will be fully covered in a layer of natural streambed material. The reestablished natural streambed will match existing invert elevations. (please refer to Impact Plans and associated details in Attachment H for details)

In addition, the impacted bank and nearby vegetated wetland will be stabilized; bank/slope stabilization will include a vegetated riprap as shown on the plans and described in detail in Special Provisions in Attachment F.

8.0 SEDIMENTATION CONTROL MEASURES

To protect the Vegetated Wetlands (VWs) and Land Under Water (LUW)/Waters of the United States (WOTUS) during construction, a combination of erosion and sediment control BMPs will be installed. Erosion control measures will be implemented as described in the approved plans. Primary erosion control techniques include but are not limited to compost filter tubes, coir rolls/logs, sedimentation fence barriers, and street sweeping. The Contractor will have a stockpile of materials required to control erosion on-site to be used to supplement or repair erosion control devices. These materials will include, but are not limited to, compost filter tubes, coir fiber rolls, sedimentation fence, silt sacks for catch basins, erosion control matting and crushed stone. The erosion controls will be maintained in good condition until on-site soils are stabilized. All areas will be permanently stabilized following the completion of construction work.

9.0 DEWATERING

It is anticipated that a NPDES Construction General Permit (CGP) will be required for the project; therefore, if dewatering is needed, all pumped effluent will be done in compliance with the dewatering

requirements within the CGP. There will be no untreated discharge of pumped water into any resource area, or closed drainage system.

Dewatering of excavated stream bed materials shall take place on an impervious surface within or near the project site. Material will be stockpiled at the construction staging area and reused as fill when suitable. Areas of temporary storage and dewatering of excavated riverbed materials should only be in use for the duration of this project. It is expected that much of the material will be re-used at the site as fill. The dewatering site will not be used for any future project. It will be the Contractor's responsibility to design, install, operate, and remove the temporary dewatering measures.

The Contractor will be expected to perform this work in accordance with MassDOT Special Provisions for Control of Water for each structure (see Attachment F). The Contractor must treat dewatering discharges, prior to outletting these flows to local waterways, for removal of sediments. This will be done by use of sediment tanks, fractionalization tanks, sediment basins, or other approved means, sized to handle anticipated flows pumped from the work areas for the footings. Outlets from these treatment measures will discharge onto splash pads or other measures that will prevent concentrated flows that could erode bank soils or streambed materials enroute to the receiving watercourse.

10.0 STORMWATER MANAGEMENT

Stormwater management for this project has been designed in compliance with the Stormwater Management Standards as outlined in 310 CMR 10.05(6)(k) through (q) and defined in detail in the DEP's Stormwater Management Handbook. The project has been designed to improve upon existing stormwater conditions while minimizing impacts to nearby resource areas from both the construction and operation of the proposed project.

The proposed stormwater enhancements are summarized below:

- Route 38 will be reconstructed to provide a typical pavement width of thirty-two feet to forty-four feet using a normal crown section for the majority of the project. Where the road is crowned, curbs will be installed, utilizing gutter flow along the outside lane of each direction of travel. Where the road is superelevated, curb will be installed, utilizing gutter flow along the outside lane of the down-slope side of the road. The new closed drainage system will be redirecting flows that currently sheet flow off Route 38 towards adjacent wetlands and residential areas and will now be conveyed into catch basins prior to discharge.
- The reconstructed drainage system will utilize existing outfall locations and invert elevations where feasible. In areas where the current pipe configuration connects multiple inlets in series (basin to basin), the reconstructed system will use manholes to connect the catch basins to the outfall line. This configuration will place all inlets "off-line" so the failure of an inlet will not adversely impact the overall performance of the entire line.
- The reconfigured system will be in accordance with the MassDEP Stormwater Handbook, which does not give credit for any reduction in total suspended solids (TSS) for catch basins connected on-line (in series). Whereas the existing catch basins do not have deep sumps or hooded outlets, sumps with a minimum depth of 4-feet will be specified, and all outlets will be equipped with hoods/traps to aid in the capture of floatable materials.
- A Low Impact Development (LID) site planning and design strategy has been incorporated into the design by installing three infiltrating SCMs as part of this project. The proposed drainage

system has been designed to convey runoff to these SCMs for water quality treatment, and attenuation prior to discharge to the surrounding environment.

- The proposed drainage improvements will contribute to enhanced flood control and storm damage prevention.
- This project provides an opportunity to improve the existing drainage system and improve the quality of stormwater runoff discharged to adjacent wetlands.

As a result of the project's activities, some drainage structures will be replaced, and the drainage system will be improved. The proposed SCMs will aid in treating runoff and mitigating impacts from the increase in impervious area.

This project qualifies as a Redevelopment project under the Stormwater Management Standards. This project is also a Limited Project under the WPA. Below is a list of the Stormwater Management Standards and a brief description of the project's compliance with the standards to the maximum extent practicable.

Standard 1: (Untreated discharges)
No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The project has been designed to comply with Standard 1. All new outfalls are designed with flared end sections and rip rap protection to prevent erosion to the existing wetland systems. Stormwater runoff will be treated by deep sump hooded catch basins, and the project includes two subsurface infiltration systems with isolator rows for pretreatment and an infiltration basin with a forebay to provide additional treatment. There are no new untreated point source discharges created as a result of this project. This standard is fully met.

Standard 2: (Peak rate control and flood prevention)
Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as designed in 310 CMR 10.04.

Standard 2 requires that the rates of flow be attenuated for the proposed development condition. This project is a redevelopment project and is required to meet Standard 2 to the maximum extent practicable. The peak flow rates were calculated for the 2-, 10-, and 100-year storm events under proposed conditions and compared to the existing peak flow rates. The realignment of the roadway and construction of a typical 32-foot pavement width results in an overall increase of 60,700 square feet in impervious area within the project limits. While there is a net increase in impervious area, the proposed project will implement three proposed SCMs to help mitigate the increase in peak rates. Though there is an increase in peak flow rates for DP-4, DP-7, DP-9, DP-11, DP-14, DP-15, DP-16, DP-18, DP-19, and DP-20 for some or all storm events, the corresponding increase in peak volume translates to a small impact to the corresponding downstream wetland or waterbody. This standard is met to the maximum extent practicable.

Standard 3: (Recharge to Ground water)
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 predevelopment

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.

As stated previously, this project is a redevelopment project and is required to meet Standard 3 to the maximum extent practicable. This project has 506,700 square feet of total existing impervious area and 567,400 square feet of total proposed area within the limit of work. The required recharge volume for the total proposed impervious and the net increase in impervious area is 28,175 cubic feet (CF) and 2,990 CF, respectively. There is a net increase in impervious area of 60,700 square feet under proposed conditions, so there is a recharge volume requirement. The project has implemented three SCMs to maximize recharge at feasible locations within the project limits. These SCMs will provide an improvement to existing conditions as there are presently no stormwater mitigation practices within the project limits.

The contributing impervious areas and underlying Hydrologic Soil Group were used to estimate the recharge volume lost by development, which was used to calculate the required recharge volume for each SCM. The required recharge volume is 1,167 CF, 462 CF, and 260 CF for SCM-1, -2, and -3, respectively. The recharge storage volume provided is 3,511 CF, 955 CF, and 2453 CF for SCM-1, -2, and -3, respectively. Therefore, each SCM provides adequate volume for the impervious area that is routed to them. In addition, the combination of recharge volume provided by all three SCMs provides adequate storage for the required net increase of proposed impervious area for the project, but not for the required total proposed impervious area within the site. Therefore, Standard 3 is met to the maximum extent practicable.

Standard 4: (80% TSS Removal)
Stormwater management systems shall be designed to remove 80% of the average annual postconstruction 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. *Stormwater BMPs are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
c. *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

As stated previously, this project is a redevelopment project and is required to meet Standard 4 to the maximum extent practicable. As mentioned in Standard 3, there is a net increase in impervious area and three SCMs are proposed as part of this project. It has been designed to provide water quality treatment for the area of impervious surface that it captures. The treatment practices are:

- Aboveground Infiltration Basin
- Subsurface infiltration chambers

This standard is met to the maximum extent practicable.

Massachusetts Stormwater Regulations require a “Water Quality Depth” of 1 inch when the project site is located within a “critical area”. This project is located within a Zone II, which is considered a critical area; therefore, a depth of 1” was used for the Water Quality calculations.

The proposed design aims to improve the water quality by installing three new infiltration SCMs. The required water quality volume for the total impervious area is 58,400 CF. The required water quality volume for the net increase in impervious area is 5,060 CF. The required water quality volume for the impervious area that SCM-1, SCM-2, and SCM-3 receives is 1,944 CF, 751 CF, and 1,041 CF, respectively. The combined storage volume of the three proposed SCMs is 6,919 CF, which provides enough volume for the net increase in impervious area, but not the total proposed impervious area. The SCMs also exceed the water quality volume requirement for the area they are designed to hold, by providing 3,511 CF, 955 CF, and 2,453 CF of storage for SCM-1, SCM-2, and SCM-3, respectively. Therefore, this standard will be met to the maximum extent practicable. See the Stormwater Report in Attachment D for required water quality volume calculations.

The project has been designed to include a minimum of 25% TSS removal for areas where SCM's were not feasible. Where SCM's are able to be installed, more than 80% TSS removal will be achieved. Since the project is located within a stormwater critical area, pretreatment of 44% TSS removal is required prior to an infiltration basin. All three SCM's include a combination of deep sump catch basins with either a forebay or isolator row that provide 44% TSS removal before the infiltration basins.

Standard 5 (Higher Potential Pollutant Loads (HPPL)
For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

The project site is not considered a Land Use with Higher Potential Pollutant Loads (LUHPPL); therefore, Standard 5 is not applicable to this project.

Standard 6 (Critical Areas)
Stormwater discharges to a Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "stormwater discharge," as defined in 314 CMR 3.04(2)(a)1 or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

This site discharges within a Zone II, which is considered a "critical area." This standard applies and the project must meet the 1" water quality requirement.

Water Quality treatment volume provided for all three SCM's have been sized for the 1". In addition, all three SCM's shall provide at least 44% TSS removal prior to discharge to the infiltration structure. The water quality standards for the proposed stormwater system have been addressed in Standard 4 of the stormwater report. Catch Basins with plastic hoods and 4' sumps are proposed throughout the project. The hoods will provide some volume to capture floatable oil, grease, and petroleum hydrocarbons if a spill occurs.

In addition, MassDOT follows established Best Management Practices (BMPs) and operational procedures and has implemented a range of strategies statewide to reduce the amount of road salt used and minimize its environmental impact. Such strategies include the increased use of liquid deicers to pre-wet dry material in order to reduce bounce and scatter and for pre-treating roadways prior to storms when conditions allow. Both techniques have been shown to reduce the overall application of sodium chloride. In addition, the use of closed loop controllers, pavement sensors and other equipment allows for more efficient operations.
Additional measures required for stormwater management systems in critical areas are the installation of shut-off valves at all outlets to a critical area. For areas where there is a closed drainage system, the risk of potential tampering by the public with the shut-off valves and the required response time by a town official to operate the valve in case of an emergency outweigh the benefits of installing the shut-off valves; therefore, they are not included in the design. This standard is met to the maximum extent practicable.

Standard 7: (Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable)
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 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.

The improvements to Route 38 are considered a Redevelopment; therefore, Standard 7 is applicable to this project. This project provides an opportunity to improve the quality of stormwater runoff discharged to adjacent wetlands. The proposed stormwater enhancements are summarized below:

- Three infiltration SCMs are proposed as part of this project. A portion of the proposed drainage system has been designed to convey runoff to the SCMs for water quality treatment, and attenuation prior to discharge to the surrounding environment. The proposed SCMs are two subsurface infiltration systems and an aboveground infiltration basin.
- The new drainage system will follow existing drainage patterns by discharging at natural existing discharge points.

Below is a bullet summary of project compliance to the standards:

- Standard 1 (Untreated Discharges) – Fully Met
- Standard 2 (Peak Rate Control and Flood Prevention) – Maximum Extent Practicable
- Standard 3 (Recharge to Groundwater) – Maximum Extent Practicable
- Standard 4 (80% TSS Removal) – Maximum Extent Practicable
- Standard 5 (Higher Potential Pollutant Loads) – N/A

- Standard 6 (Critical Areas) – Maximum Extent Practicable
- Standard 8 (Erosion Sediment Control) – Fully Met
- Standard 9 (Operations and Maintenance) – Fully Met
- Standard 10 (Illicit Discharges) – Fully Met

Standard 8: (Erosion, Sediment Control)
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.

The implementation of erosion and sediment controls (ESC) during construction is considered a standard practice for all MassDOT projects. ESC will be installed before any land disturbance begins for the Project and will remain in place for the duration of the project. Construction period pollution prevention and erosion and sedimentation control measures will be implemented at the project site to control construction related impacts during construction and land disturbance activities. The General Contractor for the project will be responsible for the implementation of the construction period controls.

The project will disturb more than one acre of land during the construction process and will require a NPDES Construction General Permit issued by the Environmental Protection Agency. As a result, the General Contractor will be required to prepare a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP document will satisfy the requirements of the Construction General Permit and the construction period erosion, sedimentation and pollution prevention plan requirements outlined in Standard 8 of the Massachusetts Stormwater Handbook. A SWPPP has not been prepared for inclusion with this stormwater report; however, one will be prepared prior to any construction activities at the site by the General Contractor.

Erosion and sedimentation controls will be employed to prevent the erosion and transport of sediment into resource areas during the earthwork and construction phases of the project. Erosion and sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period. This standard is fully met.

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

MassDOT O&M plans are addressed at a statewide, programmatic level through the State's highway operation and maintenance program. Each MassDOT district office is responsible for providing operation and maintenance for the MassDOT stormwater management systems within their respective jurisdictions. Attachment D includes the full Stormwater Report as well as the O&M Plan for this project. This standard is fully met.

Standard 10 (Illicit Discharges)
All illicit discharges to the stormwater management system are prohibited.

Standard 10 of the Massachusetts Stormwater Handbook prohibits illicit discharges to stormwater management systems. As stated in the handbook, "The stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including Stormwater Control Measures and

any pipes intended to transport stormwater the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater."

An Illicit Discharge Compliance Statement is included in the Stormwater Report in Attachment D. Where a new closed drainage system will be constructed, there will be no connections to sanitary sewer. In other areas, stormwater runoff discharges via overland flow. The design plans submitted with this report have been designed in full compliance with Standard 10. The project area does not have any known illicit connections. Any illicit connections to the stormwater management system found in the project limit of work during construction will be removed and/or resolved through MassDOT's Illicit Discharge Detention and Elimination (IDDE) Program. The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges. This standard is fully met.

For additional details see Stormwater Report in Attachment I.

11.0 FISHERIES AND WILDLIFE / NATURAL HERITAGE ENDANGERED SPECIES / VERNAL POOLS

The project site is not located within an area designated as a Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife or NHESP Priority Habitat of Rare Specie by the Natural Heritage & Endangered Species Program (NHESP) 2021 Maps. Therefore, the project activities are not expected to affect these habitats. The project is not located within an Essential Fish Habitat (EFH), and there are no cold-water fisheries or land containing shellfish within or adjacent to the project area.

A potential Vernal Pool (PVP# 29119) is located approximately 75 feet southwest of Route 38 and 550 feet south of Burlington Avenue, on the southwest side of the MBTA tracks. The Certified Vernal Pool (CVP# 2795) is located in close proximity to and south of the PVP described above, approximately 150 feet southwest of Route 38 and 550 feet south of Burlington Avenue. Another PVP #29103 is located northwest of the intersection of Route 38 and Cook Avenue, approximately 100 feet west of Route 38 and is within Wetland H; however, project activities are not expected to negatively affect these vernal pools. There are no Certified Vernal Pools in the vicinity of the project area. A combination of erosion and sediment control measures will be installed as shown on the attached plan set in the vicinity of the resource areas, therefore, the above areas will not be affected during construction.

Per MassGIS online data mapping, the project site is not located within an Area of Critical Environmental Concern (ACEC). The closest Area of Critical Environmental Concern (ACEC) to the project site is the Golden Hills ACEC in the Town of Wakefield, the limits of which are no closer than 6 miles southeast of the project area. The closest Outstanding Resource Waters (Mill Pond Reservoir Intake Point – public water supply watershed) is located approximately 1.4 miles southwest of the project limits. Please refer to Figure 3 – Environmental Constraints Map in Attachment A for details.

According to the Federally Listed Endangered and Threatened Species in Massachusetts, the Northern Long-eared Bat (*Myotis septentrionalis*) (NLEB) is an Endangered Species located Statewide; however, this species is protected by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). Review of their habitat on NHESP's website indicates that in warmer months they can be found in forested areas, specifically in clustered stands of large trees and in colder months they can be found in natural

caves and abandoned mines. The proposed work will result in tree clearing as shown on the plans. The project area is located within mapped Northern Long-eared Bat (Endangered) and Tricolored bat (Proposed Endangered) habitat. The attached USFWS NLAA Concurrence Verification letter dated 10/10/2024 demonstrates coordination with USFWS. AMMs for NLEB and Tricolored Bat (Proposed Endangered) will be included in the Contract documents. If additional tree cutting is proposed by the Contractor that is outside the scope of this contract, additional review is required by the MassDOT Highway Division's Environmental Services Section, and time of year restrictions may apply to such tree cutting.

A recent initiative by USFWS lists the Monarch Butterfly (*Danaus plexippus*), as a Candidate species, which may also be present within the project limits. The migratory population of these species may occur in the eastern United States. Since the Monarchs lay eggs on milkweed, and larvae feed only on plants in the milkweed family (*Asclepiadaceae*), the loss of milkweed from agricultural lands has been mentioned to negatively affect Eastern North America Monarch population along with other factors such as droughts, nectar source, and, not as often, roadkill. There are generally no Section 7 requirements for Candidate species; however, the USFWS encourages all agencies to take advantage of any opportunity they may have to conserve the species.

12.0 STREAM CROSSING NARRATIVE

The proposed culvert replacement at Sta. 218+00, conveying the Unnamed Intermittent Stream under Route 38, will achieve partial compliance with the Massachusetts River and Stream Crossing Standards (revised March 2011) by conforming with Stream Crossing General Standards (SCGS) #4, #5. SCGS #1, #2, #3 and #6 cannot be complied with. The existing 3.5'x1.5' box culvert at approximate Sta. 218+00, conveying the Unnamed Intermittent Stream under Route 38, is proposed to be replaced with a 3'x3' precast concrete box culvert with a natural streambed material proposed in the bottom of the proposed culvert at the same elevation as the existing surface.

The proposed replacement of Bridge No. W-38-011 between approximately Sta. 252+50 to Sta. 255+00, conveying Maple Meadow Brook under Route 38, will achieve partial compliance with the Massachusetts River and Stream Crossing Standards (revised March 2011) by conforming with SCGS #1, #4, #5. SCGS #3 and #6 cannot be complied with, and #2 does not apply. The existing Bridge No. W-38-011, a simple span reinforced concrete slab with a clear span of approximately 11.7', is proposed to be replaced with a single span superstructure comprised of Nine (9) three-sided precast concrete frame segments with a span length of 12'. The frame can be constructed with minimal impact to the channel, reducing the overall environmental impact, and maintaining the existing hydraulic opening. Where possible, the existing natural streambed material will be maintained. Any rip rap placed for scour protection will be fully covered in a layer of natural streambed material as shown on the plans and specifies in Special Provisions (see Attachments H and F for details).

The compliance of each stream crossing with the Massachusetts River and Stream Crossing Standards are summarized in Table 12.1 below:

Table 12.1: Compliance with Massachusetts River and Stream Crossing Standards

Stream Crossing (Sta. #)	SCGS #1	SCGS #2	SCGS #3	SCGS #4	SCGS #5	SCGS #6
Culvert Replacement at Sta. 218+00	MEP	MEP	MEP	Met	Met	MEP
Bridge No. W-38-011 at Sta. 252+50 to Sta. 255+00	Met	N/A	MEP	Met	Met	MEP

SCGS #1 posits that "Spans (bridges, 3-sided box culverts, open-bottom culverts or arches) that preserve the natural stream channel are strongly preferred."

- Culvert Replacement at Sta. 218+00 – The existing 3.5'x1.5' obstructed culvert is not an open bottom structure and will be replaced with the proposed 3'x3' precast concrete box culvert. This culvert conveys an intermittent stream that does not have a year-round flow and it outfalls into a Vegetated Wetland (VW) (A-series). In addition, there is another culvert west of the culvert inlet conveying this intermittent stream beneath the MBTA railroad tracks, which is not being replaced as part of this project. Both of the existing culverts beneath the MBTA railroad tracks and Route 38 are not an open bottom structure, and replacement of the culverts with open bottom structures is not feasible due to constructability constraints which will cause more impacts to the surrounding VWs and utilities, therefore, **this standard is met to the maximum extent practicable.**

- Bridge No. W-38-011 at Sta. 252+50 to Sta. 255+00 – The proposed replacement bridge will maintain a span-type structure over Maple Meadow Brook. **This standard is fully met.**

SCGS #2 provides recommendations for a culverted crossing to be embedded a minimum of 2 feet.

- Culvert Replacement at Sta. 218+00 – The existing culvert is not embedded 2 feet or more; and in order to limit the disturbance to resource areas and the depth of excavation within resource areas (VW A-series), the proposed replacement culvert will be embedded less than 2 feet as well. Natural streambed material proposed at the bottom of the proposed culvert will be at the same elevation as the existing surface. **This standard is met to the maximum extent practicable.**

- Bridge No. W-38-011 at Sta. 252+50 to Sta. 255+00 – This standard only applies to culverted stream crossings; therefore, **this standard is not applicable.**

SCGS #3 calls for a new span to incorporate a width that, at a minimum, equals 1.2 times bankfull width of the stream.

- Culvert Replacement at Sta. 218+00 – As discussed above under the SCGS #1, there is another culvert west of the culvert inlet of Route 38 conveying this intermittent stream beneath the MBTA railroad tracks, which is not being replaced as part of this project. Both of the existing structures do not comply with the SCGS. Since the existing culvert beneath the MBTA railroad tracks upstream of the Route 38 crossing is not being replaced, widening of the proposed continuation

of this stream crossing beneath Route 38 is precluded; in addition, widening of this crossing would cause more impact to the VW A-series at the outlet of this crossing on the east side of Route 38. **This standard is met to the maximum extent practicable.**

- Bridge No. W-38-011 at Sta. 252+50 to Sta. 255+00 – The existing bankfull width, as reported by USGS StreamStats, is approximately 25'. However, extensive ponding upstream and downstream of the bridge complicates accurate bankfull width measurements. The existing bridge spans approximately 11'-7" feet and therefore does not currently comply with the SCGS. The proposed span of the bridge replacement is 12'-6". Although the proposed span still does not meet the SCGS of 1.2 times bankfull width, this is an improvement upon the existing conditions and meets the standards to the maximum extent practicable. It is not feasible to replace the culvert with a span greater than 12'-6" without disturbing substantially more adjacent resources areas and the established site hydrology. A hydraulic study was done to match existing flows and not to increase the base flood elevation associated with Maple Meadow Brook. The culvert was sized using hydrological calculations to ensure no potential flooding of the properties and infrastructure will occur as a result of this replacement. It was found that further increasing the hydraulic opening for this culvert in order to meet this standard would impact the peak flow rates downstream of the bridge with a high likelihood of raising the peak water surface elevations on the downstream side and lower peak flow elevations on the upstream side. Such impacts are not permitted. **This standard is met to the maximum extent practicable.**

SCGS #4 calls for placement of natural substrate within the structure. As shown in the plans, the proposed replacements of Bridge No. W-38-011 and the culvert at Sta. 218+00 will both incorporate natural substrate as part of the streambed restoration. In addition, rip rap placed at both locations for scour protection will be fully covered in a layer of natural streambed material. **This standard is fully met.**

SCGS #5 calls for "… bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows." The proposed replacements of Bridge No. W-38-011 and the culvert at Sta. 218+00 will maintain bed forms and streambed characteristics comparable to those found in the natural channel at a variety of flows. Natural streambed materials will be placed at the same elevation to match the existing streambeds which will allow for a smooth transition from upstream to downstream of the crossing upon completion of construction. **This standard is fully met.**

SCGS #6 provides a desired level of "openness" for stream crossings so that wildlife will utilize the crossing for passage beneath a roadway. The desired ratio of cross-sectional area of opening to passage length is a minimum value of 0.82 feet.

- Culvert Replacement at Sta. 218+00 – The project proposes the replacement of the existing 3.5'x1.5' obstructed culvert with a 3'x3' precast concrete box culvert with 6" of natural streambed material over 6" of crushed stone. The existing cross-sectional area is 5.25 square feet divided by the existing passage length of 47.65 feet, yields a value of 0.11 feet. Although the size of the opening will be slightly increased, there will be a 6" layer of crushed stone topped with natural stream bottom. The proposed cross-sectional area of 6 square feet divided by a proposed passage length of 55.32 feet, both as shown in the Plans, yields a value of 0.11 feet. Therefore, both the existing and the proposed culvert do not meet Standard #6 by providing a minimum level of openness of 0.82 feet. Substantial enlargement of the structure is not feasible due to

constructability constraints discussed above and additional impacts to adjacent protected resource areas (VW A-series). **This standard is met to the maximum extent practicable.**

- Bridge No. W-38-011 at Sta. 252+50 to Sta. 255+00 – The existing bridge cross-sectional area of approximately 62.77 square feet divided by a passage length of approximately 43 feet, yields a value of 1.45 feet. The proposed bridge cross-sectional area of approximately 61.66 square feet divided by a passage length of approximately 41 feet, yields a value of 1.5 feet, an improvement of the existing 1.45 feet, and exceeding the desired level of openness of 0.82 feet. **This standard is fully met.**

13.0 ALTERNATIVES ANALYSIS

The purpose of this project is to provide safety enhancements along the Route 38 corridor in Wilmington for drivers and bicyclists, to promote improved flow of traffic, and to address drainage issues at various locations within a project segment. The corridor currently does not provide sufficient bicycle and pedestrian facilities. Pedestrian accommodations are limited to specific areas, and existing sidewalks are substandard, often failing to meet ADA/AAB requirements. Cyclists must either share vehicle lanes or use sidewalks, creating safety concerns. To comply with MassDOT's Healthy Transportation Policy, the project must include compliant sidewalks and bicycle facilities.

A Road Safety Audit (RSA) conducted on January 26, 2017, highlighted key safety concerns, including:

- Faded or improper pavement markings.
- Substandard pedestrian and bicycle accommodations.
- Intersection geometry deficiencies.
- Inefficient signage and signal equipment.
- Access management issues.
- Ineffective drainage.

The crash rate along Route 38 exceeds the Massachusetts statewide average. Angle crashes dominate at several intersections, including:

- Route 38 at Butters Row/Cross Street: 69% angle crashes.
- Route 38 at Route 62: 48% angle crashes.
- Route 38 at Route 129: 46% angle crashes.
- Route 38 at Eames Street: 29% angle and 29% rear-end crashes.

The project aims to:

- Enhance roadway infrastructure.
- Reduce traffic congestion on entering side streets.
- Improve drainage systems.
- Increase safety for all roadway users.
- Provide adequate multimodal accommodations along the Route 38 corridor in Wilmington.

Alternatives for the project included the "No-Build Alternative". However, there will be continued safety issues if the proposed project does not take place. The "No-Build Alternative" will not meet the purpose and need for the project by failing to provide roadway and intersection improvements, including traffic operation, intersection, and drainage improvements as well as providing multimodal accommodations

through the Route 38 corridor to enhance safety for all roadway users, including drivers, bicyclists, and pedestrians, and thus was not considered.

Certain accommodations were made to avoid and minimize impacts to Land Under Water (LUW)/Waters of the United States (WOTUS) to the greatest extent practicable. Options for reducing sidewalk width to minimize resource area impacts were considered across the project; however, narrower sidewalks were not considered as viable alternatives due to ADA-compliance concerns. Nevertheless, to further limit resource area impacts, a sidewalk segment was eliminated in the primarily wooded and industrial areas with low anticipated pedestrian usage. Additionally, the proposed roadway shoulders are minimized to 5 feet to accommodate bicycle usage, with select locations near the project's start reduced to 2 feet as approved under a MassDOT design exception. In areas adjacent to resource areas where embankment slopes are 2H:1V, a guardrail is required per AASHTO design standards within the clear zone. To further minimize resource area impacts, deep-post guardrails are proposed, eliminating the need for a 2-foot level bench behind the sidewalk for standard guardrail post, as specified in the MassDOT Construction Standard Details.

The following section describes the alternatives for the major design features along the proposed Route 38 improvements that were analyzed and considered during the design process. Two alternatives were evaluated for each design feature: meet the policy requirements and a compromised option. These alternatives, detailed below, reflect the designs that were deemed the most feasible in order to meet the objectives of the project while also minimizing the environmental impacts to the maximum extent practicable. Each of the alternatives below more thoroughly detail the proposed alternatives that were carefully evaluated, and each reflects an effort to avoid, minimize, and mitigate environmental impacts while still meeting the project's purpose.

Design feature – Pedestrian Accommodation

Policy Requirements: MassDOT's Healthy Transportation Policy requires 5-foot-wide sidewalks on both sides in urbanized areas.

Challenges: Installing sidewalks on both sides would:

- Significantly impact right-of-way (ROW), wetlands, and utilities.
- Increase costs and affect adjacent property owners.
- Trigger increased project impacts including over 4,000 sq. ft. of ROW impact, 500 sq. ft. of wetland impact, and the relocation of 20 utility poles.

Preferred Design: Sidewalks will be placed only on the west side between Station 248+25 to Station 314+25 serving residential areas and public parks, minimizing impacts on wetlands and utility infrastructure. The east side, which is primarily wooded and industrial areas, will not include sidewalks. A design exception was requested and approved by MassDOT for this modification.

Design feature – Bicycle Accommodation

Policy Requirements: MassDOT Design Guide requires bicycle accommodation for projects in urbanized areas and provides a separated bicycle facility.

Challenges: Installing bicycle lanes on both sides would trigger:

Two locations within the project limits that cannot meet the minimum bicycle accommodation using a 5-foot shoulder due to space constraints.

1. West Side of Route 38 (Northern Project Limits to Route 62):
   - A 2-foot shoulder is proposed to reduce congestion and accommodate a new left-turn lane.
   - Expanding to 5 feet would require reconstructing a retaining wall, impacting businesses and properties.
2. West Side of Route 38 (1,200 Feet South of Route 62):
   - A 2-foot shoulder is proposed to maintain MBTA track clearance and minimize impacts on utility infrastructure.

Preferred Design: Shoulder width is reduced to 2 feet in constrained areas while maintaining a 5-foot width shoulder elsewhere within the project limits to serve as a bicycle lane. A design exception was requested and approved by MassDOT for this modification.

Design feature – Roadway Lane Configuration

Policy Requirements: MassDOT's standard for NHS Non-Freeway roadways is 12-foot travel lanes and 8-foot shoulders.

Challenges: Meeting this standard 12-foot travel lane and 8-foot shoulders would require:

- Additional 8 feet of roadway widening.
- Additional 200 sq. ft. of wetland impact.
- Additional 16 tree removal.
- Eliminate the flat bench under the guardrail and require deep posts.
- Stone/Riprap embankment required to achieve 1H:1.5V slope at Station 237+25 RT to Station 241+00 RT and Station 248+25 LT to Station 255+00 LT to tie in with existing ground.
- Requires additional permanent wetland impacts of 3,565 square feet and temporary impacts from erosion and sediment controls of 2,653 square feet.
- Impacts on MBTA platforms, retaining walls, utility pole relocations, and electrical towers.

Preferred Design: Reduced travel lane width to 11-foot travel lanes and 5-foot shoulders. Additional reductions in shoulder widths in constrained areas to also required to minimize ROW impacts. A design exception request was submitted and approved, confirming that the proposed design meets all applicable MassDOT criteria for similar roadways.

Design feature – Horizontal Alignment

Policy Requirements: Horizontal curves must meet a minimum length of 15 times the design speed.

Challenges: Eight curves within the project do not meet these requirements. Lengthening curves to meet policy requirements would require:

- Land taken from 11 properties.
- Increase wetland impacts by 1,300 sq. ft.
- Bridge and retaining wall reconstructions from shifted roadway alignment.

Preferred Design: Horizontal curves were optimized for safety without fully meeting the design standard. A design exception was requested and approved by MassDOT to use optimized horizontal curves that do not meet minimum length requirements given the lack of crash history and constrained by existing features.

Design feature – Vertical Alignment

Policy Requirements: MassDOT requires crest and sag curves to meet specific K values to meet sight distance requirements.

Challenges: Meeting K values would require:

- Lowering or raising the roadway significantly.
- Rebuilding retaining walls.
- Hydraulic opening of existing culverts and headwalls.
- Introduces new high/low points that may require new retaining walls.
- Driveways would be steeper than the existing grade if the profile is raised.
- Minimum cover for underground utilities.
- Extending the limit of grading.

Preferred Design: Vertical curves were optimized for safety without fully meeting the design standard. A design exception was requested and approved by MassDOT to use optimized vertical curves that do not meet minimum K value requirements without major impacts on private properties.

Bridge Alternatives Analysis

The portion of the project between approximately Sta. 252+50 to Sta. 255+00 on Route 38 is associated with the replacement of the existing Bridge No. W-38-011 carrying Route 38 over Maple Meadow Brook.

Three alternatives have been identified for the replacement of Bridge No. W-38-011: No Build, Bridge Replacement with a single-span three-sided frame with cast-in-place footings on micropiles, and Bridge Replacement using Precast Concrete Box Culvert.

Alternative 1: No Build

The “No-Build” Alternative was evaluated, but it was dismissed as it does not meet the project purpose and need by failing to increase safety at the project corridor, improve operations, and provide multimodal accommodations along Route 38, and thus was not considered. There will be continued safety issues if the proposed project does not take place. It is necessary to replace the existing bridge in order to accommodate the proposed roadway design and improvements. The primary alternatives that were considered for the culvert replacement will be detailed below.

Alternative 2: Single-Span Three-Sided Frame with Cast-in-Place Footings on Micropiles (Preferred)

This alternative would feature a single span superstructure comprised of nine (9) three-sided precast concrete frame segments with varying fill and a 3” bituminous concrete wearing surface. The superstructure would be supported on newly constructed footings founded on drilled micropiles, providing the substructure with adequate geotechnical capacity. The newly constructed footings would be offset from the existing abutment footprints to increase the span length to approximately 12’-6”. The frame can be constructed with minimal impact to the channel reducing the overall environmental impact when compared to a box culvert. The frame will maintain the existing hydraulic opening.

The advantages of this alternative include that it is a low maintenance structure type, easy to install and has a natural stream bottom. The disadvantages of this design include its requirement of full-length footings, its slightly longer construction duration due to footing installation, and its higher construction cost when compared to alternative 3.

Alternative 3: Precast Concrete Box Culvert

Alternative 3 is a precast concrete box culvert. The advantage of this alternative is that it is a low maintenance structure type. The underlying soils at the site require deep foundations to provide the structure with adequate geotechnical capacity, a significant disadvantage for Alternative 3, and is why Alternative 2 (preferred) is founded on micropiles drilled into bedrock. The deeper foundation of Alternative 2 provides greater resistance to scour when compared to Alternative 3. Additionally, the box culvert will require significant channel impacts to the channel bottom.

Stormwater Alternatives Analysis

The entire project corridor was analyzed for potential SCMs. The SCM alternatives and feasibility analysis was focused at each of discharge points, including the system that discharges to Maple Meadow Brook. The SCMs considered along the project corridor include water quality swales, infiltration trenches, subsurface chamber systems, qualified pervious areas, and leaching basins. The following is a summary of all the areas and SCMs that were considered, as well as a description of whether an SCM was feasible or not:

- Gutter flow away from project site at DP-1, Sta. 203: No SCM feasible due to limited ROW and adjacent private properties.
- Gutter flow away from project site at DP-2, Sta. 11: No SCM feasible due to limited ROW and adjacent private properties.
- Closed drainage system outfall to DP-4 at Wetland A near an existing outfall and the outlet of the 3.5'x1.5' box culvert, Sta. 217+75 (L): No SCM feasible due to presence of existing resource areas, limited ROW, and adjacent private properties.
- Closed drainage system outfall at DP-5 to the Wetland southwest of the tracks beyond the project limits, Sta. 104 (R): This area consists mostly of woodland area alongside the train tracks on the western side of Route 38. No SCM feasible due to limited ROW and presence of existing train tracks.
- Overland flow to upstream end of existing box culvert at DP-6, Sta. 218 (R): No SCM feasible due to limited ROW and presence of existing train tracks.
- Gutter flow and closed drainage system to DP-7 at Wetland D, Sta. 238+50 (L): No SCM feasible due to Wetland D directly abutting the roadway and adjacent private property.
- Closed drainage system outfall to DP-8 at Wetland C, Sta. 238+50 (R): No SCM feasible due to Wetland C directly abutting the roadway.
- Closed drainage system at DP-9 to Wetland E, Sta. 250 (L): No SCM feasible due to Wetland E directly abutting the roadway.
- Overland flow to DP-10 at Wetland G, Sta. 253+75 (R): No SCM feasible due to Wetland G directly abutting the roadway.
- Overland flow to DP-11 at Wetland I, Sta. 258 (L): No SCM feasible due to limited ROW and adjacent private properties.
- Overland flow to DP-13, Sta. 275+75 (L): No SCM feasible due to limited ROW and adjacent private properties.
- Closed drainage system outfall at DP-14, Sta. 275+75 (R): One SCM is feasible in this location, a subsurface infiltration basin (SCM-1). Stormwater runoff from this area travels via gutter flow, which

enters a closed drainage system that is pretreated by isolator rows, then captured and treated by the subsurface infiltration system.

- Country drainage to wooded depression area at DP-15, Sta. 285+70 (L): No SCM feasible due to limited ROW and adjacent private properties.
- Country drainage to wooded depression area at DP-16, Sta. 290+30 (L): No SCM feasible due to limited ROW and adjacent private properties.
- Overland flow to DP-17, Sta. 285+60 (R): No SCM feasible due to limited ROW and adjacent private properties.
- Closed drainage system outfall at DP-18, Sta. 304 (R): One SCM is feasible in this location. The closed drainage system discharges to an infiltration basin (SCM-2) that has a sediment forebay for pretreatment. The infiltration basin has an outlet control structure that connects back into the closed drainage system within Route 38.
- Closed drainage system outfall at DP-20, Sta. 318 +75 (L): One SCM is feasible in this location, a subsurface infiltration system (SCM-3). Stormwater runoff from this area travels via a combination of overland flow and gutter flow into a closed drainage system. The closed drainage system outlets to a subsurface infiltration system (SCM-3) that is pretreated by isolator rows.
- Overland flow to vegetated area at DP-21, Sta. 316+50 (L): No SCM feasible due to limited ROW and adjacent private properties.

14.0 CONCLUSION

After careful analysis of different alternatives, the project's need and purpose is to reconstruct Route 38 (Main Street) roadway to improve roadway infrastructure, reduce traffic back-ups on entering side streets, improve the existing drainage system and provide increased safety for roadway users. Roadway reconstruction, bridge reconstruction, drainage and safety improvements along Route 38's present alignment and at the intersections are required in order to reduce the number of accidents that presently occur at the main cross street intersections. The project has been designed to avoid impacts to Vegetated Wetlands (VWs) and Land Under Water (LUW)/Waters of the United States (WOTUS) to the maximum extent practicable. All unavoidable impacts will be mitigated in accordance with regulatory requirements. MassDOT Highway Division respectfully requests that MassDEP and the U.S Army Corps of Engineers find these measures adequately protective of the interests identified in the 401 Water Quality Regulations and U.S. Army Corps of Engineers (USACE) Massachusetts General Permits and issue a Water Quality Certificate and 404 authorization approving the work shown on the accompanying plan set.

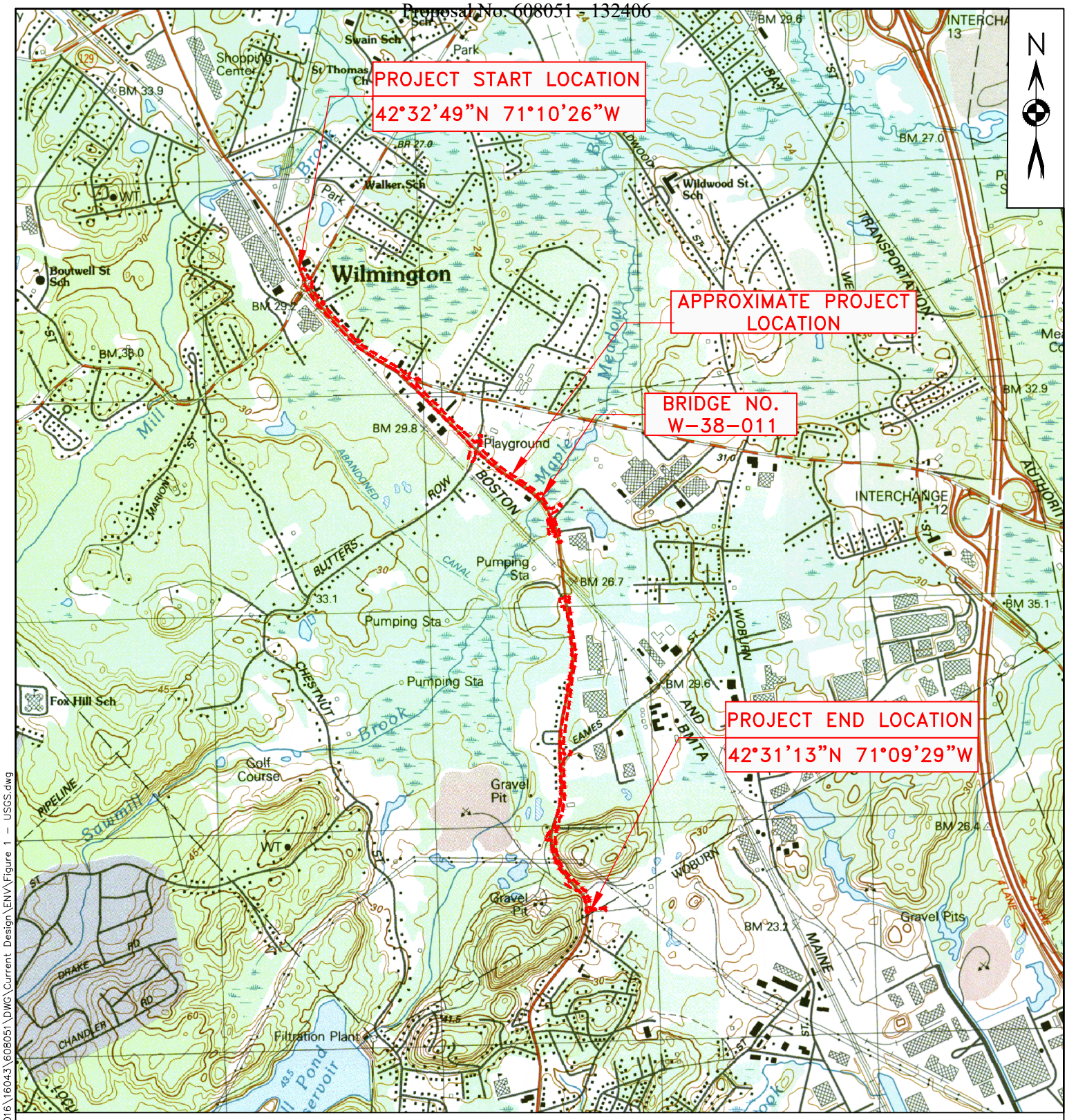
ATTACHMENTS

Attachment A – Figures:
- Figure 1 - USGS Map
- Figure 2 – Aerial Map
- Figure 3 – Environmental Constraints Map
- Figure 4 – FEMA Map

Attachment B – Site Photo Log
Attachment C – Public Notice
Attachment D – Wetland Summary Report
Attachment E – DEP Approved Sediment Sampling Plan and Results
Attachment F – Special Provisions
Attachment G – Other Federal & State Clearances
Attachment H – WQC/ACOE Submission Plans (bound separately)
Attachment I – Stormwater Report (bound separately)

ATTACHMENT A – FIGURES

- Figure 1 – USGS Map
- Figure 2 – Aerial Map
- Figure 3 – Protected Resource Area Map
- Figure 4 – FEMA Map
- Figure 5 – Soils Map



LEGEND:

APPROXIMATE PROJECT AREA

SCALE IN FEET

1000 0 1000 2000

1" = 2000'

ELEVATIONS IN METERS

NOTE: DATA TAKEN FROM MASSGIS

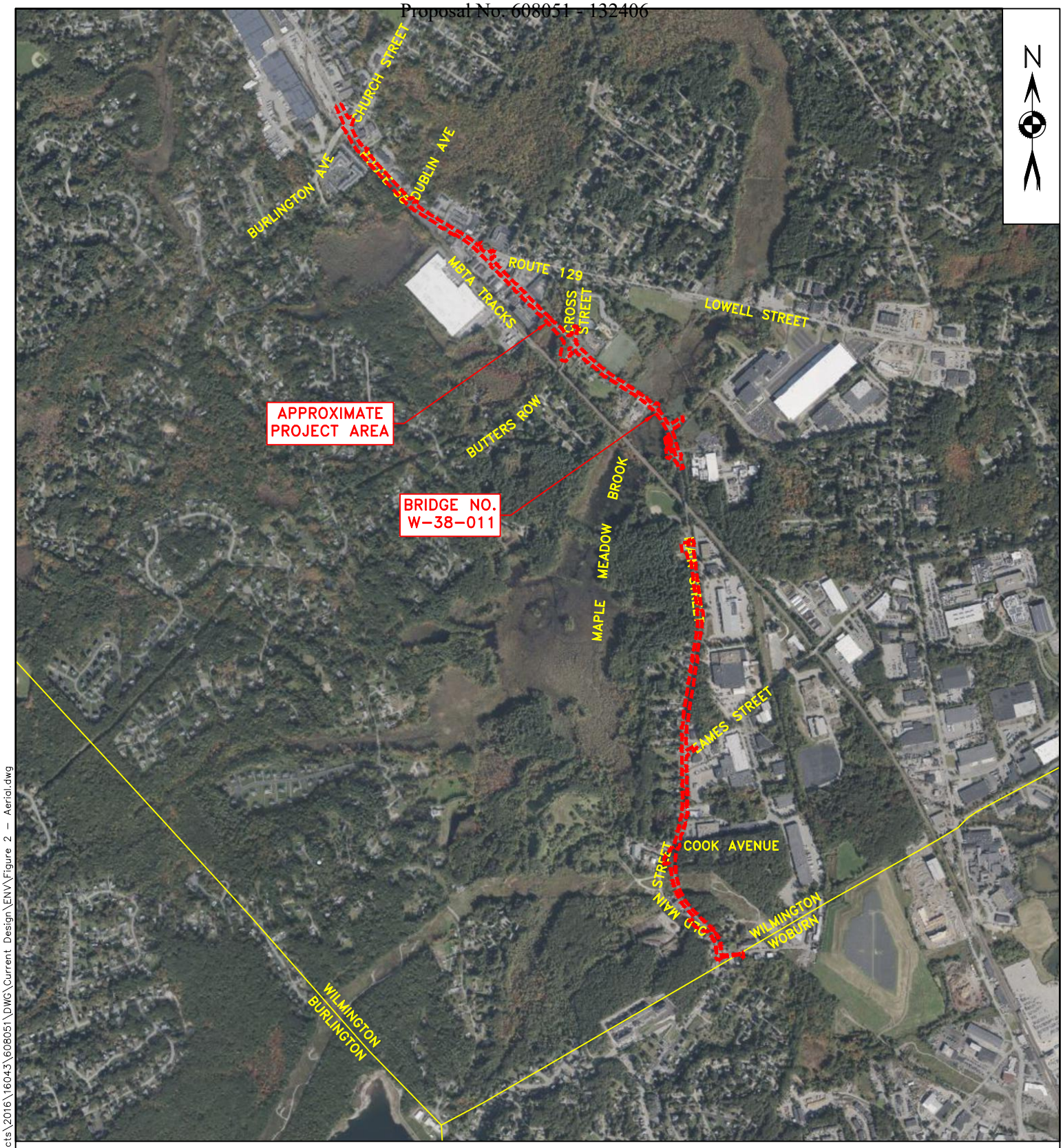
USGS LOCUS MAP

WILMINGTON – RECONSTRUCTION OF ROUTE 38 (MAIN STREET) FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051 INCLUDING THE REPLACEMENT OF BRIDGE NO. W-38-011 OVER MAPLE MEADOW BROOK

PREPARED BY:	PREPARED FOR:
GREEN A Lochner Company	massDOT Massachusetts Department of Transportation Highway Division

SCALE: AS NOTED	PROJECT NO. 21058.16XX	FIGURE 1
DATE: 03/11/2025 REVISED:	DRAWN BY: VR/EL CHECKED BY: OF	

\\EgnyteDrive\greenintl\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\ENV\Figure 1 – USGS.dwg



LEGEND:

APPROXIMATE PROJECT AREA (#608051)

SCALE IN FEET

750 0 750 1500

1" = 1500'

NOTE: DATA TAKEN FROM MASSGIS

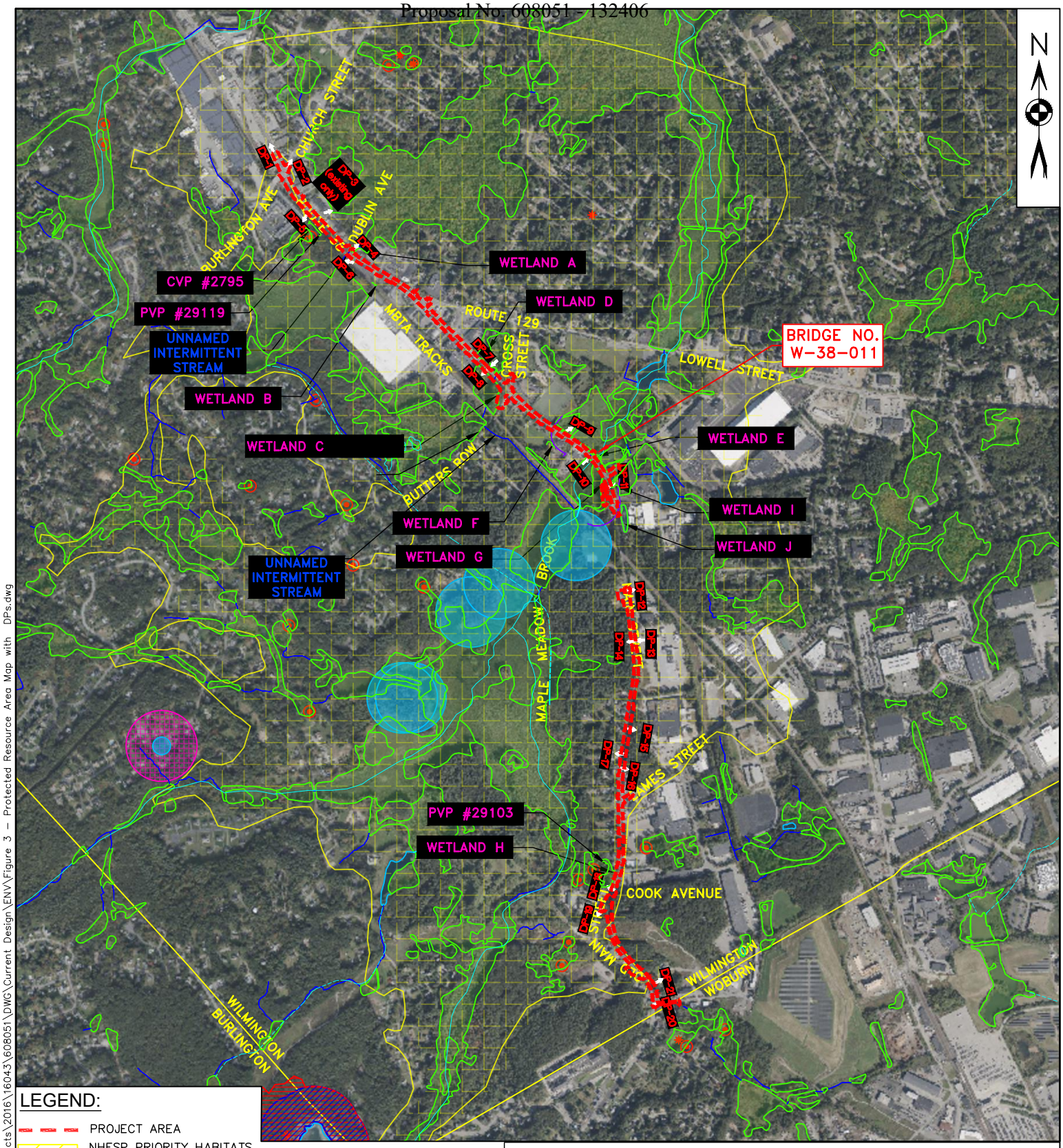
AERIAL LOCUS MAP

WILMINGTON – RECONSTRUCTION OF ROUTE 38 (MAIN STREET) FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051 INCLUDING THE REPLACEMENT OF BRIDGE NO. W-38-011 OVER MAPLE MEADOW BROOK

PREPARED BY:	PREPARED FOR:
GREEN A Lochner Company	massDOT Massachusetts Department of Transportation Highway Division

SCALE: AS NOTED	PROJECT NO. 21058.16XX	FIGURE 2
DATE: 03/11/2025 REVISED:	DRAWN BY: EA/EL CHECKED BY: OF	

\\EgnyteDrive\greenintl\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\ENV\Figure 2 – Aerial.dwg



LEGEND:

- PROJECT AREA
- NHESP PRIORITY HABITATS OF RARE SPECIES
- NHESP ESTIMATED HABITATS OF RARE WILDLIFE
- OUTSTANDING RESOURCE WATER (ORW)
- AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACEC)
- INTERIM WELLHEAD RPROTECTION AREAS (IWPAs)
- DEP APPROVED WELLHEAD PROTECTION AREAS (ZONE I)
- APPROVED WELLHEAD PROTECTION AREAS (ZONE II)
- SURFACE WATER PROTECTION AREAS (ZONE A)
- SURFACE WATER PROTECTION AREAS (ZONE B)
- DEP/SURVEYED WETLANDS
- DEP HYDROLOGIC CONNECTIONS
- MAHW/BANK/PERENNIAL INTERMITTENT STREAM
- CERTIFIED VERNAL POOLS
- POTENTIAL VERNAL POOLS

SCALE IN FEET

750 0 750 1500

1" = 1500'

NOTE: DATA TAKEN FROM MASSGIS

ENVIRONMENTAL CONSTRAINTS MAP

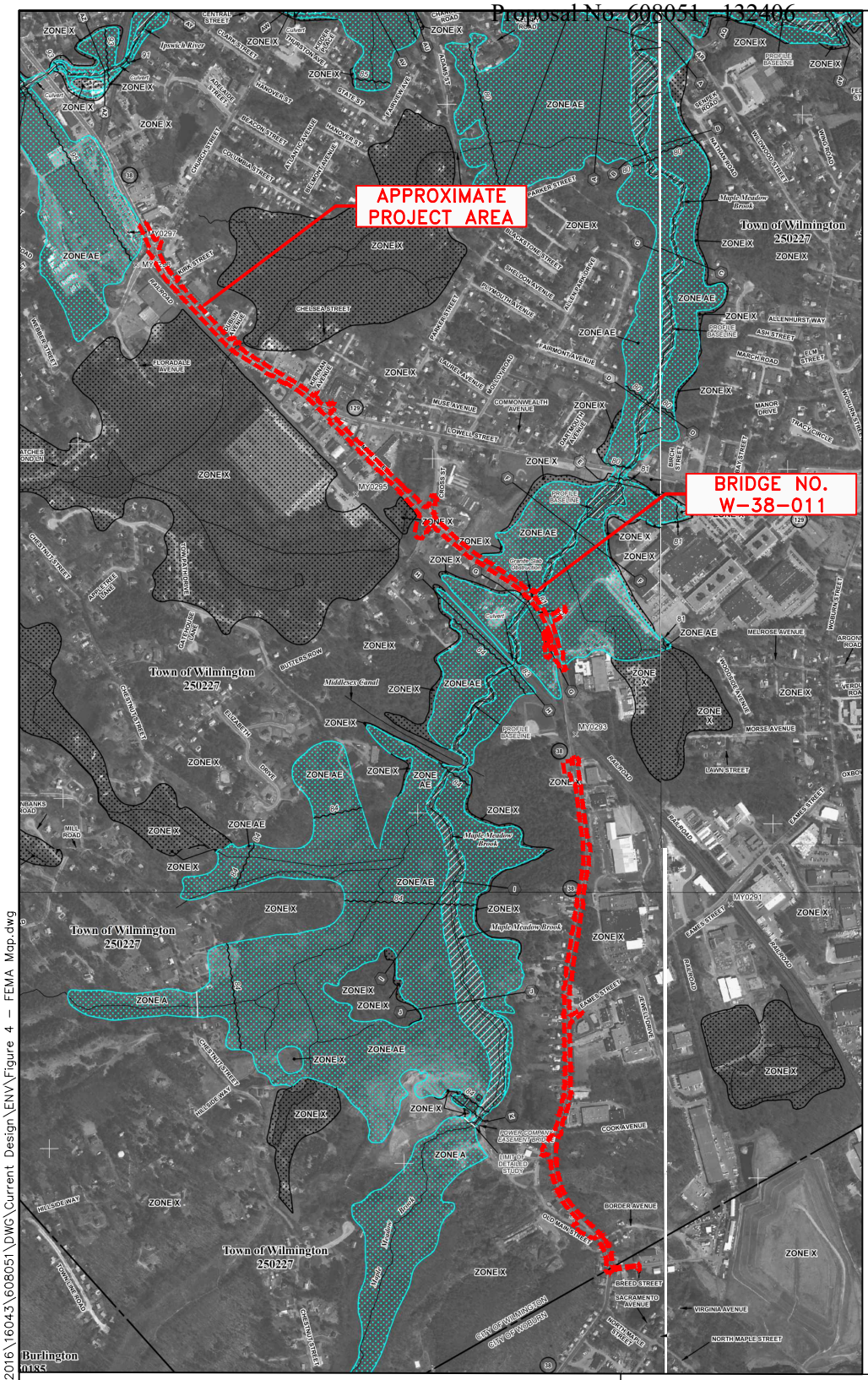
WILMINGTON – RECONSTRUCTION OF ROUTE 38 (MAIN STREET) FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051 INCLUDING THE REPLACEMENT OF BRIDGE NO. W-38-011 OVER MAPLE MEADOW BROOK

PREPARED BY: GREEN A Lochner Company

PREPARED FOR: massDOT Massachusetts Department of Transportation Highway Division

SCALE: AS NOTED	PROJECT NO. 21058.16XX	FIGURE 3
DATE: 03/11/2025	DRAWN BY: VR/EL	
REVISED:	CHECKED BY: OF	

\\EgnyteDrive\greenintl\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\ENV\Figure 3 – Protected Resource Area Map with DPs.dwg



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 (EL 987) — Base Flood Elevation line and value; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000mN — 1000-meter Universal Transverse Mercator grid values, zone 19
- 600000 FT — 5000-foot grid values: Massachusetts State Plane coordinate system, Mainland zone (FIPSZONE 2001), Lambert Conformal Conic projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

LEGEND:

APPROXIMATE PROJECT AREA

NOTE:
THE FLOOD ZONE DATA SHOWN IS TAKEN FROM THE FEDERAL INSURANCE RATE MAPS (FIRM) FOR THE TOWN OF WILMINGTON, MA. (FIRM COMMUNITY PANELS 25017C0291E, 25017C0292E, 25017C0293E, AND 25017C0294E, DATED 06/04/2010.)

SCALE IN FEET

750 0 750 1500

1" = 1500'

FEMA MAP

WILMINGTON – RECONSTRUCTION OF ROUTE 38 (MAIN STREET) FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051 INCLUDING THE REPLACEMENT OF BRIDGE NO. W-38-011 OVER MAPLE MEADOW BROOK

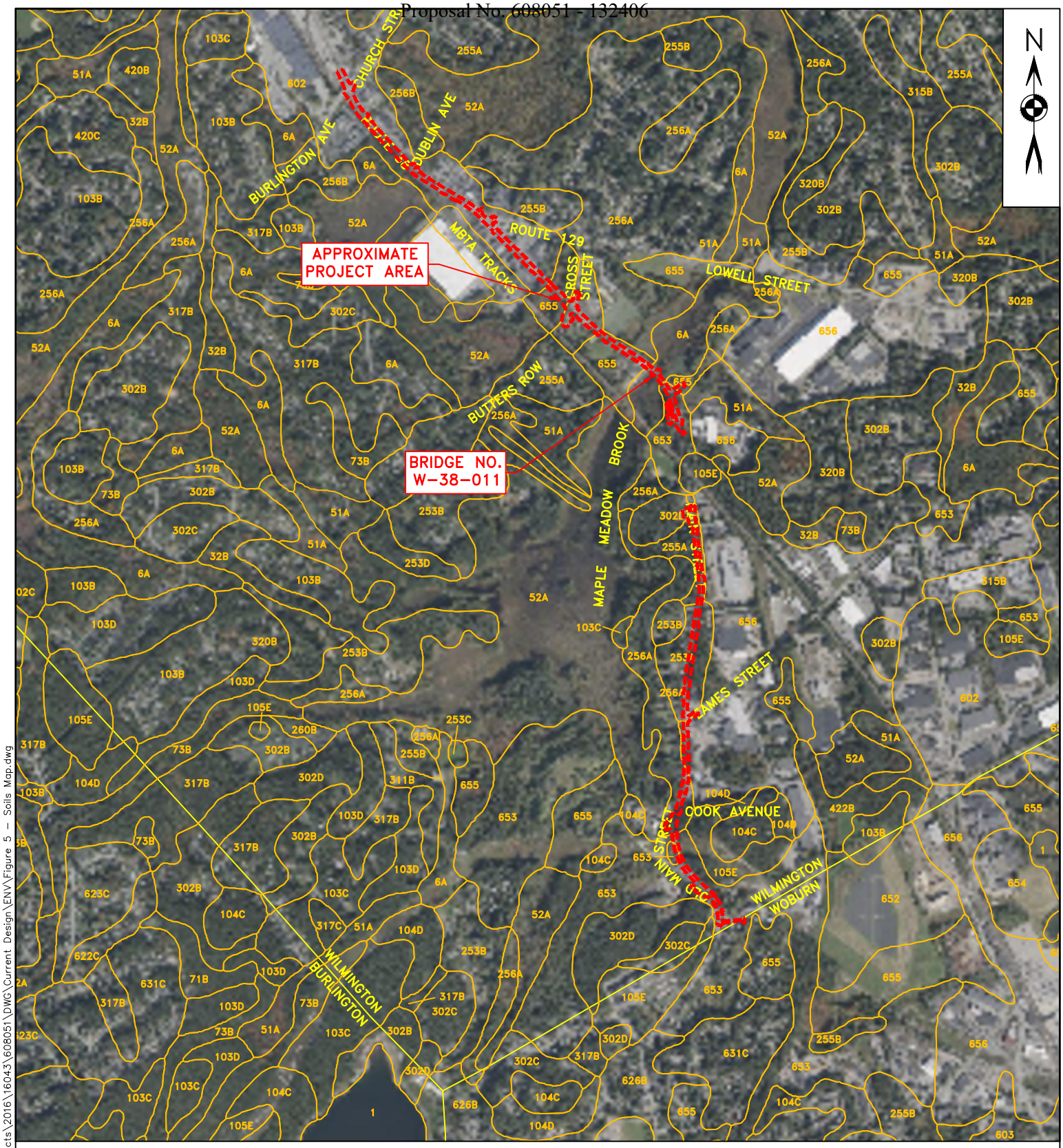
PREPARED BY: GREEN A Lochner Company

PREPARED FOR: massDOT Massachusetts Department of Transportation Highway Division

SCALE: AS NOTED	PROJECT NO. 21058.16XX
DATE: 03/11/2025	DRAWN BY: JK/EL
REVISED:	CHECKED BY: OF

FIGURE 4

\\EgnyteDrive\greenintl\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\ENV\Figure 4 – FEMA Map.dwg



LEGEND:

- APPROXIMATE LIMIT OF WORK
- NRCS SOIL SURVEY BOUNDARY
- 103C NRCS SOIL SURVEY SYMBOL

NOTE: MAP INFORMATION TAKEN FROM MASSGIS AND SOILS INFORMATION TAKEN FROM NRCS WEB SOIL SURVEY FOR MIDDLESEX COUNTY, MA.

SCALE IN FEET

750 0 750 1500

1" = 1500'

SOILS MAP

WILMINGTON – RECONSTRUCTION OF ROUTE 38 (MAIN STREET) FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051 INCLUDING THE REPLACEMENT OF BRIDGE NO. W-38-011 OVER MAPLE MEADOW BROOK

PREPARED BY: GREEN A Lochner Company

PREPARED FOR: massDOT Massachusetts Department of Transportation Highway Division

SCALE: AS NOTED	PROJECT NO. 21058.16XX	FIGURE 5
DATE: 03/11/2025 REVISED:	DRAWN BY: VR/EL CHECKED BY: OF	

\\EgnyteDrive\greenintl\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\ENV\Figure 5 – Soils Map.dwg

ATTACHMENT B – SITE PHOTO LOG

Joint Application for 401 Water Quality Certification and 404 Pre-Construction Notification
Reconstruction on Route 38 (Main Street)
Town of Wilmington **Green No. 13033.19X**

Photo Log – November 2016, April 2017, September 2018 & October 2020

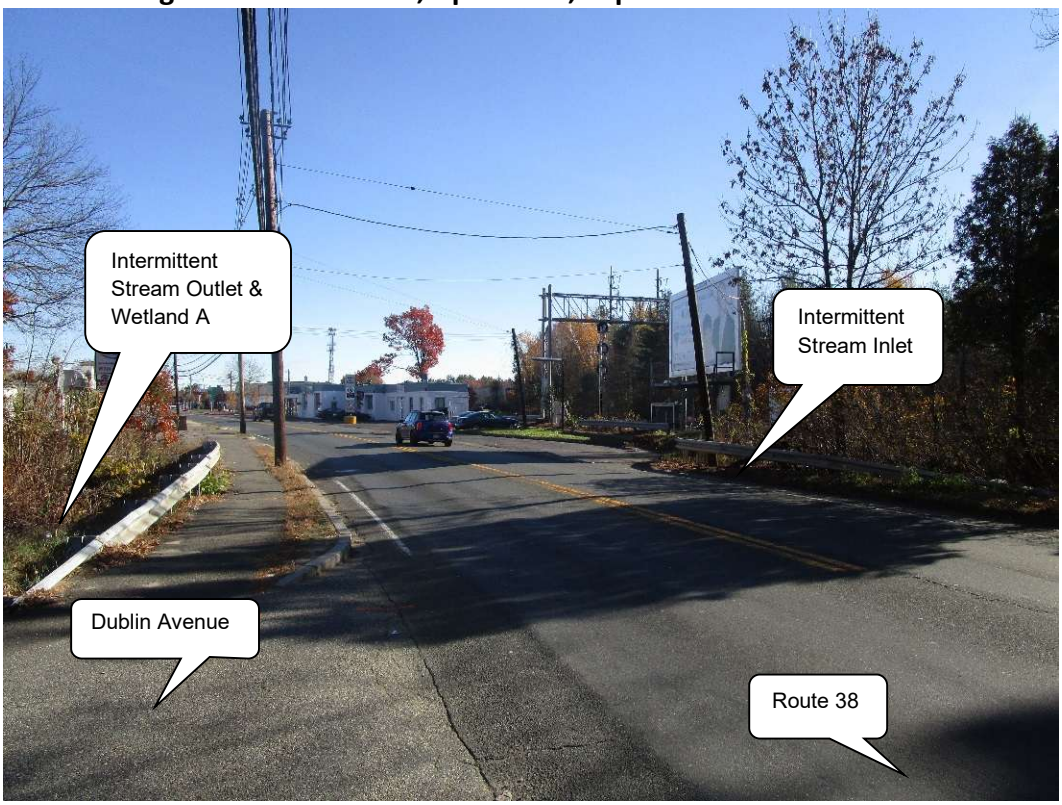


Photo 01 – View southeast on Route 38 from Dublin Avenue intersection (approx. Sta. 217)

Photo 02 – View northwest at the Intermittent Stream culvert inlet between Route and railroad tracks (approx. Sta. 218+50)

Photo 03 – Box culvert inlet on the western side of Route 38 (approx. Sta. 218)

Photo 04 – Box culvert outlet under railroad tracks west of Route 38 (approx. Sta. 218)

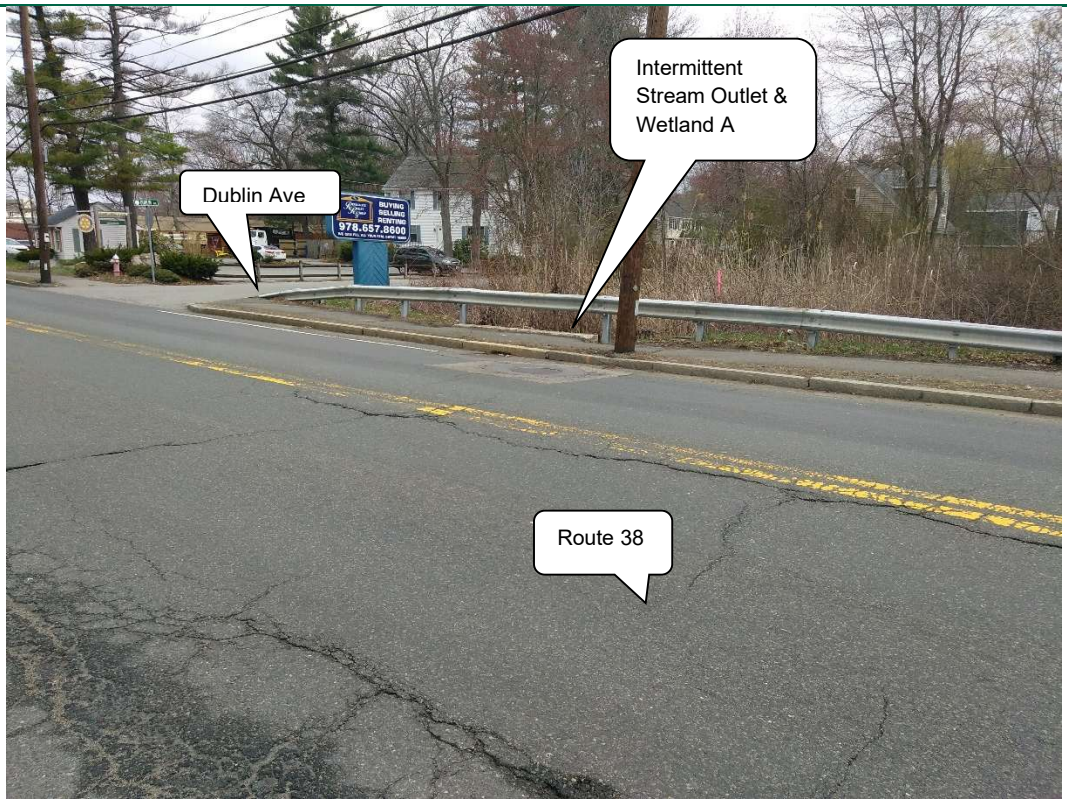


Photo 05 – View north on Route 38 at the Box culvert outlet (approx. Sta. 218+50)

Photo 06 – Box culvert outlet on the eastern side of Route 38 (approx. Sta. 218)

Photo 07 – View northwest north of Butters Row/Cross Street intersection at Wetland C and Wetland D (Sta. 239)

Photo 08 – View west at Wetland C from Route 38 (between Sta. 238 and 239)

Photo 09 – View of the stone headwall and Wetland D (between Sta. 238 and 239)

Photo 10 – View northwest at Wetland G, Wetland E and Maple Meadow Brook (approx. Sta. 257)

Photo 11 – View southwest from Box Culvert/Bridge No. W-38-011 on Route 38 upstream of Maple Meadow Brook and Wetland G (approx. Sta. 254)

Photo 12 – Inlet of concrete headwall along the west side of the Box Culvert/Bridge No. W-38-011 over Maple Meadow Brook along Route 38 and Wetland G (approx. Sta. 254)

Photo 13 – Concrete headwall along the east side of the Box Culvert/Bridge No. W-38-011 over Maple Meadow Brook along Route 38 – Wetland E (Sta. 254)

Photo 14 – View of Wetland E from the Downstream side of the Box Culvert/Bridge No. W-38-011 on the east side of Route 38 (approx. Sta. 254)

Photo 15 – View north on Route 38/Old Main Street intersection towards Wetland H (approx. Sta. 305)

Photo 16 – View northwest at Wetland H from Route 38 (approx. Sta. 305)

Photo 17 – View northwest at Wetland E and Proposed Wetland Replication Area from Textron Driveway (near approx. Sta. 257)

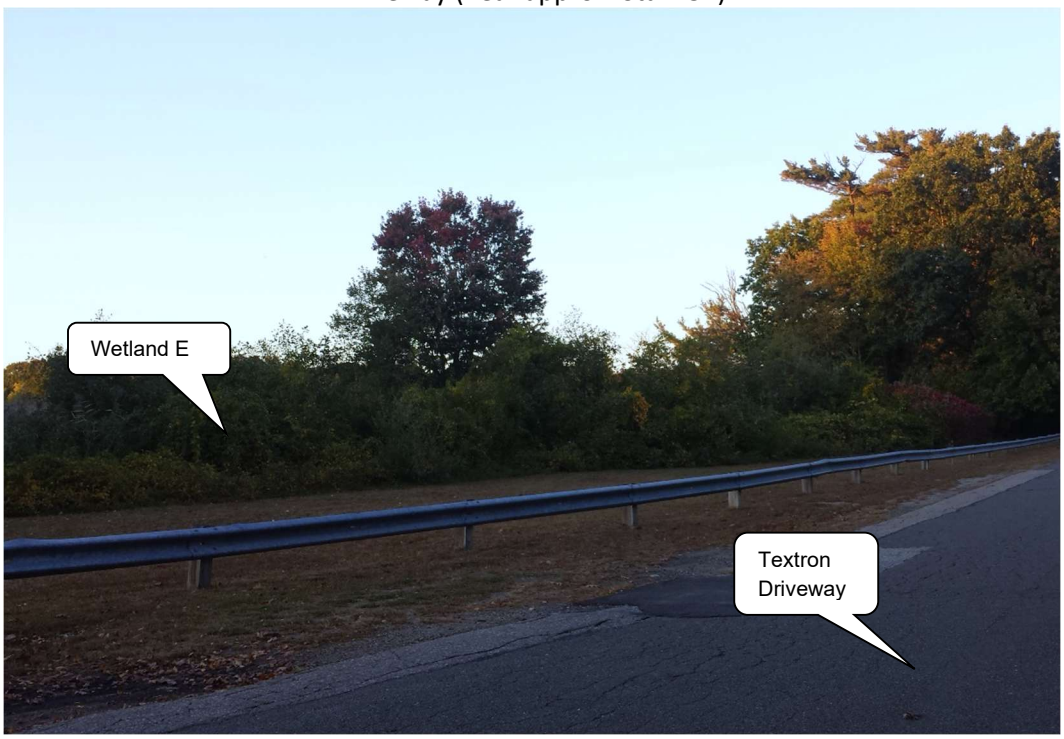


Photo 18 – View northeast at Wetland E and Proposed Wetland Replication Area from Textron Driveway (near approx. Sta. 257)

ATTACHMENT C – PUBLIC NOTICE

PUBLIC NOTICE

DEPARTMENT OF
ENVIRONMENTAL
PROTECTION
WETLANDS PROGRAM

401 Water Quality Certification Application Public Notice

Pursuant to 33.U.S.C.1341 and MGL c21 §43, notice is hereby given of a 401 Water Quality Certification (WQC) application for the reconstruction on Route 38 in Wilmington, MA from Route 62 to Woburn City Line by the Massachusetts Department of Transportation (MassDOT) 10 Park Plaza, Boston, MA 02116. The project involves the reconstruction of Route 38, including the replacement of the bridge over Maple Meadow Brook.

Additional information may be obtained from the applicant's agent –Green International Affiliates, Inc – c/o Oxana Fartushnaya. Office (978) 923-0400
Direct (978) 843-5276.

Written comments on this 401 WQC Application may be emailed to: Heidi Davis (Heidi.Davis@mass.gov)
Department of Environmental Protection Wetlands Program
100 Cambridge Street, Suite 900
Boston, MA 02114

Within 21 days of this notice. The Department will consider all written comments on this
401 WQC Application received by the Public Comments Deadline. Any group of ten persons of the Commonwealth, any aggrieved person, or any government body or private organization with a mandate to protect the environment that has submitted written comments may also appeal the Department's Certification and that failure to submit comments before the end of public comment period may result in the waiver of any right to an adjudicatory hearing..
250380 4/17/25

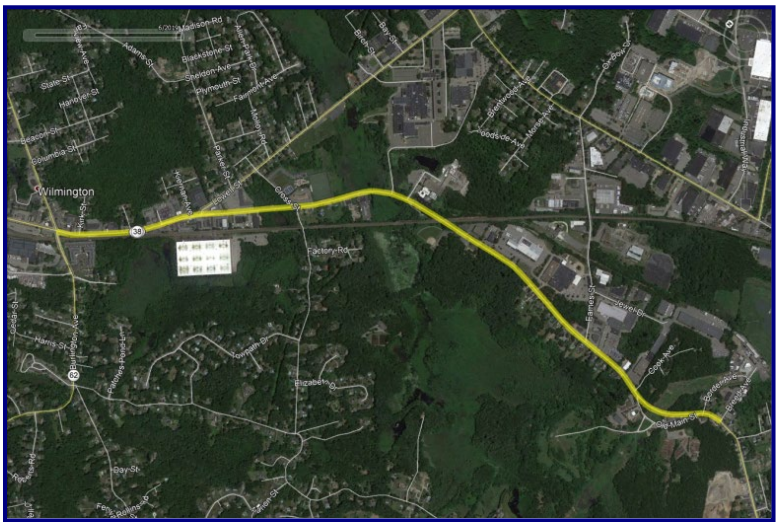
ATTACHMENT D – WETLAND SUMMARY REPORT

WETLAND SUMMARY REPORT

Route 38 Project

Route 62 to Woburn Town Line

Wilmington, Massachusetts



PREPARED FOR:
Green International Affiliates, Inc.
239 Littleton Road, Suite 3
Westford, Massachusetts 01886

PREPARED BY:
Lucas Environmental, LLC
500A Washington Street
Quincy, Massachusetts 02169

REPORT DATE: December 18, 2024

LUCAS ENVIRONMENTAL, LLC

LUCAS ENVIRONMENTAL, LLC

500A Washington Street, Quincy, MA 02169

December 18, 2024

Green International Affiliates, Inc.
Attn: Oxana Fartushnaya
239 Littleton Road, Suite 3
Westford, MA 01886

Re: Wetland Summary Report
Route 38 Project
Route 62 to Woburn Town Line
Wilmington, MA

Dear Ms. Fartushnaya,

Professional Wetland Scientists (PWS) from Lucas Environmental, LLC (LE) conducted site investigations along Main Street (Route 38) in Wilmington, Massachusetts on May 21 and 22, and December 3, 2020. A site investigation was also completed on June 6, 2023 to confirm the accuracy of the previous wetland delineation. The purpose of the site investigation was to investigate and delineate wetland resources along the portion of Route 38 located between Burlington Avenue/Church Street (Route 62) and the Wilmington/Woburn Town/City line. The site investigation was limited to wetland areas within 100 feet of and perennial streams within 200 feet of Route 38. This investigation included both a field and office-based component.

Please note that this due diligence effort is specific to environmental resources; it does not evaluate constraints related to local planning or zoning requirements.

MassDEP Bordering Vegetated Wetland Determination Forms were completed as described herein and are included with this report.

If you have any questions, please do not hesitate to contact me at 617.405.4140 or cml@lucasenviro.com. Thank you for your consideration in this matter.

Sincerely,
LUCAS ENVIRONMENTAL, LLC

Christopher M. Lucas, PWS, CWS, RPSS
Environmental Consultant/Wetland & Soil Scientist

Enclosures: Photographic Documentation
BVW Determination Forms

LUCAS ENVIRONMENTAL, LLC

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LUCAS ENVIRONMENTAL, LLC

SECTION I – NARRATIVE

LUCAS ENVIRONMENTAL, LLC

EXISTING CONDITIONS NARRATIVE

1.0 INTRODUCTION

Professional Wetland Scientists (PWS) from Lucas Environmental, LLC (LE) conducted site investigations along Main Street (Route 38) in Wilmington, Massachusetts on May 21 and 22, and December 3, 2020. The site was revisited on June 6, 2023, to review and update the wetland delineation, if needed, based on current site conditions at that time. The wetland investigation was performed in accordance with the Massachusetts Wetlands Protection Act (M.G.L. Ch. 131, § 40) and regulations (310 CMR 10.00 *et seq*.); Section 404 of the Clean Water Act (33 U.S.C. 1344); Massachusetts Department of Environmental Protection (MassDEP) publication "Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (2022); and the U.S. Army Corp of Engineers (USACE) Wetland Delineation Manual (1987); the Northcentral and Northeast Regional Supplement (2012); and the Town of Wilmington Wetlands Enforcement Bylaw (the "Bylaw").

The following data sources were examined in addition to the site investigation:

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map;
- United States Geological Survey Topographic Quadrangle (Wilmington, 2018);
- MassGIS MassDEP Wetland and Hydrography Datalayers;
- National Wetland Inventory (NWI) Maps;
- MassGIS Natural Heritage Atlas Datalayers; and
- United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) Soil Survey.

2.0 EXISTING CONDITIONS

The area under investigation includes wetland areas within 100 feet and perennial streams within 200 feet of the portion of Route 38 between Burlington Avenue/Church Street (Route 62) and the Wilmington/Woburn Town/City line in Wilmington, Massachusetts (the Study Area). Within the Study Area, both sides of Route 38 are generally bounded by commercial and residential properties with the exception of the area in relatively close proximity to Maple Meadow Brook. Maple Meadow Brook is a perennial stream in the Ipswich River Basin that flows from southwest to northeast through the Study Area and is crossed by Route 38. An MBTA railroad track runs roughly parallel to and in close proximity to Route 38 within the northern portion of the Study Area.

A review of the current MassGIS data layer for the Massachusetts Natural Heritage Atlas (effective August 1, 2021) under the Natural Heritage and Endangered Species Program (NHESP) indicates that no portion of the site is located within Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species under the Massachusetts Endangered Species Act (321 CMR 10.00 et seq.). A Certified Vernal Pool under the jurisdiction of the Wetlands Protection Act Regulations (310 CMR 10.00 et seq.) is present near the Study Area, as are two mapped Potential Vernal Pools. The Mass CAPS Important Wildlife Habitat Map for Wilmington indicates a potential area of important habitat wildlife within approximately 150 feet west of Route 38, south of the Maple Meadow Brook crossing.

The Study Area is not located within an Area of Critical Environmental Concern (ACEC), Outstanding Resource Water (ORW), or Watershed Protection Area. Several MassDEP Zone I Wellhead Protection Areas are mapped near the Study Area, the closest being within approximately 90 feet of Route 38 near Maple Meadow Brook. In addition, most of the Study Area is located within a Zone II Wellhead Protection Area (Zone II #152, Wilmington Water Department).

Maple Meadow Brook (Segment ID MA92-04) is identified as a Category 5 water requiring a Total Maximum Daily Load (TMDL) per the Final MassDEP 2022 Integrated List of Waters (305(b)/303(d)). Waters are listed in Category 5 if they were identified as impaired (i.e., not supporting one or more intended uses), the impairment was related to the presence of one or more "pollutants", and the source of those pollutants was not considered to be natural. The causes of impairment in Maple Meadow Brook have been identified as dewatering* (*TMDL not required), and dissolved oxygen (no EPA TMDL Number).

3.0 ENVIRONMENTAL RESOURCE AREAS

Wetland resource areas identified within the Study Area include Inland Bank, Bordering Vegetated Wetland (BVW), Land Under Waterbodies and Waterways (LUWW), Bordering Land Subject to Flooding (BLSF), and Riverfront Area. Under the Massachusetts Wetlands Protection Act (WPA) and Wilmington Wetlands Enforcement Bylaw the wetlands in the Study Area are defined as follows. Note that the Bylaw does not define any resource areas differently than defined under the WPA.

3.1 Inland Bank – 310 CMR 10.54

Section 310 CMR 10.54 of the WPA defines a Bank *as the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and an upland. The upper boundary of a Bank is the first observable break in the slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level*. The delineated Banks are described below.

3.2 Bordering Vegetated Wetlands – 310 CMR 10.55

Section 310 CMR 10.55 of the WPA defines BVW *as freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The boundary of Bordering Vegetated Wetlands is the line within which 50% or more of the vegetational community consists of wetland indicator plants and saturated or inundated conditions exist. Wetland indicator plants are also those classified in the indicator categories of Facultative, Facultative+, Facultative Wetland-, Facultative Wetland, Facultative Wetland+, or Obligate Wetland in the National List of Plant Species That Occur in Wetlands: Massachusetts (Fish & Wildlife Service, U.S. Department of the Interior, 1988) or plants exhibiting physiological or morphological adaptations to life in saturated or inundated conditions.* The delineated BVWs are described below.

3.3 Land Under Water Bodies and Waterways – 310 CMR 10.56

Section 310 CMR 10.56(2) of the WPA defines Land Under Water Bodies and Waterways *as the 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 Land under Water Bodies and Waterways is the mean annual low water level.* LUWW is present within Maple Meadow Brook within the Study Area. This resource area is located below the edge of Bank or the Mean Annual High Water (MAHW) mark of perennial streams, therefore it is not field delineated.

3.4 Bordering Land Subject to Flooding – 310 CMR 10.57

Section 310 CMR 10.57(2)(a) of the WPA defines BLSF as *an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. It extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland. The boundary of Bordering Land Subject to Flooding is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm.*

Flood zones are present within the Study Area. According to the FEMA Flood Insurance Rate Maps (FIRM) for Middlesex County, Massachusetts, Maps Number 25017C0291E and 25017C0293E, effective June 4, 2010, areas designated as Zone AE are present within and along Maple Meadow Brook. Zone AE is classified as an area subject to the 1% annual chance flood (100-year flood), where base flood elevations have been determined. The flood elevations at Maple Meadow Brook are 82.9 feet (NAVD 88) upstream (west) of Main Street and 81.5 feet downstream (east) of Main Street, as provided by Green International Affiliates, Inc. based upon the flood profiles in the Flood Insurance Study. An AE Zone (elevation 95 feet), located within the flood plain of Mill Brook, is also mapped near the Study Area just north of Burlington Avenue.

Areas identified as Zone X are also present near the Study Area west of the MBTA tracks, between the MBTA tracks and Route 38 just north of Butters Row, and near Maple Meadow Brook. Zone X is defined as the 0.2% Annual Chance Flood Hazard (i.e., 500-year flood). The remainder of the Study Area is designated as a Zone X which is classified as an Area of Minimal Flood Hazard. The boundary of BLSF was not delineated in the field and should be identified on the plans.

3.5 Riverfront Area – 310 CMR 10.58

Section 310 CMR 10.58(2)(a)(3) of the WPA defines Riverfront Area *as the area of land between a river's mean annual high water line measured horizontally outward from the river and a parallel line located 200 feet away.* Maple Meadow Brook is mapped as perennial on the current USGS topographic map (Wilmington, Massachusetts Quadrangle, 2024) and is therefore presumed to be perennial. No other perennial streams are mapped within 200 feet of Route 38 within the Study Area. The MAHW line was delineated in the field as described for Stream 2 in the following section.

3.6 Wetland Descriptions

The following describes each of the wetlands identified in the Study Area. This description includes BVW only as no isolated wetlands were identified within the Study Area.

LUCAS ENVIRONMENTAL, LLC

EXISTING CONDITIONS NARRATIVE

Wetland A

Wetland A is a BVW bordering on an intermittent stream (Stream 1) and is located on the north side of Route 38 just east of Dublin Avenue. The BVW boundary was delineated with pink survey tape numbered sequentially with flag series WFA-1 to WFA-20. Common vegetation observed within this palustrine forested (PFO) wetland includes red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), common greenbrier (*Smilax rotundifolia*), northern arrowwood (*Viburnum recognitum*), common reed (*Phragmites australis*), and skunk cabbage (*Symplocarpus foetidus*). Upland vegetation includes black cherry (*Prunus serotina*), red oak (*Quercus rubra*), Oriental bittersweet (*Celastrus orbiculatus*), annual ragweed (*Ambrosia artemisiifolia*), and goldenrods (*Solidago sp.*). Soil within the wetland is a mucky histosol. Upland soils are loamy fine sand and indicative of historic fill and disturbance. Indicators of wetland hydrology included saturation at the soil surface. State and federal boundaries are coincident.

Wetland B

Wetland B is a small narrow BVW within a swale located between a stormwater basin and the MBTA tracks, where the swale enters a culvert under the tracks. The BVW boundary was delineated with pink survey tape numbered sequentially with flag series WFB-1 to WFB-8. Little vegetation is present within the swale but consists primarily of broad-leaf cattail (*Typha latifolia*). Upland vegetation consists of Oriental bittersweet, evening primrose (*Oenothera biennis*), common mullein (*Verbascum thapsus*), goldenrods, and grass. The swale substrate is primarily crushed stone. State and federal boundaries are coincident.

Wetland C & D

Wetland C is located on the south side of Route 38 in the general area northwest of the intersection of Route 38 with Butters Row. The BVW boundary was delineated with pink survey tape numbered sequentially with flag series WFC-1 to WFC-4 and WFC-10 to WFC-26. The area from flags WFC-1 to WFC-10 was re-delineated in 2023 due to the redevelopment of the site at 635 Main Street. No stream channel was observed here, although there may be a blocked culvert. Wetlands D is located on the north side of Route 38 in the general area northwest of the intersection of Route 38 with Cross Street. The BVW boundary was delineated with pink survey tape numbered sequentially with flag series WFD-1 to WFD-31. Wetland C consists of a central area of palustrine emergent (PEM) broad-leaf cattail marsh and open water bounded by red maple swamp (PFO) to the east and west. Wetland D consists of a western area of PEM *Phragmites* marsh and eastern area of a red maple swamp (PFO).

Common vegetation in the forested wetlands includes red maple, green ash, American elm, glossy buckthorn (*Frangula alnus*), white pine, cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), and Canada mayflower (*Maianthemum canadense*). Common upland vegetation includes red oak, white oak (*Quercus alba*), white pine (*Pinus strobus*), Virginia creeper (*Parthenocissus quinquefolia*), Oriental bittersweet, Tatarian honeysuckle (*Lonicera tatarica*), poison ivy (*Toxicodendron radicans*), and goldenrods.

Soils within the wetlands consist of silty loam with a shallow depleted matrix. Upland soils were fine sandy loam to loamy fine sand and indicative of historic fill and disturbance. Indicators of wetland hydrology included surface water, water stained leaves, and saturation at the soil surface. State and federal boundaries are coincident. The west end of the Wetland D (*Phragmites* marsh) adjacent to a parking lot was particularly filled with trash and debris, much of which appeared recent.

Wetlands E & G

Wetlands E and G are located along Maple Meadow Brook on the north and south sides of Route 38, respectively. The BVW boundary was delineated with pink survey tape numbered sequentially with flag series WFE-1 to WFE-78 and WFG-1 to WFG-43. Wetland E is primarily a *Phragmites* marsh (PEM) with areas of open water, palustrine scrub/shrub (PSS) and PFO. Wetland G is primarily a PEM with areas of open water and PFO. Within the emergent marsh common vegetation includes water lily, arrowhead, broad-leaf cattail, sedges (*Carex sp.*) and common reed. Common vegetation in the forested and shrub wetland areas includes red maple, green ash, glossy buckthorn, northern arrowwood, pussy willow (*Salix discolor*), speckled alder (*Alnus incana*), meadowsweet (*Spiraea alba*), elderberry (*Sambucus nigra ssp. canadensis*), common reed, and skunk cabbage. Common upland vegetation includes black cherry, red oak, black locust (*Robinia pseudoacacia*), white pine, Oriental bittersweet, poison ivy, wild sarsaparilla (*Aralia nudicaulis*), goldenrods, and grasses. Soil within the wetland consists of histosols in the wetter areas and deep, dark fine sandy loam with shallow redoximorphic features in the forested areas. Upland soils were generally loamy sand and indicative of historic fill and disturbance, such as containing buried A-horizons. Indicators of wetland hydrology included surface water, water stained leaves, and saturation at or near the soil surface. State and federal boundaries are coincident.

Wetland F

Wetland F is a red maple swamp (PFO) located behind a small house and an automobile repair business on the south side of Route 38, approximately 350 feet west of Maple Meadow Brook. The north edge of the wetland is a shrub dominated PSS. The BVW boundary was delineated with pink survey tape numbered sequentially with flag series WFF-1 to WFF-7. Common vegetation in the wetland includes red maple, glossy buckthorn, silky dogwood (*Cornus amomum*), sensitive fern, jewelweed (*Impatiens capensis*), and goldenrods. The upland includes lawn grass and a gravel parking area. The wetland was generally saturated to the surface and appeared to have recently ponded surface water approximately six to eight inches deep. State and federal boundaries are coincident.

Wetland H

Wetland H is a red maple swamp (PFO) located west of Route 38 and northwest of the intersection of Route 38 and Cook Avenue. The BVW boundary was delineated with pink survey tape numbered sequentially with flag series WFH-1 to WFH-14. Common vegetation in the wetland includes red maple, occasional red oak, glossy buckthorn, highbush blueberry (*Vaccinium corymbosum*), skunk cabbage, cinnamon fern, royal fern (*Osmunda regalis*), and New York fern (*Thelypteris noveboracensis*). Common upland vegetation includes red oak, white pine, black cherry, Virginia creeper, Oriental bittersweet, Canada mayflower, and garlic mustard (*Alliaria petiolata*). Potential Vernal Pool #29103 is located within this wetland (see MAHW3 description below). State and federal boundaries are coincident.

Wetland I

Wetland I is located approximately 350 feet south of Maple Meadow Brook on the east side of Route 38, between the driveways for Textron, Inc. and DSM, Inc. Because this wetland is surrounded by a security fence, it was not delineated in the field. Close to Route 38 the wetland is a red maple swamp (PFO) and further east the wetland becomes a *Phragmites* dominated PEM. Common vegetation in the forested wetland includes red maple, dead and dying red oak trees, glossy buckthorn, northern arrowwood, highbush blueberry, and sensitive fern. Common vegetation in the upland includes red and white oak, gray birch (*Betula populifolia*), American witch-hazel (*Hamamelis virginiana*), glossy buckthorn, Virginia creeper, Oriental bittersweet and goldenrod.

Wetland J

Wetland J is located immediately south of Wetland I along the eastern side or Route 38, on the property of DSM, Inc. Because this wetland is surrounded by a security fence, it was not delineated in the field. Due to the security fencing and topography, visibility of this wetland was limited; however, it appears to have been recently delineated with stakes along the wetland/upland boundary. The wetland edge is lawn and either consists of a large ponded area, or flooded wetland.

3.7 Watercourse Descriptions

The following describes each of the watercourses identified in the Study Area. This description includes both perennial and intermittent streams.

Stream 1 – Unnamed Intermittent Stream

The Banks of a small, unnamed intermittent stream, located just south and east of Dublin Avenue were delineated with blue survey flagging numbered sequentially from BF1-100 to BF1-104 and BF1-200 to BF1-204. Flags BF1-100 through BF1-102 and BF1-200 to BF1-202 are located north of Route 38 on the west and east banks respectively. Flags BF1-103 through BF1-104 and BF1-203 to BF1-204 are located south of Route 38, between the road and MBTA tracks, on the west and east banks respectively. North of Route 38 the stream channel is approximately three to four feet wide with a gravelly substrate and four to six inches of water present at the time of the site visit. Bank vegetation includes American elm (*Ulmus americana*), Oriental bittersweet, common reed, and skunk cabbage. South of Route 38 the open stream channel is approximately two feet wide and located between two culverts. The banks consist of crushed stone with sparse vegetation, including Oriental bittersweet, black cherry, and winterberry holly (*Ilex verticillata*). Erosion from street runoff was apparent.

Stream 2 – Maple Meadow Brook

The MAHW of Maple Meadow Brook upstream and downstream of the culvert crossing under Route 38 was delineated with blue survey flagging numbered sequentially from BF2-100 to BF2-159 and BF2-200 to BF2-229. In some locations MAHW is coincident with the top of Bank; however, in many locations the delineated MAHW line is upgradient of the first break in slope; therefore, the delineation was based on apparent evidence of recent or current high water, such as standing water or water staining of soil, leaves or vegetation.

Flags BF2-100 through BF2-120 and BF2-200 to BF2-208 are located south of Route 38 on the northeast and southwest banks respectively. South of Route 38 the primary stream channel is completely inundated and contains aquatic vegetation such as arrowhead (*Sagittaria latifolia*) and water lily (*Nymphaea odorata* and/or *Nuphar lutea ssp*.) and broad-leaf cattail. The slopes are generally well defined with the MAHW line occurring near the toe of slope. Upgradient vegetation is described under Wetland G above.

Flags BF2-121 through BF2-140 and BF2-209 to BF2-229 are located north of Route 38 on the southeast and northwest banks respectively. North of Route 38 the primary stream channel is completely inundated and vaguely apparent along a shrub line. Vegetation along the delineated MAHW line is dominated by common reed. Upgradient vegetation is described under Wetland E above.

The Riverfront Area extends 200 feet horizontally from the delineated Inland Bank/MAHW line along Maple Meadow Brook. The Riverfront Area includes portions of Wetlands E, G and I described above as well as adjacent upland areas. The adjacent upland Riverfront Area includes a relatively narrow fringe of upland along Route 38 consisting of a mix of grassy roadside areas, wooded areas and developed/commercial property. Common vegetation within the areas of wooded upland Riverfront Area includes red oak, white pine, black cherry, red maple, glossy buckthorn, multiflora rose (*Rosa multiflora*), Oriental bittersweet, Virginia creeper, poison ivy, and garlic mustard.

3.8 Vernal Pool Descriptions

Potential Vernal Pool (PVP#29119)

The MAHW line closest to Route 38 was delineated with blue survey flagging numbered sequentially from MAHW1-1 to MAHW1-15. This PVP (#29119) is located approximately 75 feet southwest of Route 38 and 550 feet south of Burlington Avenue, on the southwest side of the MBTA tracks. The delineation was based on observable evidence of the high water line, such as water stained leaves and water staining on trees or shrubs. Common wetland vegetation included red maple, glossy buckthorn, poison ivy, sensitive fern, and skunk cabbage. Common upland vegetation included white pine, red oak, multiflora rose, Virginia creeper, Oriental bittersweet, and garlic mustard. Surface water remained present within the pool at the time of the delineation and an adult green frog (*Lithobates clamitans*) was observed in the pool.

Certified Vernal Pool (CVP #2795)

The MAHW line closest to Route 38 was delineated with blue survey flagging numbered sequentially from MAHW2-1 to MAHW2-11. This Certified Vernal Pool (CVP # 2795) is located in close proximity to and south of the PVP described above (MAHW1), approximately 150 feet southwest of Route 38 and 550 feet south of Burlington Avenue. The delineation was based on observable evidence of the high water line, such as water stained leaves and water staining on trees or shrubs. Common vegetation is as described under MAHW1 with highbush blueberry and witch-hazel also observed along the pool/upland boundary. Surface water remained present within the pool at the time of the delineation. It appears that there is a potential surface water connection with MAHW1 during very high water conditions via a topographical low point between the two pools.

LUCAS ENVIRONMENTAL, LLC

EXISTING CONDITIONS NARRATIVE

Potential Vernal Pool (PVP #29103)

The MAHW line closest to Route 38 was delineated with blue survey flagging numbered sequentially from MAHW3-1 to MAHW3-26. This PVP (#29103) is located northwest of the intersection of Route 38 and Cook Avenue, approximately 100 feet west of Route 38 and is within Wetland H (see above). The delineation was based on observable evidence of the high water line, such as water stained leaves and water staining on trees or shrubs. Common vegetation is described under Wetland H. At the time of the delineation, surface water remained present within a large deeper portion of the pool located west of the delineation line. Based on the size and apparent depth of this pool it may be semi-permanent. Gray tree frogs (*Hyla versicolor*) and green frogs were heard calling from the pool.

LUCAS ENVIRONMENTAL, LLC

SECTION II – APPENDICES

LUCAS ENVIRONMENTAL, LLC

APPENDIX A

PHOTOGRAPHIC DOCUMENTATION

LUCAS ENVIRONMENTAL, LLC

PHOTOGRAPHIC DOCUMENTATION

DATE: May 2020

Photograph 1: View of unnamed intermittent stream (Stream 1) and culvert under MBTA tracks, along the west side of Route 138.

Photograph 2: View of Wetland A along the east side of Route 138.

LUCAS ENVIRONMENTAL, LLC

PHOTOGRAPHIC DOCUMENTATION

DATE: May 2020

Photograph 3: View of Wetland B along the MBTA tracks along the west side of Route 138.

Photograph 4: View of Wetland C near flag WFC-18, along the west side of Route 138, opposite Wetland D.

LUCAS ENVIRONMENTAL, LLC

PHOTOGRAPHIC DOCUMENTATION

DATE: May 2020

Photograph 5: View of northwest end of Wetland D marsh, along the east side of Route 138 (note amount of trash).

Photograph 6: View of Wetland E transition from marsh to shrub swamp, along the east side of Route 138.

LUCAS ENVIRONMENTAL, LLC

PHOTOGRAPHIC DOCUMENTATION

DATE: May 2020

Photograph 7: View of MAHW line of Maple Meadow Brook along marsh edge of Wetland E near flag BF2-225, along the east side of Route 138.

Photograph 8: View of Wetland F along the west side of Route 138.

LUCAS ENVIRONMENTAL, LLC

PHOTOGRAPHIC DOCUMENTATION

DATE: May 2020

Photograph 9: View of Maple Meadow Brook (Stream 2) along edge of Wetland G near flag BF2-208, along the west side of Route 138.

Photograph 10: View of Wetland H near flag WHF-10, west of Route 138.

LUCAS ENVIRONMENTAL, LLC

PHOTOGRAPHIC DOCUMENTATION

DATE: May 2020

Photograph 11: View of Wetland I, not delineated, along the east side of Route 138.

Photograph 12: View of Wetland J, not delineated by LE, along the east side of Route 138.

LUCAS ENVIRONMENTAL, LLC

PHOTOGRAPHIC DOCUMENTATION

DATE: May 2020

Photograph 13: View of Potential Vernal Pool along MBTA tracks (MAHW1), along the west side of Route 138.

Photograph 14: View of Certified Vernal Pool along MBTA tracks (MAHW2), along the western side of Route 138.

LUCAS ENVIRONMENTAL, LLC

PHOTOGRAPHIC DOCUMENTATION

DATE: May 2020

Photograph 15: View of Potential Vernal Pool (MAHW3) near flag MAHW3-17, within Wetland H, west of Route 138.

LUCAS ENVIRONMENTAL, LLC

APPENDIX B

BVW DETERMINATION FORMS

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Route 38 City/Town: Wilmington Sampling Date: 06/06/23

Applicant/Owner: MassDOT Sampling Point or Zone: WFA-10/11 WET

Investigator(s): Lucas Enviroinmental, LLC Latitude / Longitude: 42.544003° / -71.170559°

Soil Map Unit Name: Freetown muck (52A) NWI or DEP Classification: Wooded Swamp Deciduous

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? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)
Water Table Present?	Yes [✓]	No [ ]	Depth (inches) 4.00
Saturation Present (including capillary fringe)?	Yes [✓]	No [ ]	Depth (inches) 0.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[✓] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[✓] Free water in a soil test hole	[✓] Drainage patterns
[ ] Iron deposits	[✓] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point WFA-10/11 WET

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red maple	Acer rubrum	FAC	20.5	Yes	Yes
2. American elm	Ulmus americana	FACW	10.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

31.0 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Glossy buckthorn	Frangula alnus	FAC	20.5	Yes	Yes
2. Northern arrowwood	Viburnum recognitum	FAC	20.5	Yes	Yes
3. Red maple	Acer rubrum	FAC	10.5	No	Yes
4. Green ash	Fraxinus pennsylvanica	FACW	10.5	No	Yes
5. American elm	Ulmus americana	FACW	10.5	No	Yes
6. Crabapple	Malus sp.	UPL	3.0	No	No
7. Black cherry	Prunus serotina	FACU	1.0	No	No
8.					
9.					

76.5 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Skunk cabbage	Symplocarpus foetidus	OBL	38.0	Yes	Yes
2. Common reed	Phragmites australis	FACW	20.5	Yes	Yes
3. Wrinkleleaf goldenrod	Solidago rugosa	FAC	10.5	No	Yes
4. Tall goldenrod	Solidago altissima	FACU	3.0	No	No
5. Purple loosestrife	Lythrum salicaria	OBL	1.0	No	Yes
6. Virginia creeper	Parthenocissus quinquefolia	FACU	1.0	No	No
7.					
8.					
9.					
10.					
11.					
12.					

74.0 = Total Cover

Sampling Point WFA-10/11 WET

VEGETATION – continued.

Woody Vine Stratum	Plot size 30'				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Poison ivy	Toxicodendron radicans	FAC	3.0	Yes	Yes
2.					
3.					
4.					
			3.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	7	7		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point WFA-10/11 WET

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-18	10YR 2/1	100.00					sapric	Oa horizon

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☑ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: Historic disturbance/fill

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Route 38 City/Town: Wilmington Sampling Date: 06/06/23

Applicant/Owner: MassDOT Sampling Point or Zone: WFA-10/11 UPL

Investigator(s): Lucas Enviroinmental, LLC Latitude / Longitude: 42.544003° / -71.170559°

Soil Map Unit Name: Urban Land (602) NWI or DEP Classification: Wooded Swamp Deciduous

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? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soils criterion met?	Yes [ ] No [✓]	
Wetlands hydrology present?	Yes [ ] No [✓]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ]	No [✓]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point WFA-10/11 UPL

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red maple	Acer rubrum	FAC	20.5	Yes	Yes
2. American elm	Ulmus americana	FACW	20.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

41.0 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red oak	Quercus rubra	FACU	10.5	Yes	No
2. Black cherry	Prunus serotina	FACU	3.0	No	No
3. Green ash	Fraxinus pennsylvanica	FACW	3.0	No	Yes
4.					
5.					
6.					
7.					
8.					
9.					

16.5 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Wrinkleleaf goldenrod	Solidago rugosa	FAC	10.5	Yes	Yes
2. Tall goldenrod	Solidago altissima	FACU	10.5	Yes	No
3. Creeping bellflower	Campanula rapunculoides	UPL	10.5	Yes	No
4. Poison ivy	Toxicodendron radicans	FAC	10.5	Yes	Yes
5. Virginia creeper	Parthenocissus quinquefolia	FACU	3.0	No	No
6. Northern dewberry	Rubus flagellaris	FACU	3.0	No	No
7.					
8.					
9.					
10.					
11.					
12.					

48.0 = Total Cover

Sampling Point WFA-10/11 UPL

VEGETATION – continued.

Woody Vine Stratum	Plot size 30'				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Poison ivy	Toxicodendron radicans	FAC	10.5	Yes	Yes
2. Oriental bittersweet	Celastrus orbiculatus	FACU	3.0	Yes	No
3.					
4.					
			13.5 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species?
	9	5		Yes ☑ No ☐
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point WFA-10/11 UPL

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-1	10YR 2/1	100.00					loamy fine sand	A horizon
1-4	10YR 4/4 & 2/2 mixed	100.00					loamy fine sand	A/B horizon (mixed)
4-20	10YR 4/4	100.00					loamy fine sand	B horizon

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: Disturbed/fill soils adjacent to the parking lot.

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Route 38 City/Town: Wilmington Sampling Date: 06/06/23

Applicant/Owner: MassDOT Sampling Point or Zone: WFC-12 WET

Investigator(s): Lucas Enviroinmental, LLC Latitude / Longitude: 42.540176° / -71.165126°

Soil Map Unit Name: Udorthents (655) NWI or DEP Classification: Wooded Swamp Deciduous

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? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [✓]	No [ ]	Depth (inches)
Water Table Present?	Yes [✓]	No [ ]	Depth (inches) 7.00
Saturation Present (including capillary fringe)?	Yes [✓]	No [ ]	Depth (inches) 0.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[✓] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[✓] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[✓] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point WFC-12 WET

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red maple	Acer rubrum	FAC	85.5	Yes	Yes
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

85.5 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. White pine	Pinus strobus	FACU	20.5	Yes	No
2. Red maple	Acer rubrum	FAC	10.5	Yes	Yes
3. Glossy buckthorn	Frangula alnus	FAC	10.5	Yes	Yes
4.					
5.					
6.					
7.					
8.					
9.					

41.5 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Canada mayflower	Maianthemum canadense	FACU	10.5	Yes	No
2. Cinnamon fern	Osmunda cinnamomea	FACW	1.0	No	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

11.5 = Total Cover

Sampling Point WFC-12 WET

VEGETATION – continued.

Woody Vine Stratum	Plot size				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species? Yes ☑ No ☐
	5	3		
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?		**Yes** ☑	**No** ☐	

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point WFC-12 WET

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
4-0	7.5YR 2.5/1	100.00					hemic	Oe horizon
0-2	10YR 3/1	100.00					silt loam	A horizon
2-8	10YR 5/1	78.00	10YR 3/4	2.00	C	M	silt loam	B horizon
			7.5YR _/1	20.00	D	M		
8-14	10YR 2/1	100.00					mucky loam	A2
14-20	7.5YR 3/1 & 3/3	100.00					loamy fine sand	B2 mixed

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☑ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: Historic disturbance/fill

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Route 38 City/Town: Wilmington Sampling Date: 06/06/23

Applicant/Owner: MassDOT Sampling Point or Zone: WFC-12 UPL

Investigator(s): Lucas Enviroinmental, LLC Latitude / Longitude: 42.540176° / -71.165126°

Soil Map Unit Name: Urban Land (602) NWI or DEP Classification: Wooded Swamp Deciduous

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? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soils criterion met?	Yes [ ] No [✓]	
Wetlands hydrology present?	Yes [ ] No [✓]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ]	No [✓]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point WFC-12 UPL

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red maple	Acer rubrum	FAC	20.5	Yes	Yes
2. American elm	Ulmus americana	FACW	10.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

31.0 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Glossy buckthorn	Frangula alnus	FAC	38.0	Yes	Yes
2. White pine	Pinus strobus	FACU	10.5	No	No
3. American elm	Ulmus americana	FACW	10.5	No	Yes
4.					
5.					
6.					
7.					
8.					
9.					

59.0 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Canada mayflower	Maianthemum canadense	FACU	10.5	Yes	No
2. Field horsetail	Equisetum arvense	FAC	1.0	No	Yes
3. Wrinkleleaf goldenrod	Solidago rugosa	FAC	1.0	No	Yes
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

12.5 = Total Cover

Sampling Point WFC-12 UPL

VEGETATION – continued.

Woody Vine Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Oriental bittersweet	Celastrus orbiculatus	FACU	3.0	Yes	Yes
2.					
3.					
4.					
			3.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	5	4	Yes ☑ No ☐

Prevalence Index:	Total % Cover (all strata)	Multiply by:	Result
OBL species		X 1	= 0.00
FACW species		X 2	= 0.00
FAC species		X 3	= 0.00
FACU species		X 4	= 0.00
UPL species		X 5	= 0.00
Column Totals	(A) 0		(B) 0
Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐

Wetland vegetation criterion met? Yes ☑ No ☐

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point WFC-12 UPL

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
2-0	10YR 2/2	100.00					hemic	Oe horizon
0-4	10YR 2/2	100.00					fine sandy loam	A horizon
4-10	10YR 3/2	100.00					loamy fine sand	A/B horizon
10-20	10YR 5/3 & 3/3	100.00					fine sand	small redox present below 18"

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks: Historic fill slope for roadway.

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Route 38 City/Town: Wilmington Sampling Date: 06/06/23

Applicant/Owner: MassDOT Sampling Point or Zone: WFE-32/33 WET

Investigator(s): Lucas Enviroinmental, LLC Latitude / Longitude: 42.537835° / -71.160888°

Soil Map Unit Name: Scarboro mucky fine sandy loam (6A) NWI or DEP Classification: Wooded Swamp Deciduous

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? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)
Saturation Present (including capillary fringe)?	Yes [✓]	No [ ]	Depth (inches) 8.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[✓] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[✓] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point WFE-32/33 WET

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. Canadian serviceberry	Amelanchier canadensis	FAC	10.5	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

48.5 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Highbush blueberry	Vaccinium corymbosum	FACW	63.0	Yes	Yes
2. Northern arrowwood	Viburnum recognitum	FAC	38.0	Yes	Yes
3. Glossy buckthorn	Frangula alnus	FAC	20.5	No	Yes
4. Canadian serviceberry	Amelanchier canadensis	FAC	10.5	No	Yes
5. Meadowsweet	Spiraea alba	FACW	3.0	No	Yes
6.					
7.					
8.					
9.					

135.0 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Unidentified grass	NA		38.0	Yes	
2. Tussock sedge	Carex stricta	OBL	38.0	Yes	Yes
3. Poison ivy	Toxicodendron radicans	FAC	10.5	No	Yes
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

86.5 = Total Cover

Sampling Point WFE-32/33 WET

VEGETATION – continued.

Woody Vine Stratum	Plot size 30'				
Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW?				Yes ☐ No ☑
Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants		Do wetland indicator plants make up ≥ 50% of dominant plant species? Yes ☑ No ☐
	6	5		
Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
Prevalence Index		B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐
Wetland vegetation criterion met?		**Yes** ☑ **No** ☐		

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point WFE-32/33 WET

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
2-0	7.5YR 2.5/1	100.00					hemic	Oe horizon
0-4	10YR 2/1	100.00					fine sandy loam	A horizon
4-14	10YR 4/1	90.00	7.5 YR 4/4	10.00	C	M	loamy fine sand	B-horizon
								Refusal

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☑ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☑ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: rocks/stones Depth (inches): 14.00

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Route 38 City/Town: Wilmington Sampling Date: 06/06/23

Applicant/Owner: MassDOT Sampling Point or Zone: WFE-32/33 UPL

Investigator(s): Lucas Enviroinmental, LLC Latitude / Longitude: 42.537835° / -71.160888°

Soil Map Unit Name: Udorthents (655) NWI or DEP Classification: Wooded Swamp Deciduous

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? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [ ] No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soils criterion met?	Yes [ ] No [✓]	
Wetlands hydrology present?	Yes [ ] No [✓]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ]	No [✓]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point WFE-32/33 UPL

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red maple	Acer rubrum	FAC	10.5	Yes	Yes
2. Red oak	Quercus rubra	FACU	10.5	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					

21.0 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red oak	Quercus rubra	FACU	63.0	Yes	No
2. Glossy buckthorn	Frangula alnus	FAC	38.0	Yes	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

101.0 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Unidentified grass 1	NA		38.0	Yes	
2. Poison ivy	Toxicodendron radicans	FAC	38.0	Yes	Yes
3. Unidentified grass 2	NA		10.5	No	
4. Common yarrow	Achillea millefolium	FACU	3.0	No	No
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

89.5 = Total Cover

Sampling Point WFE-32/33 UPL

VEGETATION – continued.

Woody Vine Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Oriental bittersweet	Celastrus orbiculatus	FACU	3.0	Yes	No
2.					
3.					
4.					
			3.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	7	3	Yes ☐ No ☑

Prevalence Index:	Total % Cover (all strata)	Multiply by:	Result
OBL species		X 1	= 0.00
FACW species		X 2	= 0.00
FAC species		X 3	= 0.00
FACU species		X 4	= 0.00
UPL species		X 5	= 0.00
Column Totals	(A) 0		(B) 0
Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐

Wetland vegetation criterion met? Yes ☐ No ☑

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point WFE-32/33 UPL

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
0-4	10YR 3/2	100.00					loamy fine sand	A horizon
4-10	10YR 4/4	100.00					loamy sand	B horizon
10-14	10YR 2/1	100.00					loamy fine sand	A2 horizon
14-16	10YR 3/1	90.00	10YR 4/3	10.00	C	M	loamy fine sand	A3 horizon
								Refusal

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: rocks/stones Depth (inches): 16.00

Remarks: Historic fill slope.

Hydric Soils criterion met? **Yes** ☐ **No** ☑

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Route 38 City/Town: Wilmington Sampling Date: 06/06/23

Applicant/Owner: MassDOT Sampling Point or Zone: WFH-7 WET

Investigator(s): Lucas Enviroinmental, LLC Latitude / Longitude: 42.524470° / -71.159787°

Soil Map Unit Name: Freetown muck (52A) NWI or DEP Classification: Wooded Swamp Deciduous

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? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [✓] No [ ]	**Is the Sampled Area within a Wetland?** Yes [✓] No [ ]
Hydric Soils criterion met?	Yes [✓] No [ ]	
Wetlands hydrology present?	Yes [✓] No [ ]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)
Water Table Present?	Yes [✓]	No [ ]	Depth (inches) 18.00
Saturation Present (including capillary fringe)?	Yes [✓]	No [ ]	Depth (inches) 8.00

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

This form is only for BVW delineations. Other wetland resource areas may be present and should be delineated according to the applicable regulatory provisions.

Sampling Point WFH-7 WET

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red maple	Acer rubrum	FAC	85.5	Yes	Yes
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

85.5 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Glossy buckthorn	Frangula alnus	FAC	63.0	Yes	Yes
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

63.0 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Canada mayflower	Maianthemum canadense	FACU	85.5	Yes	No
2. Feathery false Solomon's-seal	Maianthemum racemosum	FACU	3.0	No	No
3. Skunk cabbage	Symplocarpus foetidus	OBL	1.0	No	Yes
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

89.5 = Total Cover

Sampling Point WFH-7 WET

VEGETATION – continued.

Woody Vine Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1.					
2.					
3.					
4.					
			0.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	3	2	Yes ☑ No ☐

Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species		X 1	= 0.00
	FACW species		X 2	= 0.00
	FAC species		X 3	= 0.00
	FACU species		X 4	= 0.00
	UPL species		X 5	= 0.00
	Column Totals	(A) 0		(B) 0
	Prevalence Index	B/A = 0.00		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☐

Wetland vegetation criterion met? Yes ☑ No ☐

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point WFH-7 WET

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
3-0	10YR 2/1	100.00					hemic	Oe horizon
0-8	10YR 2/1	100.00					fine sandy loam	A horizon
8-12	10YR 2/1	90.00	5YR 3/3	10.00	C	M	v.fine sandy loam	A2 horizon
12-20	10YR 2/1	50.00	5YR 3/3	50.00	C	M	v.fine sandy loam	A3 horizon

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☑ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: _____ Depth (inches): _____

Remarks:

Hydric Soils criterion met? **Yes** ☑ **No** ☐

BORDERING VEGETATED WETLAND DETERMINATION FORM

Project/Site: Route 38 City/Town: Wilmington Sampling Date: 06/06/23

Applicant/Owner: MassDOT Sampling Point or Zone: WFH-7 UPL

Investigator(s): Lucas Enviroinmental, LLC Latitude / Longitude: 42.524470° / -71.159787°

Soil Map Unit Name: Deerfield loamy fine sand (256A) NWI or DEP Classification: Wooded Swamp Deciduous

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? (If yes, explain in Remarks)

Are Vegetation [ ], Soil [ ], or Hydrology [ ] naturally problematic? (If yes, explain in Remarks)

SUMMARY OF FINDINGS – Attach site map and photograph log showing sampling locations, transects, etc.

Wetland vegetation criterion met?	Yes [ ] No [✓]	**Is the Sampled Area within a Wetland?** Yes [ ] No [✓]
Hydric Soils criterion met?	Yes [ ] No [✓]	
Wetlands hydrology present?	Yes [ ] No [✓]	

Remarks, Photo Details, Flagging, etc.:

HYDROLOGY

Field Observations:			
Surface Water Present?	Yes [ ]	No [✓]	Depth (inches)_____
Water Table Present?	Yes [ ]	No [✓]	Depth (inches)_____
Saturation Present (including capillary fringe)?	Yes [ ]	No [✓]	Depth (inches)_____

Wetland Hydrology Indicators

Reliable Indicators of Wetlands Hydrology	Indicators that can be Reliable with Proper Interpretation	Indicators of the Influence of Water
[ ] Water-stained leaves	[ ] Hydrological records	[ ] Direct observation of inundation
[ ] Evidence of aquatic fauna	[ ] Free water in a soil test hole	[ ] Drainage patterns
[ ] Iron deposits	[ ] Saturated soil	[ ] Drift lines
[ ] Algal mats or crusts	[ ] Water marks	[ ] Scoured areas
[ ] Oxidized rhizospheres/pore linings	[ ] Moss trim lines	[ ] Sediment deposits
[ ] Thin muck surfaces	[ ] Presence of reduced iron	[ ] Surface soil cracks
[ ] Plants with air-filled tissue (aerenchyma)	[ ] Woody plants with adventitious roots	[ ] Sparsely vegetated concave surface
[ ] Plants with polymorphic leaves	[ ] Trees with shallow root systems	[ ] Microtopographic relief
[ ] Plants with floating leaves	[ ] Woody plants with enlarged lenticels	[ ] Geographic position (depression, toe of slope, fringing lowland
[ ] Hydrogen sulfide odor		

Remarks (describe recorded data from stream gauge, monitoring well, aerial photos, previous inspections, if available):

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Sampling Point WFH-7 UPL

VEGETATION – Use both common and scientific names of plants.

Tree Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Red maple	Acer rubrum	FAC	38.0	Yes	Yes
2. Black cherry	Prunus serotina	FACU	38.0	Yes	No
3.					
4.					
5.					
6.					
7.					
8.					
9.					

76.0 = Total Cover

Shrub/Sapling Stratum Plot size 15'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Glossy buckthorn	Frangula alnus	FAC	20.5	Yes	Yes
2. Green ash	Fraxinus pennsylvanica	FACW	1.0	No	Yes
3.					
4.					
5.					
6.					
7.					
8.					
9.					

21.5 = Total Cover

Herb Stratum Plot size 5'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Virginia creeper	Parthenocissus quinquefolia	FACU	38.0	Yes	No
2. Unidentified grass sp.			10.5	No	
3. Unidentified goldenrod sp.			10.5	No	
4. Canada mayflower	Maianthemum canadense	FACU	3.0	No	No
5. Feathery false Solomon's-seal	Maianthemum racemosum	FACU	3.0	No	No
6. Sensitive fern	Onoclea sensibilis	FACW	1.0	No	Yes
7.					
8.					
9.					
10.					
11.					
12.					

66.0 = Total Cover

Sampling Point WFH-7 UPL

VEGETATION – continued.

Woody Vine Stratum Plot size 30'

Common name	Scientific name	Indicator Status	Absolute % Cover	Dominant? (yes/no)	Wetland Indictor? (yes/no)
1. Virginia creeper	Parthenocissus quinquefolia	FACU	3.0	Yes	No
2. Oriental bittersweet	Celastrus orbiculatus	FACU	3.0	Yes	No
3.					
4.					
			6.0 = Total Cover		

Rapid Test: Do all dominant species have an indicator status of OBL or FACW? Yes ☐ No ☑

Dominance Test:	Number of dominant species	Number of dominant species that are wetland indicator plants	Do wetland indicator plants make up ≥ 50% of dominant plant species?
	6	2	Yes ☐ No ☑

Prevalence Index:		Total % Cover (all strata)	Multiply by:	Result
	OBL species	0	X 1	= 0.00
	FACW species	2	X 2	= 4.00
	FAC species	59	X 3	= 175.50
	FACU species	88	X 4	= 352.00
	UPL species	0	X 5	= 0.00
	Column Totals	(A) 148.5		(B) 531.5
	Prevalence Index	B/A = 3.58		Is the Prevalence Index ≤ 3.0? Yes ☐ No ☑

Wetland vegetation criterion met? Yes ☐ No ☑

Definitions of Vegetation Strata

Tree - Woody plants 3 in. (7.62 cm) or more in diameter at breast height (DBH), regardless of height

Shrub / Sapling - Woody plants less than 3 in. (7.62 cm) DBH and greater than or equal to 3.3 ft. (1 m) tall

Herb - All herbaceous (non-woody plants, regardless of size, and woody plants less than 3.3 ft. (1 m) tall

Woody vines - All woody vines greater than 3.3 ft. (1 m) in height

Cover Ranges	
Range	Midpoint
1-5 %	3.0 %
6-15 %	10.5 %
15-25 %	20.5 %
26-50 %	38.0 %
51-75 %	63.0 %
76-95 %	85.5 %
96-100 %	98.0 %

Sampling Point WFH-7 UPL

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Location[2]		
1-0								leaf litter
0-16	10YR 3/2	100.00					loamy fine sand	A horizon
								Refusal

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators (Check all that apply)		**Indicators for Problematic Hydric Soils**
☐ Histosol (A1)	☐ Polyvalue Below Surface (S8)	☐ 2 cm Muck (A10)
☐ Histic Epipedon (A2)	☐ Thin Dark Surface (S9)	☐ 5 cm Mucky Peat or Peat (S3)
☐ Black Histic (A3)	☐ Loamy Gleyed Matrix (F2)	☐ Iron-Manganese Masses (F12)
☐ Hydrogen Sulfide (A4)	☐ Depleted Matrix (F3)	☐ Mesic Spodic (A17)
☐ Stratified Layers (A5)	☐ Redox Dark Surface (F6)	☐ Red Parent Material (F21)
☐ Depleted Below Dark Surface (A11)	☐ Depleted Dark Surface (F7)	☐ Very Shallow Dark Surface (F22)
☐ Thick Dark Surface (A12)	☐ Redox Depressions (F8)	
☐ Sandy Mucky Mineral (S1)		
☐ Sandy Gleyed Matrix (S4)		
☐ Sandy Redox (S5)		☐ Other (Include Explanation in Remarks)
☐ Stripped Matrix (S6)		
☐ Dark Surface (S7)		

Restrictive Layer (if observed) Type: Stones Depth (inches): 16.00

Remarks: Years of accumulated road sand on slope. Buried plastic bag/debris at 12 inches below surface.

Hydric Soils criterion met? **Yes** ☐ **No** ☑

ATTACHMENT E – DEP APPROVED SEDIMENT SAMPLING PLAN AND RESULTS

Oxana Fartushnaya

From: Davis, Heidi (DEP) <heidi.davis@mass.gov>
Sent: Friday, June 7, 2024 11:07 AM
To: Oxana Fartushnaya
Cc: Lewis, Tyler (DEP); Hale, Ryan (DEP); Lenker, Melissa (DOT); Larner, Erica N. (DOT); Beckwith, Corinna (DOT); 1303319X MassDOT Wilmington Rte 38; Dennis Vertiyev; Danielle Spicer
Subject: RE: DEP WQC Sediment Sampling Plan - MassDOT 608051 Wilmington

RE: Sediment Sampling Plan
Reconstruction of Route 38, Wilmington
MassDOT 608051

Good morning, Oxana –

Thank you for submitting the Sediment Sampling Plan for the Route 38 Reconstruction project in Wilmington. MassDEP has reviewed the plan and, via this correspondence, approves this plan.

Please contact me at heidi.davis@mass.gov or tyler.lewis@mass.gov with any questions.

Best, Heidi

Heidi M. Davis
Senior Wetland Analyst
Highway Unit Supervisor
Wetlands Program, Boston Office
MassDEP
339-225-2332

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection

From: Oxana Fartushnaya <ofartushnaya@greenintl.com>
Sent: Thursday, May 30, 2024 7:34 PM
To: Davis, Heidi (DEP) <heidi.davis@mass.gov>
Cc: Lewis, Tyler (DEP) <Tyler.Lewis@mass.gov>; Hale, Ryan (DEP) <Ryan.Hale@mass.gov>; Lenker, Melissa (DOT) <Melissa.Lenker@dot.state.ma.us>; Larner, Erica N. (DOT) <erica.n.larner@dot.state.ma.us>; Beckwith, Corinna (DOT) <corinna.beckwith@dot.state.ma.us>; 1303319X MassDOT Wilmington Rte 38 <1303319XMassDOTWilmingtonRte38@GreenIntl.com>; Dennis Vertiyev <dvertiyev@greenintl.com>; Danielle Spicer <dspicer@greenintl.com>
Subject: DEP WQC Sediment Sampling Plan - MassDOT 608051 Wilmington

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hi Heidi,

Attached please find the Sediment Sampling Plan for the MassDOT 608051 Reconstruction on Route 38 (Main Street) project. The project will require obtaining a Water Quality Certificate (WQC) for fill/excavation and minor dredging associated with the proposed work on the Culvert/Bridge No. W-38-011, carrying Route 38 over Maple Meadow Brook.

Please let us know if you have any questions or comments on the plan.

Thank you,

Oxana

Oxana Fartushnaya
Client Manager I | Stormwater & Permitting Group

Office (978) 923-0400
Direct (978) 843-5276
Mobile (857) 753-9193
Website www.greenintl.com

Green International Affiliates, Inc.
Tewksbury, MA and Lincoln, RI

Green International Affiliates, Inc.
100 Ames Pond Drive, Suite 200 Tewksbury, MA 01876
T: (978) 923-0400 | www.greenintl.com

May 30, 2024

To:	Heidi Davis, MassDEP (heidi.davis@mass.gov) Tyler Lewis, MassDEP (Tyler.Lewis@mass.gov) Ryan Hale, MassDEP (Ryan.Hale@mass.gov)
Cc:	Melissa Lenker, MassDOT (melissa.lenker@state.ma.us) Cori Beckwith, MassDOT (corinna.beckwith2@state.ma.us)
From:	Danielle Spicer, P.E., Green International Affiliates, Inc.
Date:	May 30, 2024
Project Name:	Reconstruction on Route 38 (Main Street), Wilmington, MA MassDOT Project No. 608051)
Project Number:	Green No. 13033.19X/21058.16X
Subject:	**Sediment Sampling Plan for WQC**

1.0 INTRODUCTION AND PURPOSE

Green International Affiliates (Green) has been retained to assist the Massachusetts Department of Transportation (MassDOT), in conjunction with the Town of Wilmington, with the proposed Reconstruction on Route 38 (Main Street) project, between the intersection of Route 38 and Route 62 to the Woburn city line for a total project length of approximately 2.1 miles in the Town of Wilmington.

As part of the project, Green has been tasked with obtaining a Water Quality Certification (WQC) since the project will result in cumulative permanent and temporary impacts to Bordering Vegetated Wetlands (BVW) and Waterways/Land Under Water (LUW) in excess of 5,000 square feet as well as dredging in waterways in excess of 100 cubic yards. The proposed improvements under this project will result in permanent impacts to LUW/WOTUS associated with the proposed substructure work and channel armoring to mitigate the existing scour holes and for future scour protection near the Culvert/Bridge No. W-38-011 conveying Maple Meadow Brook beneath Route 38. Therefore, the sediment sampling analysis for upland reuse or disposal of dredged material in accordance with 314 CRMC 09.07 is required.

Green will be tasked with collecting up to two (2) sediment samples via hand-auguring. The Sediment Sampling Plan depicts the locations of the two (2) proposed exploratory sediment coring locations. Green will utilize TG&B Marine Services (TG&B) to characterize the soil, record field screening, and collect sediment samples at the bottom of exploration. Samples will be submitted to a Massachusetts Certified Laboratory to test for:

- Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Mercury, Zinc)
- Polychlorinated Biphenyls (PCB's) Pesticides
- Extractable Petroleum Hydrocarbons (EPH)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Semi-Volatile Organic Compounds (SVOCs)
- Total Organic Compounds (TOCs)
- Percent Water
- Grain Size

The “due diligence" was completed at earlier design stages as part of Early Environmental Coordination for this project, per MassDOT project development schedule. A review of the Massachusetts Department of Environmental Protection (DEP) sites database for releases of oil and/or hazardous materials (OHM) revealed numerous sites within the entire project corridor which were reviewed during the early environmental review for this project. This project was also reviewed by the MassDOT HazMat unit to evaluate the potential for hazardous material impacts to the proposed work. Information regarding the proposed project was obtained from the 25% submission.

We revisited the MassDEP Waste Site & Reportable Releases database in March 2024 to review and confirm the following listed sites located in within 2500 feet of the bridge/culvert area where dredging below the Ordinary High Water Mark (OHWM) of Maple Meadow Brook is proposed:

- RTN 3-0037527 and RTN 3-0037804 at 175 Lowell Street
- RTN 3-0029532 at 49 Butters Row
- RTN 3-0019545 at 730 Main St
- RTN 3-0033341 at 730 Main St
- RTN 3-0034114 at 207 Lowell St
- RTN 3-0026281 at 207 Lowell St
- RTN 3-0003929 at 685-687 Main St

The majority of the above sites are closed sites located downstream of the Route 38 crossing over Maple Meadow Brook.

The only listed open site with RTN 3-0037527 and 3-0037804 located at 175 Lowell Street, lists a release of fuel oil #2 at the construction site reported on 10/18/2022; however, this release reached a compliance status of “RTN Closed” on 6/27/2023. According to MassGIS Massmapper, this site is also listed in the DEP Tier Classified 21E Sites database. This site is located northeast of the downstream side of the Maple Meadow Brook crossing; therefore, it is not likely to contribute to the potential for hazardous material to impact the proposed work at the Culvert/Bridge No. W-38-011 site.

There is one closed site with an AUL (RTN 3-0003929) located northwest of the Culvert/Bridge No. W-38-011 at BET 685-687 Main St, with RAO class A3. This site received an AUL received on 08/01/1997 and reached a compliance back on 8/11/1997. According to MassGIS Massmapper, this site also has a history of reported Underground Storage Tanks, and is listed in the DEP BAW Major Facilities Large Quantity Generators of Hazardous Waste (Facility ID# 417394) and DEP BAW Major Facilities Large Quantity Toxic Users (ID# MAR000503961) databases.

In addition, the southern portion of Route 38 within the project limits from Woburn city line to approximately Route 38/Butters Row intersection is located within a groundwater study area of the Olin Chemical Superfund Site (3-acre property at 51 Eames Street in Wilmington). The historic groundwater contamination with N-Nitroso-dimethylamine (NDMA) occurred upstream of the proposed sediment sampling location.

The purpose of this plan is to provide the scope of work for the environmental sampling and guidance to the field staff regarding proper sediment sampling and observation and notification procedures in the event of “suspect” contamination. All necessary provisions for dealing with the potentially contaminated sediment or hazardous materials on site are included in the Contract.

Soil to be removed from the project area shall not be assumed to be uncontaminated and must be evaluated prior to off-site management for potential contamination with hazardous materials. Quantities for soil disposal are based on the project design, existing knowledge of soil contamination in the project area, the presence of known risk factors for soil contamination in the project area, and the designer's best professional judgment.

Any stockpiling of soil must be performed in compliance with Policy Directive P-22-001, Off-Site Stockpiling of Soil from MassDOT Construction Projects. This directive limits the allowable locations for off-site stockpiling of soil generated during MassDOT projects and includes various requirements that must be satisfied by the contractor prior to off-site stockpiling.

2.0 SAMPLING PROCEDURE

The work will be done using a coring platform, 3 coring operators, and a petite ponar sampler.

3.0 SITE CONTACTS

TG&B Marine Services
Mark Avakian – (508) 326-3686
mark@tgandbmarine.com

Green International Affiliates
Danielle Spicer – (978) 843-5218
dspicer@greenintl.com

4.0 HEALTH AND SAFETY

The Site is located within an abandoned railroad bed and within a body of water. TG&B Marine Services will take all necessary precautionary measures to assure safety during the duration of work.

The site is located within the Maple Meadow Brook in Wilmington, MA.

5.0 SEDIMENT SAMPLING OVERSIGHT

The following is the proposed scope of work for the environmental assessment:

- Two (2) sediment cores will be progressed. The sediment cores will be advanced via hand augur down to the anticipated depth of dredging, a depth of four (4) feet below ground surface (fbgs) as shown on Sediment Sampling Plan. When the bottom of exploration is reached, the sediment cores will be terminated. There will be a uniform amount of dredging occurring on the upstream and downstream sides of each stream crossing, therefore only one sample is needed at each of the following sampling locations. The bottom of exploration for sediment coring locations is as follows:
    - "SS-1" (Culvert/Bridge W-38-011 No. 1 at Sta. 329+85 – North) at 4 fbgs
    - "SS-2" (Culvert/Bridge W-38-011 No. 2 at Sta. 346+20 – North) at 4 fbgs

- A TG&B Marine Services engineer will oversee the sediment coring and:
    - Photo-document the sediment conditions for each sample location
    - Prepare field notes documenting the sediment coring activities, sediment descriptions, visual/olfactory observations, and any instances of "suspect" contamination.
    - Observe and screen sediment with a PID at 1-ft intervals

5.1 "Suspect" Contamination Observation Procedures

Considering the nature of the work and limited exposure duration during sediment coring activities, the risk to non-construction and professional personnel is low. However, not all parts of the Site are sampled, and it is crucial for all personnel to be aware of "suspect" contamination.

If "suspect" contamination is observed, TG&B will notify Green and MassDOT immediately to determine appropriate steps moving forward.

6.0 SAMPLING PLAN

The following sampling procedures are guidelines to be followed during the sediment sampling program to assist with determining where (location and depth) to collect sediment samples for analyses. **Please discuss any changes to the sampling procedures with the MassDOT PM before proceeding with the change.**

6.1 Sampling Procedure

At **each** location, samples will be collected and submitted for analysis of EPHs, PCBs, SVOCs, Metals, Pesticides, TOC, Percent water and grain size.

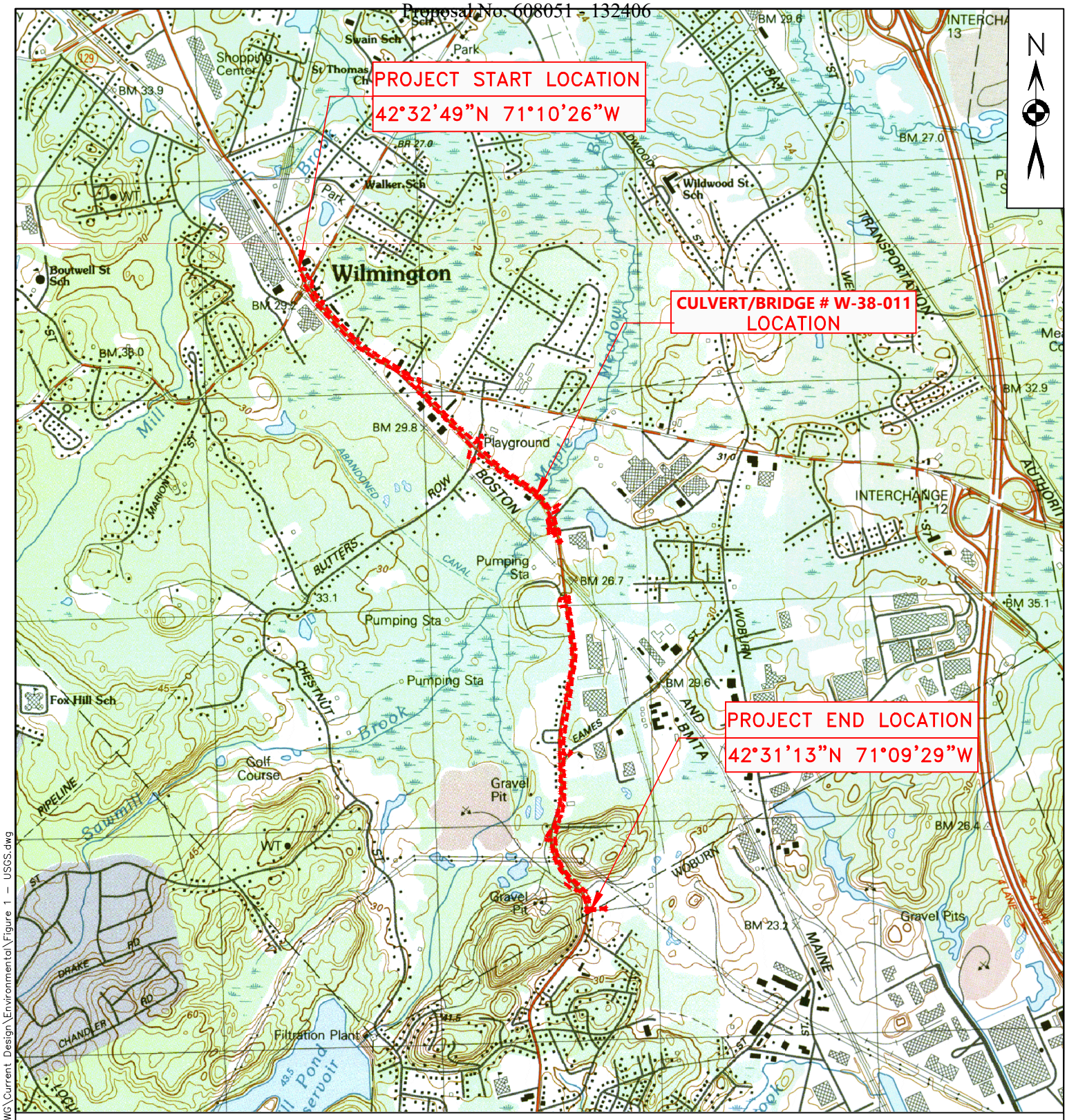
Augur will be advanced to depths of four (4) fbgs. Sampling will be performed in the following manner.

6.1.1 Composite Samples (Metals, SVOCs, EPH, PCBs, Pesticides, TOC, % Water, and Grain Size)

Composite samples will consist of no more than two (2) grab samples, either vertically or horizontally. Composite sampling shall be completed in the following manner:

- At each location, place soils from similar strata into baggies or jars noting location and depth on the container.
- If no "suspect" material is present, collect a composite sample of the suspect material using two (2) grab samples from the same boring, as applicable.
- Composite samples will not to be submitted for VOCs.

LOCUS MAP



LEGEND:

APPROXIMATE PROJECT AREA

SCALE IN FEET

1000 0 1000 2000

1" = 2000'

ELEVATIONS IN METERS

NOTE: DATA TAKEN FROM MASSGIS

USGS LOCUS MAP

WILMINGTON – RECONSTRUCTION ON ROUTE 38 (MAIN STREET)
FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS
100 AMES POND DRIVE, SUITE 200, TEWKSBURY, MA
24 ALBION RD, LINCOLN, RI (401) 305-7895

PREPARED FOR:
massDOT
Massachusetts Department of Transportation
Highway Division

SCALE: AS NOTED	PROJECT NO. 13033.19	FIGURE 1
DATE: 09/06/2023	DRAWN BY: OF/VR	
REVISED:	CHECKED BY: DS	

Y:\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\Environmental\Figure 1 – USGS.dwg

SEDIMENT SAMPLING PLAN

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	22	370
PROJECT FILE NO.	608051		

CONSTRUCTION PLANS - 10

608051_HD06(CONST-PLANS).DWG Plotted on 24-Jan-2024 4:05 PM

HIGHWAY GUARD DETAILS

STA. 248+33 LT - STA. 253+12 LT GUARDRAIL, TL-2 (SINGLE FACED)
STA. 253+12 LT - STA. 253+46 LT TRANSITION TO BRIDGE RAIL
STA. 253+97 LT - STA. 254+31 LT TRANSITION TO BRIDGE RAIL
STA. 254+31 LT - STA. 255+13 LT GUARDRAIL, TL-2 (SINGLE FACED)
STA. 255+13 LT - STA. 255+50 LT GUARDRAIL TANGENT END TREATMENT, TL-2
STA. 253+31 RT - STA. 253+31 RT TRAILING ANCHORAGE
STA. 253+31 RT - STA. 253+41 RT GUARDRAIL - CURVED, TL-2 (SINGLE FACED)
STA. 254+41 RT - STA. 254+54 RT GUARDRAIL, TL-2 (SINGLE FACED)
STA. 254+07 RT - STA. 254+41 RT TRANSITION TO BRIDGE RAIL
STA. 254+41 RT - STA. 257+83 RT GUARDRAIL, TL-2 (SINGLE FACED)
STA. 257+83 RT - STA. 257+92 RT TRAILING ANCHORAGE

TRAFFIC SIGNAL CONDUIT

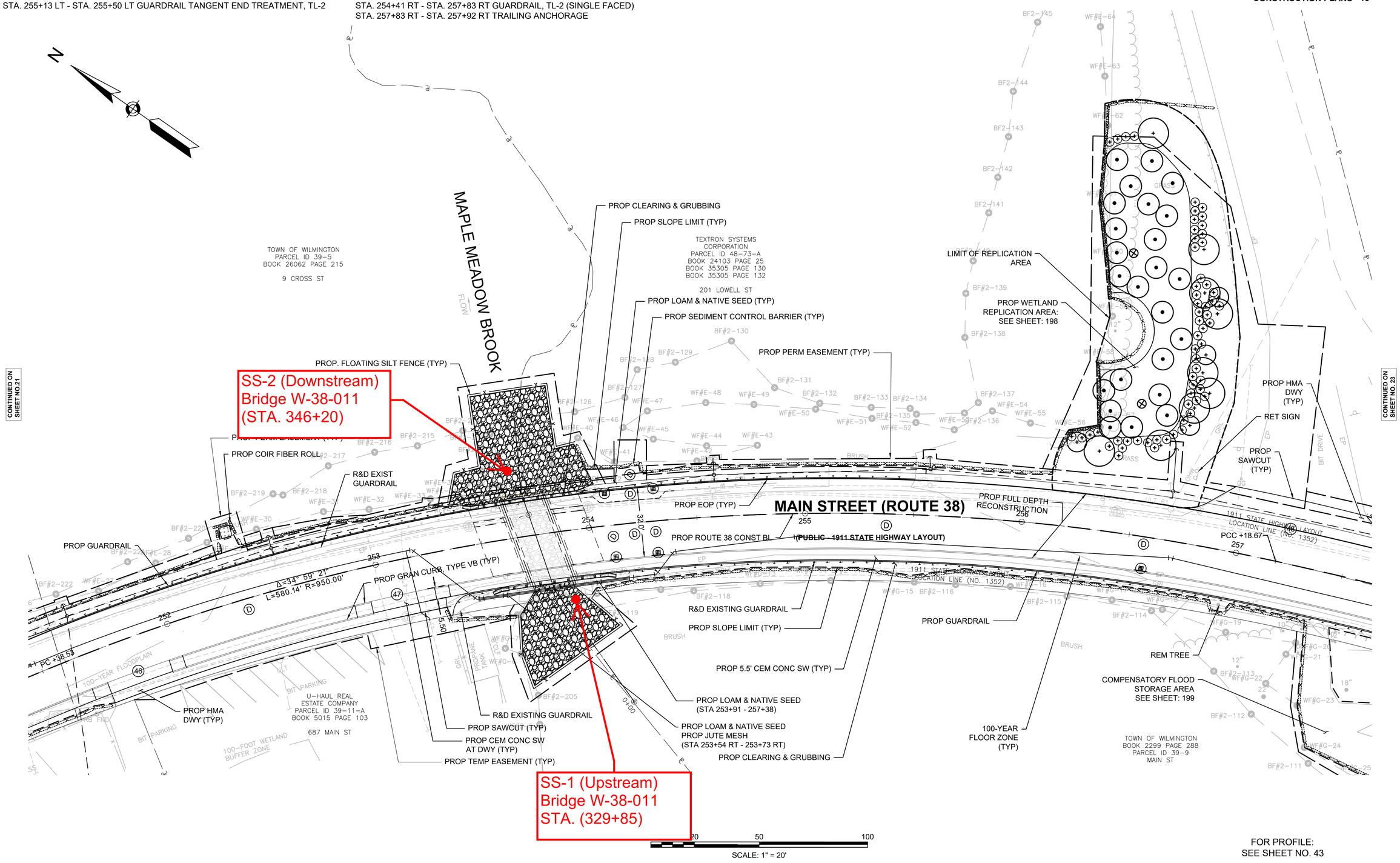
N/A

WATER SUPPLY ALTERATIONS

SEE SHEET 117

DRAINAGE DETAILS

SEE SHEET 96



FOR PROFILE:
SEE SHEET NO. 43

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Camila Knight
Thielsch Engineering, Inc.
195 Frances Avenue
Cranston, RI 02910

RE: Route 38 Bridge Maple Meadow Brook Wilmington MA (74-25-0002.401)
ESS Laboratory Work Order Number: 25A0540

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 6:05 pm, Jan 30, 2025

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

SAMPLE RECEIPT

The following samples were received on January 20, 2025 for the analyses specified on the enclosed Chain of Custody Record.

All samples for Metals were oven dried at 60 degrees Celsius prior to digestion and relogged in as Samples 25A0540-03 and 25A0540-04. This was done to increase the dry weight of the sample digested which decreases variability of results and lowers the detection limits for samples with high water content.

Low Level VOA vials were frozen by the client on January 16, 2025.

Lab Number	Sample Name	Matrix	Analysis
25A0540-01	SS-1	Soil	2540G, 8081B, 8082A Cong, 8260D Low, 8270E, EPH8270, EPH8270SIM, LK, MADEP-EPH
25A0540-02	SS-2	Soil	2540G, 8081B, 8082A Cong, 8260D Low, 8270E, EPH8270, EPH8270SIM, LK, MADEP-EPH
25A0540-03	SS-1 - Oven Dried	Soil	6010D, 7471B
25A0540-04	SS-2 - OVEN DRIED	Soil	6010D, 7471B

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
ESS Laboratory Work Order: 25A0540

PROJECT NARRATIVE

8082 Polychlorinated Biphenyls (PCB) / Congeners

25A0540-01 **Lower value is used due to matrix interferences (LC).**
BZ#138

25A0540-01 **Percent difference between primary and confirmation results exceeds 40% (P).**
BZ#138

25A0540-02 **Lower value is used due to matrix interferences (LC).**
BZ#138

25A0540-02 **Percent difference between primary and confirmation results exceeds 40% (P).**
BZ#138

MADEP-EPH Extractable Petroleum Hydrocarbons

25A0540-01 **Present in Method Blank (B).**
Phenanthrene

25A0540-02 **Present in Method Blank (B).**
Phenanthrene

D5A0370-CCV1 **Continuing Calibration %Diff/Drift is above control limit (CD+).**
Fluoranthene (21% @ 20%)

Semi-Volatile Organic Compounds

D5A0363-CCV1 **Calibration required quadratic regression (Q).**
2,4-Dinitrophenol (99% @ 40-160%)

D5A0363-CCV1 **Continuing Calibration %Diff/Drift is above control limit (CD+).**
Di-n-octylphthalate (22% @ 20%)

D5A0363-CCV1 **Initial Calibration Verification recovery is below lower control limit (ICV-).**
Aniline , bis(2-chloroisopropyl)Ether

Volatile Organics Low Level

D5A0394-CCV1 **Calibration required quadratic regression (Q).**
Naphthalene (94% @ 40-160%)

No other observations noted.

End of Project Narrative.

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
ESS Laboratory Work Order: 25A0540

DATA USABILITY LINKS

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Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010D - ICP
6020B - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260D - VOA
8270E - SVOA
8270E SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 19-2.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 6.9g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Prepared: 1/22/25 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,1,1-Trichloroethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,1,2,2-Tetrachloroethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,1,2-Trichloroethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,1-Dichloroethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,1-Dichloroethene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,1-Dichloropropene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2,3-Trichlorobenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2,3-Trichloropropane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2,4-Trichlorobenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2,4-Trimethylbenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2-Dibromo-3-Chloropropane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2-Dibromoethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2-Dichlorobenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2-Dichloroethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,2-Dichloropropane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,3,5-Trimethylbenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,3-Dichlorobenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,3-Dichloropropane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,4-Dichlorobenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
1,4-Dioxane	ND (0.109)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
2,2-Dichloropropane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
2-Butanone	ND (0.0543)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
2-Chlorotoluene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
2-Hexanone	ND (0.0543)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
4-Chlorotoluene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
4-Isopropyltoluene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 6.9g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Prepared: 1/22/25 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
4-Methyl-2-Pentanone	ND (0.0543)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Acetone	**0.103** (0.0543)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Benzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Bromobenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Bromochloromethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Bromodichloromethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Bromoform	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Bromomethane	ND (0.0109)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Carbon Disulfide	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Carbon Tetrachloride	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Chlorobenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Chloroethane	ND (0.0109)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Chloroform	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Chloromethane	ND (0.0109)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
cis-1,2-Dichloroethene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
cis-1,3-Dichloropropene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Dibromochloromethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Dibromomethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Dichlorodifluoromethane	ND (0.0109)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Diethyl Ether	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Di-isopropyl ether	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Ethyl tertiary-butyl ether	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Ethylbenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Hexachlorobutadiene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Isopropylbenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Methyl tert-Butyl Ether	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Methylene Chloride	ND (0.0272)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 6.9g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Prepared: 1/22/25 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Naphthalene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
n-Butylbenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
n-Propylbenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
sec-Butylbenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Styrene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
tert-Butylbenzene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Tertiary-amyl methyl ether	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Tetrachloroethene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Tetrahydrofuran	ND (0.0217)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Toluene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
trans-1,2-Dichloroethene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
trans-1,3-Dichloropropene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Trichloroethene	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Trichlorofluoromethane	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Vinyl Chloride	ND (0.0109)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Xylene O	ND (0.0054)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Xylene P,M	ND (0.0109)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222
Xylenes (Total)	ND (0.0109)	---	8260D Low	---	1	MEK	01/22/25 14:46	D5A0394	DA52222

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*95 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*92 %*		*70-130*
Surrogate: Dibromofluoromethane	*92 %*		*70-130*
Surrogate: Toluene-d8	*104 %*		*70-130*

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 19.2g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/21/25 10:15

Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
1,1-Biphenyl	ND (0.039)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
1,2,4-Trichlorobenzene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
1,2-Dichlorobenzene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
1,3-Dichlorobenzene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
1,4-Dichlorobenzene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2,4,5-Trichlorophenol	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2,4,6-Trichlorophenol	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2,4-Dichlorophenol	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2,4-Dimethylphenol	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2,4-Dinitrophenol	ND (1.56)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2,4-Dinitrotoluene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2,6-Dinitrotoluene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2-Chloronaphthalene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2-Chlorophenol	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2-Methylnaphthalene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2-Methylphenol	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
2-Nitrophenol	ND (0.781)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
3,3´-Dichlorobenzidine	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
3+4-Methylphenol	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
4-Bromophenyl-phenylether	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
4-Chloroaniline	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
4-Nitrophenol	ND (1.56)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Acenaphthene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Acenaphthylene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Acetophenone	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Aniline	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Anthracene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 19.2g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/21/25 10:15

Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Azobenzene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Benzo(a)anthracene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Benzo(a)pyrene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Benzo(b)fluoranthene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Benzo(g,h,i)perylene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Benzo(k)fluoranthene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
bis(2-Chloroethoxy)methane	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
bis(2-Chloroethyl)ether	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
bis(2-chloroisopropyl)Ether	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
bis(2-Ethylhexyl)phthalate	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Butylbenzylphthalate	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Chrysene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Dibenzo(a,h)Anthracene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Dibenzofuran	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Diethylphthalate	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Dimethylphthalate	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Di-n-butylphthalate	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Di-n-octylphthalate	ND (0.781)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Fluoranthene	**0.505** (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Fluorene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Hexachlorobenzene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Hexachlorobutadiene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Hexachloroethane	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Indeno(1,2,3-cd)Pyrene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Isophorone	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Naphthalene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Nitrobenzene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 19.2g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540
ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/21/25 10:15

Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
N-Nitrosodimethylamine	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Pentachlorophenol	ND (1.56)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Phenanthrene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Phenol	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106
Pyrene	ND (0.391)	---	8270E	---	1	TJ	01/21/25 21:16	D5A0363	DA52106

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*82 %*		*30-130*
Surrogate: 2,4,6-Tribromophenol	*104 %*		*30-130*
Surrogate: 2-Chlorophenol-d4	*82 %*		*30-130*
Surrogate: 2-Fluorobiphenyl	*93 %*		*30-130*
Surrogate: 2-Fluorophenol	*83 %*		*30-130*
Surrogate: Nitrobenzene-d5	*83 %*		*30-130*
Surrogate: Phenol-d6	*81 %*		*30-130*
Surrogate: p-Terphenyl-d14	*98 %*		*30-130*

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 24.4g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/20/25 18:32

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (15.4)	---	MADEP-EPH	---	1	JDN	01/21/25 22:38	D5A0369	DA52044
C19-C36 Aliphatics1	ND (15.4)	---	MADEP-EPH	---	1	JDN	01/21/25 22:38	D5A0369	DA52044
C11-C22 Unadjusted Aromatics1	**19.0** (15.4)	---	EPH8270	---	1	DMC	01/21/25 22:28	D5A0359	DA52044
C11-C22 Aromatics1,2	**18.0** (15.6)	---	EPH8270	---		TJ	01/21/25 23:44	---	[CALC]
2-Methylnaphthalene	ND (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Acenaphthene	ND (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Naphthalene	ND (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Phenanthrene	**B 0.084** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Acenaphthylene	ND (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Anthracene	ND (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Benzo(a)anthracene	**0.059** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Benzo(a)pyrene	**0.091** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Benzo(b)fluoranthene	**0.083** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Benzo(g,h,i)perylene	**0.077** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Benzo(k)fluoranthene	**0.084** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Chrysene	**0.093** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Dibenzo(a,h)Anthracene	**0.039** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Fluoranthene	**0.189** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Fluorene	ND (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Indeno(1,2,3-cd)Pyrene	**0.064** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044
Pyrene	**0.129** (0.012)	---	EPH8270SIM	---	1	TJ	01/21/25 23:44	D5A0370	DA52044

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*84 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*103 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*98 %*		*40-140*
Surrogate: O-Terphenyl	*111 %*		*40-140*

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 20g
Final Volume: 5ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: DMC
Prepared: 1/20/25 18:32

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4´-DDD	**0.0072** (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
4,4´-DDE	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
4,4´-DDT	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Aldrin	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
alpha-BHC	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
alpha-Chlordane	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
beta-BHC	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Chlordane (Total)	ND (0.0300)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
delta-BHC	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Dieldrin [2C]	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Endosulfan I	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Endosulfan II	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Endosulfan Sulfate	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Endrin	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Endrin Ketone	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
gamma-BHC (Lindane)	ND (0.0022)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
gamma-Chlordane	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Heptachlor	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Heptachlor Epoxide	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Hexachlorobenzene	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005
Methoxychlor	ND (0.0038)	---	8081B	---	1	01/22/25 14:26	D5A0377	DA52005

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*51 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*51 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*62 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*50 %*		*30-150*

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67

ESS Laboratory Work Order: 25A0540
ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**33** (1)	---	2540G	---	1	CCP	01/20/25 18:20	%	DA52010
Total Organic Carbon (Average)	**18100** (500)	---	LK	---	1	CCP	01/23/25 12:07	mg/kg	[CALC]

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1
Date Sampled: 01/16/25 13:05
Percent Solids: 67
Initial Volume: 30.3g
Final Volume: 2ml
Extraction Method: 3540C

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: DMC
Prepared: 1/24/25 10:17

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#18	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#28	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#44	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#52 [2C]	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#66	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#101	**0.00072** (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#105	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#118 [2C]	**0.00069** (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#128	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#138	**P, LC 0.00081** (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#153	**0.00080** (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#170 [2C]	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#180	**0.00056** (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#187	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#195	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#206	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404
BZ#209	ND (0.00040)	---	8082A Cong	---	1	01/30/25 8:39	D5A0509	DA52404

	%Recovery	*Qualifier*	*Limits*
Surrogate: Tetrachloro-m-xylene	*64 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*66 %*		*30-150*

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 8.1g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Prepared: 1/22/25 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,1,1-Trichloroethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,1,2,2-Tetrachloroethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,1,2-Trichloroethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,1-Dichloroethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,1-Dichloroethene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,1-Dichloropropene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2,3-Trichlorobenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2,3-Trichloropropane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2,4-Trichlorobenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2,4-Trimethylbenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2-Dibromo-3-Chloropropane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2-Dibromoethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2-Dichlorobenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2-Dichloroethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,2-Dichloropropane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,3,5-Trimethylbenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,3-Dichlorobenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,3-Dichloropropane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,4-Dichlorobenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
1,4-Dioxane	ND (0.0754)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
2,2-Dichloropropane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
2-Butanone	ND (0.0377)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
2-Chlorotoluene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
2-Hexanone	ND (0.0377)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
4-Chlorotoluene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
4-Isopropyltoluene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 8.1g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Prepared: 1/22/25 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
4-Methyl-2-Pentanone	ND (0.0377)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Acetone	ND (0.0377)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Benzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Bromobenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Bromochloromethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Bromodichloromethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Bromoform	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Bromomethane	ND (0.0075)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Carbon Disulfide	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Carbon Tetrachloride	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Chlorobenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Chloroethane	ND (0.0075)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Chloroform	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Chloromethane	ND (0.0075)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
cis-1,2-Dichloroethene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
cis-1,3-Dichloropropene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Dibromochloromethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Dibromomethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Dichlorodifluoromethane	ND (0.0075)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Diethyl Ether	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Di-isopropyl ether	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Ethyl tertiary-butyl ether	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Ethylbenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Hexachlorobutadiene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Isopropylbenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Methyl tert-Butyl Ether	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Methylene Chloride	ND (0.0189)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 8.1g
Final Volume: 10ml
Extraction Method: 5035

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Prepared: 1/22/25 8:00

Volatile Organics Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Naphthalene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
n-Butylbenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
n-Propylbenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
sec-Butylbenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Styrene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
tert-Butylbenzene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Tertiary-amyl methyl ether	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Tetrachloroethene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Tetrahydrofuran	ND (0.0151)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Toluene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
trans-1,2-Dichloroethene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
trans-1,3-Dichloropropene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Trichloroethene	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Trichlorofluoromethane	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Vinyl Chloride	ND (0.0075)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Xylene O	ND (0.0038)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Xylene P,M	ND (0.0075)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222
Xylenes (Total)	ND (0.0075)	---	8260D Low	---	1	MEK	01/22/25 15:11	D5A0394	DA52222

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*95 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*97 %*		*70-130*
Surrogate: Dibromofluoromethane	*93 %*		*70-130*
Surrogate: Toluene-d8	*102 %*		*70-130*

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 20.6g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/21/25 10:15

Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
1,1-Biphenyl	ND (0.030)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
1,2,4-Trichlorobenzene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
1,2-Dichlorobenzene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
1,3-Dichlorobenzene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
1,4-Dichlorobenzene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2,4,5-Trichlorophenol	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2,4,6-Trichlorophenol	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2,4-Dichlorophenol	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2,4-Dimethylphenol	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2,4-Dinitrophenol	ND (1.19)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2,4-Dinitrotoluene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2,6-Dinitrotoluene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2-Chloronaphthalene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2-Chlorophenol	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2-Methylnaphthalene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2-Methylphenol	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
2-Nitrophenol	ND (0.593)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
3,3´-Dichlorobenzidine	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
3+4-Methylphenol	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
4-Bromophenyl-phenylether	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
4-Chloroaniline	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
4-Nitrophenol	ND (1.19)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Acenaphthene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Acenaphthylene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Acetophenone	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Aniline	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Anthracene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 20.6g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/21/25 10:15

Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Azobenzene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Benzo(a)anthracene	**0.402** (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Benzo(a)pyrene	**0.445** (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Benzo(b)fluoranthene	**0.599** (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Benzo(g,h,i)perylene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Benzo(k)fluoranthene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
bis(2-Chloroethoxy)methane	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
bis(2-Chloroethyl)ether	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
bis(2-chloroisopropyl)Ether	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
bis(2-Ethylhexyl)phthalate	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Butylbenzylphthalate	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Chrysene	**0.494** (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Dibenzo(a,h)Anthracene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Dibenzofuran	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Diethylphthalate	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Dimethylphthalate	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Di-n-butylphthalate	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Di-n-octylphthalate	ND (0.593)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Fluoranthene	**1.11** (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Fluorene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Hexachlorobenzene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Hexachlorobutadiene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Hexachloroethane	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Indeno(1,2,3-cd)Pyrene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Isophorone	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Naphthalene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Nitrobenzene	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 20.6g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540
ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/21/25 10:15

Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
N-Nitrosodimethylamine	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Pentachlorophenol	ND (1.19)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Phenanthrene	**0.455** (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Phenol	ND (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106
Pyrene	**0.832** (0.297)	---	8270E	---	1	TJ	01/21/25 21:47	D5A0363	DA52106

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*86 %*		*30-130*
Surrogate: 2,4,6-Tribromophenol	*102 %*		*30-130*
Surrogate: 2-Chlorophenol-d4	*89 %*		*30-130*
Surrogate: 2-Fluorobiphenyl	*90 %*		*30-130*
Surrogate: 2-Fluorophenol	*92 %*		*30-130*
Surrogate: Nitrobenzene-d5	*83 %*		*30-130*
Surrogate: Phenol-d6	*94 %*		*30-130*
Surrogate: p-Terphenyl-d14	*101 %*		*30-130*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 25g
Final Volume: 1ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/20/25 18:32

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (12.2)	---	MADEP-EPH	---	1	JDN	01/21/25 23:13	D5A0369	DA52044
C19-C36 Aliphatics1	**18.6** (12.2)	---	MADEP-EPH	---	1	JDN	01/21/25 23:13	D5A0369	DA52044
C11-C22 Unadjusted Aromatics1	**32.7** (12.2)	---	EPH8270	---	1	DMC	01/21/25 23:39	D5A0359	DA52044
C11-C22 Aromatics1,2	**30.4** (12.4)	---	EPH8270	---		TJ	01/22/25 0:12	---	[CALC]
2-Methylnaphthalene	ND (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Acenaphthene	ND (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Naphthalene	ND (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Phenanthrene	**B 0.246** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Acenaphthylene	ND (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Anthracene	**0.040** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Benzo(a)anthracene	**0.164** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Benzo(a)pyrene	**0.174** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Benzo(b)fluoranthene	**0.172** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Benzo(g,h,i)perylene	**0.125** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Benzo(k)fluoranthene	**0.166** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Chrysene	**0.223** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Dibenzo(a,h)Anthracene	**0.057** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Fluoranthene	**0.504** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Fluorene	**0.016** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Indeno(1,2,3-cd)Pyrene	**0.106** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044
Pyrene	**0.373** (0.010)	---	EPH8270SIM	---	1	TJ	01/22/25 0:12	D5A0370	DA52044

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*76 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*99 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*95 %*		*40-140*
Surrogate: O-Terphenyl	*94 %*		*40-140*

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 19.7g
Final Volume: 5ml
Extraction Method: 3546

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: DMC
Prepared: 1/20/25 18:32

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4′-DDD	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
4,4′-DDE	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
4,4′-DDT	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Aldrin	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
alpha-BHC	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
alpha-Chlordane [2C]	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
beta-BHC	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Chlordane (Total)	ND (0.0248)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
delta-BHC	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Dieldrin	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Endosulfan I	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Endosulfan II	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Endosulfan Sulfate	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Endrin	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Endrin Ketone	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
gamma-BHC (Lindane)	ND (0.0019)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
gamma-Chlordane [2C]	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Heptachlor	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Heptachlor Epoxide	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Hexachlorobenzene	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005
Methoxychlor	ND (0.0031)	---	8081B	---	1	01/22/25 14:54	D5A0377	DA52005

	%Recovery	Qualifier	Limits
Surrogate: Decachlorobiphenyl	*63 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*58 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*78 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*62 %*		*30-150*

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82

ESS Laboratory Work Order: 25A0540
ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Percent Moisture	**18** (1)	---	2540G	---	1	CCP	01/20/25 18:20	%	DA52010
Total Organic Carbon (Average)	**3820** (500)	---	LK	---	1	CCP	01/23/25 13:13	mg/kg	[CALC]

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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2
Date Sampled: 01/16/25 13:44
Percent Solids: 82
Initial Volume: 30.1g
Final Volume: 2ml
Extraction Method: 3540C

ESS Laboratory Work Order: 25A0540

ESS Laboratory Sample ID: 25A0540-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: DMC
Prepared: 1/24/25 10:17

8082 Polychlorinated Biphenyls (PCB) / Congeners

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
BZ#8	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#18 [2C]	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#28	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#44	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#52 [2C]	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#66	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#101	**0.00078** (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#105	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#118	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#128 [2C]	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#138	**P, LC 0.00050** (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#153	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#170	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#180	**0.00047** (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#187	**0.00052** (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#195	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#206	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404
BZ#209	ND (0.00033)	---	8082A Cong	---	1	01/30/25 9:09	D5A0509	DA52404

	%Recovery	*Qualifier*	*Limits*
Surrogate: Tetrachloro-m-xylene	*70 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*72 %*		*30-150*

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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-1 - Oven Dried
Date Sampled: 01/16/25 13:05
Percent Solids: 100

ESS Laboratory Work Order: 25A0540
ESS Laboratory Sample ID: 25A0540-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	IV / FV	Batch
Arsenic	**9.51** (0.39)	---	6010D	---	1	KJB	01/22/25 11:40	5.16 100	DA52107
Cadmium	ND (0.10)	---	6010D	---	1	KJB	01/22/25 11:40	5.16 100	DA52107
Chromium	**11.3** (0.39)	---	6010D	---	1	KJB	01/22/25 11:40	5.16 100	DA52107
Copper	**8.50** (0.97)	---	6010D	---	1	KJB	01/22/25 11:40	5.16 100	DA52107
Lead	**11.6** (0.97)	---	6010D	---	1	KJB	01/22/25 11:40	5.16 100	DA52107
Mercury	**0.013** (0.010)	---	7471B	---	1	AFV	01/21/25 15:55	2.03 40	DA52109
Nickel	**8.82** (0.97)	---	6010D	---	1	KJB	01/22/25 11:40	5.16 100	DA52107
Zinc	**21.6** (0.97)	---	6010D	---	1	KJB	01/22/25 11:40	5.16 100	DA52107

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
Client Sample ID: SS-2 - OVEN DRIED
Date Sampled: 01/16/25 13:44
Percent Solids: 100

ESS Laboratory Work Order: 25A0540
ESS Laboratory Sample ID: 25A0540-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	IV / FV	Batch
Arsenic	**2.31** (0.39)	---	6010D	---	1	KJB	01/22/25 11:42	5.1 100	DA52107
Cadmium	ND (0.10)	---	6010D	---	1	KJB	01/22/25 11:42	5.1 100	DA52107
Chromium	**11.4** (0.39)	---	6010D	---	1	KJB	01/22/25 11:42	5.1 100	DA52107
Copper	**12.9** (0.98)	---	6010D	---	1	KJB	01/22/25 11:42	5.1 100	DA52107
Lead	**18.9** (0.98)	---	6010D	---	1	KJB	01/22/25 11:42	5.1 100	DA52107
Mercury	ND (0.009)	---	7471B	---	1	AFV	01/21/25 15:57	2.11 40	DA52109
Nickel	**6.93** (0.98)	---	6010D	---	1	KJB	01/22/25 11:42	5.1 100	DA52107
Zinc	**66.2** (0.98)	---	6010D	---	1	KJB	01/22/25 11:42	5.1 100	DA52107

ESS Laboratory
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BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch DA52107 - 3050B										
Blank										
Arsenic	ND	0.93	mg/kg wet							
Cadmium	ND	0.23	mg/kg wet							
Chromium	ND	0.93	mg/kg wet							
Copper	ND	2.34	mg/kg wet							
Lead	ND	2.34	mg/kg wet							
Nickel	ND	2.34	mg/kg wet							
Zinc	ND	2.34	mg/kg wet							
LCS										
Arsenic	147	3.28	mg/kg wet	151.0		98	80-120			
Cadmium	109	0.82	mg/kg wet	117.0		93	80-120			
Chromium	188	3.28	mg/kg wet	191.0		98	80-120			
Copper	40.6	8.20	mg/kg wet	45.90		89	80-120			
Lead	59.4	8.20	mg/kg wet	59.50		100	80-120			
Nickel	116	8.20	mg/kg wet	114.0		101	80-120			
Zinc	110	8.20	mg/kg wet	107.0		103	80-120			
LCS Dup										
Arsenic	160	3.33	mg/kg wet	151.0		106	80-120	8	30	
Cadmium	120	0.83	mg/kg wet	117.0		103	80-120	10	30	
Chromium	203	3.33	mg/kg wet	191.0		106	80-120	8	30	
Copper	44.2	8.33	mg/kg wet	45.90		96	80-120	8	30	
Lead	64.2	8.33	mg/kg wet	59.50		108	80-120	8	30	
Nickel	126	8.33	mg/kg wet	114.0		110	80-120	8	30	
Zinc	120	8.33	mg/kg wet	107.0		112	80-120	9	30	
Batch DA52109 - 245.1/7470A										
Blank										
Mercury	ND	0.032	mg/kg wet							
LCS										
Mercury	24.4	3.00	mg/kg wet	24.90		98	80-120			
LCS Dup										
Mercury	24.1	3.05	mg/kg wet	24.90		97	80-120	1	30	
Volatile Organics Low Level										
Batch DA52222 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DA52222 - 5035										
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0500	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0500	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0500	mg/kg wet							
Acetone	ND	0.0500	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0050	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DA52222 - 5035										
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0250	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0200	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0564*		mg/kg wet	*0.05000*		*113*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0482*		mg/kg wet	*0.05000*		*96*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0541*		mg/kg wet	*0.05000*		*108*	*70-130*			
Surrogate: Toluene-d8	*0.0507*		mg/kg wet	*0.05000*		*101*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	0.0538	0.0050	mg/kg wet	0.05000		108	70-130			
1,1,1-Trichloroethane	0.0566	0.0050	mg/kg wet	0.05000		113	70-130			
1,1,2,2-Tetrachloroethane	0.0510	0.0050	mg/kg wet	0.05000		102	40-160			
1,1,2-Trichloroethane	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
1,1-Dichloroethane	0.0560	0.0050	mg/kg wet	0.05000		112	70-130			
1,1-Dichloroethene	0.0598	0.0050	mg/kg wet	0.05000		120	70-130			
1,1-Dichloropropene	0.0556	0.0050	mg/kg wet	0.05000		111	70-130			
1,2,3-Trichlorobenzene	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
1,2,3-Trichloropropane	0.0486	0.0050	mg/kg wet	0.05000		97	70-130			
1,2,4-Trichlorobenzene	0.0548	0.0050	mg/kg wet	0.05000		110	70-130			
1,2,4-Trimethylbenzene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130			
1,2-Dibromo-3-Chloropropane	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
1,2-Dibromoethane	0.0529	0.0050	mg/kg wet	0.05000		106	70-130			
1,2-Dichlorobenzene	0.0499	0.0050	mg/kg wet	0.05000		100	70-130			

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Volatile Organics Low Level

Batch DA52222 - 5035

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
1,2-Dichloroethane	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
1,2-Dichloropropane	0.0551	0.0050	mg/kg wet	0.05000		110	70-130			
1,3,5-Trimethylbenzene	0.0537	0.0050	mg/kg wet	0.05000		107	70-130			
1,3-Dichlorobenzene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
1,3-Dichloropropane	0.0524	0.0050	mg/kg wet	0.05000		105	70-130			
1,4-Dichlorobenzene	0.0498	0.0050	mg/kg wet	0.05000		100	70-130			
1,4-Dioxane	1.00	0.100	mg/kg wet	1.000		100	70-130			
2,2-Dichloropropane	0.0576	0.0050	mg/kg wet	0.05000		115	70-130			
2-Butanone	0.291	0.0500	mg/kg wet	0.2500		117	40-160			
2-Chlorotoluene	0.0521	0.0050	mg/kg wet	0.05000		104	70-130			
2-Hexanone	0.249	0.0500	mg/kg wet	0.2500		99	40-160			
4-Chlorotoluene	0.0511	0.0050	mg/kg wet	0.05000		102	70-130			
4-Isopropyltoluene	0.0503	0.0050	mg/kg wet	0.05000		101	70-130			
4-Methyl-2-Pentanone	0.248	0.0500	mg/kg wet	0.2500		99	40-160			
Acetone	0.288	0.0500	mg/kg wet	0.2500		115	40-160			
Benzene	0.0549	0.0050	mg/kg wet	0.05000		110	70-130			
Bromobenzene	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			
Bromochloromethane	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
Bromodichloromethane	0.0576	0.0050	mg/kg wet	0.05000		115	70-130			
Bromoform	0.0534	0.0050	mg/kg wet	0.05000		107	40-160			
Bromomethane	0.0603	0.0100	mg/kg wet	0.05000		121	40-160			
Carbon Disulfide	0.0589	0.0050	mg/kg wet	0.05000		118	70-130			
Carbon Tetrachloride	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
Chlorobenzene	0.0520	0.0050	mg/kg wet	0.05000		104	70-130			
Chloroethane	0.0606	0.0100	mg/kg wet	0.05000		121	40-160			
Chloroform	0.0537	0.0050	mg/kg wet	0.05000		107	70-130			
Chloromethane	0.0522	0.0100	mg/kg wet	0.05000		104	40-160			
cis-1,2-Dichloroethene	0.0551	0.0050	mg/kg wet	0.05000		110	70-130			
cis-1,3-Dichloropropene	0.0570	0.0050	mg/kg wet	0.05000		114	40-160			
Dibromochloromethane	0.0564	0.0050	mg/kg wet	0.05000		113	40-160			
Dibromomethane	0.0540	0.0050	mg/kg wet	0.05000		108	70-130			
Dichlorodifluoromethane	0.0488	0.0100	mg/kg wet	0.05000		98	40-160			
Diethyl Ether	0.0575	0.0050	mg/kg wet	0.05000		115	70-130			
Di-isopropyl ether	0.0578	0.0050	mg/kg wet	0.05000		116	70-130			
Ethyl tertiary-butyl ether	0.0574	0.0050	mg/kg wet	0.05000		115	70-130			
Ethylbenzene	0.0550	0.0050	mg/kg wet	0.05000		110	70-130			
Hexachlorobutadiene	0.0513	0.0050	mg/kg wet	0.05000		103	40-160			
Isopropylbenzene	0.0611	0.0050	mg/kg wet	0.05000		122	70-130			
Methyl tert-Butyl Ether	0.0559	0.0050	mg/kg wet	0.05000		112	70-130			
Methylene Chloride	0.0523	0.0250	mg/kg wet	0.05000		105	70-130			
Naphthalene	0.0525	0.0050	mg/kg wet	0.05000		105	40-160			
n-Butylbenzene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
n-Propylbenzene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130			

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Volatile Organics Low Level

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch DA52222 - 5035										
sec-Butylbenzene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
Styrene	0.0493	0.0050	mg/kg wet	0.05000		99	40-160			
tert-Butylbenzene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130			
Tertiary-amyl methyl ether	0.0570	0.0050	mg/kg wet	0.05000		114	70-130			
Tetrachloroethene	0.0454	0.0050	mg/kg wet	0.05000		91	70-130			
Tetrahydrofuran	0.0505	0.0200	mg/kg wet	0.05000		101	70-130			
Toluene	0.0552	0.0050	mg/kg wet	0.05000		110	70-130			
trans-1,2-Dichloroethene	0.0576	0.0050	mg/kg wet	0.05000		115	70-130			
trans-1,3-Dichloropropene	0.0569	0.0050	mg/kg wet	0.05000		114	70-130			
Trichloroethene	0.0554	0.0050	mg/kg wet	0.05000		111	70-130			
Trichlorofluoromethane	0.0549	0.0050	mg/kg wet	0.05000		110	40-160			
Vinyl Chloride	0.0550	0.0100	mg/kg wet	0.05000		110	70-130			
Xylene O	0.0503	0.0050	mg/kg wet	0.05000		101	70-130			
Xylene P,M	0.102	0.0100	mg/kg wet	0.1000		102	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0501*		mg/kg wet	*0.05000*		*100*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0518*		mg/kg wet	*0.05000*		*104*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0503*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: Toluene-d8	*0.0498*		mg/kg wet	*0.05000*		*100*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0558	0.0050	mg/kg wet	0.05000		112	70-130	4	20	
1,1,1-Trichloroethane	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,1,2,2-Tetrachloroethane	0.0528	0.0050	mg/kg wet	0.05000		106	40-160	3	20	
1,1,2-Trichloroethane	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,1-Dichloroethane	0.0559	0.0050	mg/kg wet	0.05000		112	70-130	0.2	20	
1,1-Dichloroethene	0.0581	0.0050	mg/kg wet	0.05000		116	70-130	3	20	
1,1-Dichloropropene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	4	20	
1,2,3-Trichlorobenzene	0.0564	0.0050	mg/kg wet	0.05000		113	70-130	5	20	
1,2,3-Trichloropropane	0.0510	0.0050	mg/kg wet	0.05000		102	70-130	5	20	
1,2,4-Trichlorobenzene	0.0574	0.0050	mg/kg wet	0.05000		115	70-130	5	20	
1,2,4-Trimethylbenzene	0.0546	0.0050	mg/kg wet	0.05000		109	70-130	2	20	
1,2-Dibromo-3-Chloropropane	0.0530	0.0050	mg/kg wet	0.05000		106	70-130	6	20	
1,2-Dibromoethane	0.0553	0.0050	mg/kg wet	0.05000		111	70-130	4	20	
1,2-Dichlorobenzene	0.0524	0.0050	mg/kg wet	0.05000		105	70-130	5	20	
1,2-Dichloroethane	0.0536	0.0050	mg/kg wet	0.05000		107	70-130	2	20	
1,2-Dichloropropane	0.0557	0.0050	mg/kg wet	0.05000		111	70-130	1	20	
1,3,5-Trimethylbenzene	0.0551	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,3-Dichlorobenzene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
1,3-Dichloropropane	0.0545	0.0050	mg/kg wet	0.05000		109	70-130	4	20	
1,4-Dichlorobenzene	0.0522	0.0050	mg/kg wet	0.05000		104	70-130	5	20	
1,4-Dioxane	1.05	0.100	mg/kg wet	1.000		105	70-130	4	20	
2,2-Dichloropropane	0.0560	0.0050	mg/kg wet	0.05000		112	70-130	3	20	
2-Butanone	0.311	0.0500	mg/kg wet	0.2500		125	40-160	7	20	

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Volatile Organics Low Level

Batch DA52222 - 5035

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
2-Chlorotoluene	0.0527	0.0050	mg/kg wet	0.05000		105	70-130	1	20	
2-Hexanone	0.281	0.0500	mg/kg wet	0.2500		112	40-160	12	20	
4-Chlorotoluene	0.0526	0.0050	mg/kg wet	0.05000		105	70-130	3	20	
4-Isopropyltoluene	0.0509	0.0050	mg/kg wet	0.05000		102	70-130	1	20	
4-Methyl-2-Pentanone	0.258	0.0500	mg/kg wet	0.2500		103	40-160	4	20	
Acetone	0.332	0.0500	mg/kg wet	0.2500		133	40-160	14	20	
Benzene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130	1	20	
Bromobenzene	0.0536	0.0050	mg/kg wet	0.05000		107	70-130	6	20	
Bromochloromethane	0.0549	0.0050	mg/kg wet	0.05000		110	70-130	2	20	
Bromodichloromethane	0.0583	0.0050	mg/kg wet	0.05000		117	70-130	1	20	
Bromoform	0.0565	0.0050	mg/kg wet	0.05000		113	40-160	6	20	
Bromomethane	0.0573	0.0100	mg/kg wet	0.05000		115	40-160	5	20	
Carbon Disulfide	0.0570	0.0050	mg/kg wet	0.05000		114	70-130	3	20	
Carbon Tetrachloride	0.0546	0.0050	mg/kg wet	0.05000		109	70-130	3	20	
Chlorobenzene	0.0528	0.0050	mg/kg wet	0.05000		106	70-130	1	20	
Chloroethane	0.0578	0.0100	mg/kg wet	0.05000		116	40-160	5	20	
Chloroform	0.0536	0.0050	mg/kg wet	0.05000		107	70-130	0.1	20	
Chloromethane	0.0496	0.0100	mg/kg wet	0.05000		99	40-160	5	20	
cis-1,2-Dichloroethene	0.0551	0.0050	mg/kg wet	0.05000		110	70-130	0.07	20	
cis-1,3-Dichloropropene	0.0579	0.0050	mg/kg wet	0.05000		116	40-160	2	20	
Dibromochloromethane	0.0589	0.0050	mg/kg wet	0.05000		118	40-160	4	20	
Dibromomethane	0.0551	0.0050	mg/kg wet	0.05000		110	70-130	2	20	
Dichlorodifluoromethane	0.0453	0.0100	mg/kg wet	0.05000		91	40-160	7	20	
Diethyl Ether	0.0600	0.0050	mg/kg wet	0.05000		120	70-130	4	20	
Di-isopropyl ether	0.0588	0.0050	mg/kg wet	0.05000		118	70-130	2	20	
Ethyl tertiary-butyl ether	0.0593	0.0050	mg/kg wet	0.05000		119	70-130	3	20	
Ethylbenzene	0.0556	0.0050	mg/kg wet	0.05000		111	70-130	1	20	
Hexachlorobutadiene	0.0514	0.0050	mg/kg wet	0.05000		103	40-160	0.3	20	
Isopropylbenzene	0.0617	0.0050	mg/kg wet	0.05000		123	70-130	1	20	
Methyl tert-Butyl Ether	0.0583	0.0050	mg/kg wet	0.05000		117	70-130	4	20	
Methylene Chloride	0.0523	0.0250	mg/kg wet	0.05000		105	70-130	0	20	
Naphthalene	0.0557	0.0050	mg/kg wet	0.05000		111	40-160	6	20	
n-Butylbenzene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130	0.04	20	
n-Propylbenzene	0.0541	0.0050	mg/kg wet	0.05000		108	70-130	0.3	20	
sec-Butylbenzene	0.0506	0.0050	mg/kg wet	0.05000		101	70-130	0.3	20	
Styrene	0.0504	0.0050	mg/kg wet	0.05000		101	40-160	2	20	
tert-Butylbenzene	0.0543	0.0050	mg/kg wet	0.05000		109	70-130	1	20	
Tertiary-amyl methyl ether	0.0598	0.0050	mg/kg wet	0.05000		120	70-130	5	20	
Tetrachloroethene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130	18	20	
Tetrahydrofuran	0.0526	0.0200	mg/kg wet	0.05000		105	70-130	4	20	
Toluene	0.0549	0.0050	mg/kg wet	0.05000		110	70-130	0.5	20	
trans-1,2-Dichloroethene	0.0568	0.0050	mg/kg wet	0.05000		114	70-130	1	20	
trans-1,3-Dichloropropene	0.0589	0.0050	mg/kg wet	0.05000		118	70-130	4	20	

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics Low Level										
Batch DA52222 - 5035										
Trichloroethene	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	0.7	20	
Trichlorofluoromethane	0.0528	0.0050	mg/kg wet	0.05000		106	40-160	4	20	
Vinyl Chloride	0.0517	0.0100	mg/kg wet	0.05000		103	70-130	6	20	
Xylene O	0.0510	0.0050	mg/kg wet	0.05000		102	70-130	1	20	
Xylene P,M	0.103	0.0100	mg/kg wet	0.1000		103	70-130	1	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0504*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0499*		mg/kg wet	*0.05000*		*100*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0503*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: Toluene-d8	*0.0507*		mg/kg wet	*0.05000*		*101*	*70-130*			
Semi-Volatile Organic Compounds										
Batch DA52106 - 3546										
Blank										
1,1-Biphenyl	ND	0.025	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.250	mg/kg wet							
1,2-Dichlorobenzene	ND	0.250	mg/kg wet							
1,3-Dichlorobenzene	ND	0.250	mg/kg wet							
1,4-Dichlorobenzene	ND	0.250	mg/kg wet							
2,4,5-Trichlorophenol	ND	0.250	mg/kg wet							
2,4,6-Trichlorophenol	ND	0.250	mg/kg wet							
2,4-Dichlorophenol	ND	0.250	mg/kg wet							
2,4-Dimethylphenol	ND	0.250	mg/kg wet							
2,4-Dinitrophenol	ND	1.00	mg/kg wet							
2,4-Dinitrotoluene	ND	0.250	mg/kg wet							
2,6-Dinitrotoluene	ND	0.250	mg/kg wet							
2-Chloronaphthalene	ND	0.250	mg/kg wet							
2-Chlorophenol	ND	0.250	mg/kg wet							
2-Methylnaphthalene	ND	0.250	mg/kg wet							
2-Methylphenol	ND	0.250	mg/kg wet							
2-Nitrophenol	ND	0.500	mg/kg wet							
3,3´-Dichlorobenzidine	ND	0.250	mg/kg wet							
3+4-Methylphenol	ND	0.250	mg/kg wet							
4-Bromophenyl-phenylether	ND	0.250	mg/kg wet							
4-Chloroaniline	ND	0.250	mg/kg wet							
4-Nitrophenol	ND	1.00	mg/kg wet							
Acenaphthene	ND	0.250	mg/kg wet							
Acenaphthylene	ND	0.250	mg/kg wet							
Acetophenone	ND	0.250	mg/kg wet							
Aniline	ND	0.250	mg/kg wet							
Anthracene	ND	0.250	mg/kg wet							
Azobenzene	ND	0.250	mg/kg wet							
Benzo(a)anthracene	ND	0.250	mg/kg wet							

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
ESS Laboratory Work Order: 25A0540

Quality Control Data

Semi-Volatile Organic Compounds

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch DA52106 - 3546										
Benzo(a)pyrene	ND	0.250	mg/kg wet							
Benzo(b)fluoranthene	ND	0.250	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.250	mg/kg wet							
Benzo(k)fluoranthene	ND	0.250	mg/kg wet							
bis(2-Chloroethoxy)methane	ND	0.250	mg/kg wet							
bis(2-Chloroethyl)ether	ND	0.250	mg/kg wet							
bis(2-chloroisopropyl)Ether	ND	0.250	mg/kg wet							
bis(2-Ethylhexyl)phthalate	ND	0.250	mg/kg wet							
Butylbenzylphthalate	ND	0.250	mg/kg wet							
Chrysene	ND	0.250	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.250	mg/kg wet							
Dibenzofuran	ND	0.250	mg/kg wet							
Diethylphthalate	ND	0.250	mg/kg wet							
Dimethylphthalate	ND	0.250	mg/kg wet							
Di-n-butylphthalate	ND	0.250	mg/kg wet							
Di-n-octylphthalate	ND	0.500	mg/kg wet							
Fluoranthene	ND	0.250	mg/kg wet							
Fluorene	ND	0.250	mg/kg wet							
Hexachlorobenzene	ND	0.250	mg/kg wet							
Hexachlorobutadiene	ND	0.250	mg/kg wet							
Hexachloroethane	ND	0.250	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.250	mg/kg wet							
Isophorone	ND	0.250	mg/kg wet							
Naphthalene	ND	0.250	mg/kg wet							
Nitrobenzene	ND	0.250	mg/kg wet							
N-Nitrosodimethylamine	ND	0.250	mg/kg wet							
Pentachlorophenol	ND	1.00	mg/kg wet							
Phenanthrene	ND	0.250	mg/kg wet							
Phenol	ND	0.250	mg/kg wet							
Pyrene	ND	0.250	mg/kg wet							
Surrogate: 1,2-Dichlorobenzene-d4	*2.35*		mg/kg wet	*2.500*		*94*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*4.25*		mg/kg wet	*3.750*		*113*	*30-130*			
Surrogate: 2-Chlorophenol-d4	*3.68*		mg/kg wet	*3.750*		*98*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*2.50*		mg/kg wet	*2.500*		*100*	*30-130*			
Surrogate: 2-Fluorophenol	*3.72*		mg/kg wet	*3.750*		*99*	*30-130*			
Surrogate: Nitrobenzene-d5	*2.51*		mg/kg wet	*2.500*		*101*	*30-130*			
Surrogate: Phenol-d6	*3.62*		mg/kg wet	*3.750*		*97*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.80*		mg/kg wet	*2.500*		*112*	*30-130*			
LCS										
1,1-Biphenyl	2.26	0.025	mg/kg wet	2.500		90	40-140			
1,2,4-Trichlorobenzene	2.17	0.250	mg/kg wet	2.500		87	40-140			
1,2-Dichlorobenzene	2.11	0.250	mg/kg wet	2.500		84	40-140			

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Semi-Volatile Organic Compounds

Batch DA52106 - 3546

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
1,3-Dichlorobenzene	2.07	0.250	mg/kg wet	2.500		83	40-140			
1,4-Dichlorobenzene	2.01	0.250	mg/kg wet	2.500		81	40-140			
2,4,5-Trichlorophenol	2.35	0.250	mg/kg wet	2.500		94	30-130			
2,4,6-Trichlorophenol	2.25	0.250	mg/kg wet	2.500		90	30-130			
2,4-Dichlorophenol	2.15	0.250	mg/kg wet	2.500		86	30-130			
2,4-Dimethylphenol	2.24	0.250	mg/kg wet	2.500		90	30-130			
2,4-Dinitrophenol	1.96	1.00	mg/kg wet	2.500		78	15-140			
2,4-Dinitrotoluene	2.25	0.250	mg/kg wet	2.500		90	40-140			
2,6-Dinitrotoluene	2.27	0.250	mg/kg wet	2.500		91	40-140			
2-Chloronaphthalene	2.10	0.250	mg/kg wet	2.500		84	40-140			
2-Chlorophenol	2.12	0.250	mg/kg wet	2.500		85	30-130			
2-Methylnaphthalene	2.40	0.250	mg/kg wet	2.500		96	40-140			
2-Methylphenol	2.20	0.250	mg/kg wet	2.500		88	15-140			
2-Nitrophenol	2.13	0.500	mg/kg wet	2.500		85	30-130			
3,3´-Dichlorobenzidine	1.84	0.250	mg/kg wet	2.500		74	40-140			
3+4-Methylphenol	4.30	0.250	mg/kg wet	5.000		86	15-140			
4-Bromophenyl-phenylether	2.26	0.250	mg/kg wet	2.500		90	40-140			
4-Chloroaniline	1.48	0.250	mg/kg wet	2.500		59	15-140			
4-Nitrophenol	1.37	1.00	mg/kg wet	2.500		55	15-140			
Acenaphthene	2.25	0.250	mg/kg wet	2.500		90	40-140			
Acenaphthylene	2.21	0.250	mg/kg wet	2.500		88	40-140			
Acetophenone	2.06	0.250	mg/kg wet	2.500		82	40-140			
Aniline	1.29	0.250	mg/kg wet	2.500		52	40-140			
Anthracene	2.33	0.250	mg/kg wet	2.500		93	40-140			
Azobenzene	2.37	0.250	mg/kg wet	2.500		95	40-140			
Benzo(a)anthracene	2.37	0.250	mg/kg wet	2.500		95	40-140			
Benzo(a)pyrene	2.53	0.250	mg/kg wet	2.500		101	40-140			
Benzo(b)fluoranthene	2.28	0.250	mg/kg wet	2.500		91	40-140			
Benzo(g,h,i)perylene	2.24	0.250	mg/kg wet	2.500		89	40-140			
Benzo(k)fluoranthene	2.39	0.250	mg/kg wet	2.500		96	40-140			
bis(2-Chloroethoxy)methane	2.26	0.250	mg/kg wet	2.500		90	40-140			
bis(2-Chloroethyl)ether	1.91	0.250	mg/kg wet	2.500		77	40-140			
bis(2-chloroisopropyl)Ether	1.34	0.250	mg/kg wet	2.500		54	40-140			
bis(2-Ethylhexyl)phthalate	2.84	0.250	mg/kg wet	2.500		113	40-140			
Butylbenzylphthalate	2.77	0.250	mg/kg wet	2.500		111	40-140			
Chrysene	2.34	0.250	mg/kg wet	2.500		94	40-140			
Dibenzo(a,h)Anthracene	2.45	0.250	mg/kg wet	2.500		98	40-140			
Dibenzofuran	2.19	0.250	mg/kg wet	2.500		88	40-140			
Diethylphthalate	2.32	0.250	mg/kg wet	2.500		93	40-140			
Dimethylphthalate	2.23	0.250	mg/kg wet	2.500		89	15-140			
Di-n-butylphthalate	2.63	0.250	mg/kg wet	2.500		105	40-140			
Di-n-octylphthalate	3.08	0.500	mg/kg wet	2.500		123	40-140			
Fluoranthene	2.31	0.250	mg/kg wet	2.500		92	40-140			

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Semi-Volatile Organic Compounds										
Batch DA52106 - 3546										
Fluorene	2.19	0.250	mg/kg wet	2.500		88	40-140			
Hexachlorobenzene	2.19	0.250	mg/kg wet	2.500		87	40-140			
Hexachlorobutadiene	2.09	0.250	mg/kg wet	2.500		84	40-140			
Hexachloroethane	2.04	0.250	mg/kg wet	2.500		82	40-140			
Indeno(1,2,3-cd)Pyrene	2.35	0.250	mg/kg wet	2.500		94	40-140			
Isophorone	2.07	0.250	mg/kg wet	2.500		83	40-140			
Naphthalene	2.15	0.250	mg/kg wet	2.500		86	40-140			
Nitrobenzene	2.35	0.250	mg/kg wet	2.500		94	40-140			
N-Nitrosodimethylamine	2.11	0.250	mg/kg wet	2.500		85	40-140			
Pentachlorophenol	1.91	1.00	mg/kg wet	2.500		76	15-140			
Phenanthrene	2.25	0.250	mg/kg wet	2.500		90	40-140			
Phenol	1.81	0.250	mg/kg wet	2.500		72	15-140			
Pyrene	2.47	0.250	mg/kg wet	2.500		99	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	*2.21*		mg/kg wet	*2.500*		*88*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*3.86*		mg/kg wet	*3.750*		*103*	*30-130*			
Surrogate: 2-Chlorophenol-d4	*3.51*		mg/kg wet	*3.750*		*94*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*2.53*		mg/kg wet	*2.500*		*101*	*30-130*			
Surrogate: 2-Fluorophenol	*3.44*		mg/kg wet	*3.750*		*92*	*30-130*			
Surrogate: Nitrobenzene-d5	*2.58*		mg/kg wet	*2.500*		*103*	*30-130*			
Surrogate: Phenol-d6	*3.49*		mg/kg wet	*3.750*		*93*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.72*		mg/kg wet	*2.500*		*109*	*30-130*			
LCS Dup										
1,1-Biphenyl	2.07	0.025	mg/kg wet	2.500		83	40-140	9	30	
1,2,4-Trichlorobenzene	1.98	0.250	mg/kg wet	2.500		79	40-140	9	30	
1,2-Dichlorobenzene	1.90	0.250	mg/kg wet	2.500		76	40-140	10	30	
1,3-Dichlorobenzene	2.00	0.250	mg/kg wet	2.500		80	40-140	4	30	
1,4-Dichlorobenzene	1.97	0.250	mg/kg wet	2.500		79	40-140	2	30	
2,4,5-Trichlorophenol	2.23	0.250	mg/kg wet	2.500		89	30-130	5	30	
2,4,6-Trichlorophenol	2.08	0.250	mg/kg wet	2.500		83	30-130	8	30	
2,4-Dichlorophenol	1.96	0.250	mg/kg wet	2.500		79	30-130	9	30	
2,4-Dimethylphenol	1.98	0.250	mg/kg wet	2.500		79	30-130	12	30	
2,4-Dinitrophenol	2.12	1.00	mg/kg wet	2.500		85	15-140	8	30	
2,4-Dinitrotoluene	2.20	0.250	mg/kg wet	2.500		88	40-140	2	30	
2,6-Dinitrotoluene	2.25	0.250	mg/kg wet	2.500		90	40-140	0.8	30	
2-Chloronaphthalene	1.91	0.250	mg/kg wet	2.500		76	40-140	10	30	
2-Chlorophenol	2.01	0.250	mg/kg wet	2.500		80	30-130	5	30	
2-Methylnaphthalene	2.17	0.250	mg/kg wet	2.500		87	40-140	10	30	
2-Methylphenol	2.04	0.250	mg/kg wet	2.500		82	15-140	8	30	
2-Nitrophenol	1.86	0.500	mg/kg wet	2.500		75	30-130	13	30	
3,3´-Dichlorobenzidine	1.83	0.250	mg/kg wet	2.500		73	40-140	1	30	
3+4-Methylphenol	4.18	0.250	mg/kg wet	5.000		84	15-140	3	30	
4-Bromophenyl-phenylether	2.19	0.250	mg/kg wet	2.500		88	40-140	3	30	

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Semi-Volatile Organic Compounds

Batch DA52106 - 3546

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
4-Chloroaniline	1.24	0.250	mg/kg wet	2.500		50	15-140	18	30	
4-Nitrophenol	1.34	1.00	mg/kg wet	2.500		54	15-140	2	30	
Acenaphthene	2.07	0.250	mg/kg wet	2.500		83	40-140	8	30	
Acenaphthylene	2.04	0.250	mg/kg wet	2.500		82	40-140	8	30	
Acetophenone	1.97	0.250	mg/kg wet	2.500		79	40-140	4	30	
Aniline	1.16	0.250	mg/kg wet	2.500		46	40-140	11	30	
Anthracene	2.35	0.250	mg/kg wet	2.500		94	40-140	0.7	30	
Azobenzene	2.29	0.250	mg/kg wet	2.500		92	40-140	3	30	
Benzo(a)anthracene	2.36	0.250	mg/kg wet	2.500		94	40-140	0.5	30	
Benzo(a)pyrene	2.55	0.250	mg/kg wet	2.500		102	40-140	0.7	30	
Benzo(b)fluoranthene	2.20	0.250	mg/kg wet	2.500		88	40-140	4	30	
Benzo(g,h,i)perylene	2.22	0.250	mg/kg wet	2.500		89	40-140	0.6	30	
Benzo(k)fluoranthene	2.36	0.250	mg/kg wet	2.500		94	40-140	1	30	
bis(2-Chloroethoxy)methane	2.02	0.250	mg/kg wet	2.500		81	40-140	11	30	
bis(2-Chloroethyl)ether	1.81	0.250	mg/kg wet	2.500		72	40-140	6	30	
bis(2-chloroisopropyl)Ether	1.27	0.250	mg/kg wet	2.500		51	40-140	5	30	
bis(2-Ethylhexyl)phthalate	2.88	0.250	mg/kg wet	2.500		115	40-140	1	30	
Butylbenzylphthalate	2.73	0.250	mg/kg wet	2.500		109	40-140	1	30	
Chrysene	2.38	0.250	mg/kg wet	2.500		95	40-140	2	30	
Dibenzo(a,h)Anthracene	2.40	0.250	mg/kg wet	2.500		96	40-140	2	30	
Dibenzofuran	2.09	0.250	mg/kg wet	2.500		83	40-140	5	30	
Diethylphthalate	2.34	0.250	mg/kg wet	2.500		94	40-140	1	30	
Dimethylphthalate	2.16	0.250	mg/kg wet	2.500		86	15-140	3	30	
Di-n-butylphthalate	2.60	0.250	mg/kg wet	2.500		104	40-140	1	30	
Di-n-octylphthalate	3.06	0.500	mg/kg wet	2.500		123	40-140	0.6	30	
Fluoranthene	2.31	0.250	mg/kg wet	2.500		93	40-140	0.3	30	
Fluorene	2.14	0.250	mg/kg wet	2.500		86	40-140	2	30	
Hexachlorobenzene	2.13	0.250	mg/kg wet	2.500		85	40-140	2	30	
Hexachlorobutadiene	1.92	0.250	mg/kg wet	2.500		77	40-140	8	30	
Hexachloroethane	1.99	0.250	mg/kg wet	2.500		80	40-140	2	30	
Indeno(1,2,3-cd)Pyrene	2.30	0.250	mg/kg wet	2.500		92	40-140	2	30	
Isophorone	1.89	0.250	mg/kg wet	2.500		75	40-140	9	30	
Naphthalene	1.96	0.250	mg/kg wet	2.500		78	40-140	9	30	
Nitrobenzene	2.05	0.250	mg/kg wet	2.500		82	40-140	14	30	
N-Nitrosodimethylamine	2.05	0.250	mg/kg wet	2.500		82	40-140	3	30	
Pentachlorophenol	1.86	1.00	mg/kg wet	2.500		74	15-140	3	30	
Phenanthrene	2.21	0.250	mg/kg wet	2.500		88	40-140	2	30	
Phenol	1.80	0.250	mg/kg wet	2.500		72	15-140	0.5	30	
Pyrene	2.46	0.250	mg/kg wet	2.500		98	40-140	0.5	30	
Surrogate: 1,2-Dichlorobenzene-d4	*2.19*		mg/kg wet	*2.500*		*88*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*3.73*		mg/kg wet	*3.750*		*100*	*30-130*			
Surrogate: 2-Chlorophenol-d4	*3.25*		mg/kg wet	*3.750*		*87*	*30-130*			

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Semi-Volatile Organic Compounds										
Batch DA52106 - 3546										
Surrogate: 2-Fluorobiphenyl	*2.27*		mg/kg wet	*2.500*		*91*	*30-130*			
Surrogate: 2-Fluorophenol	*3.01*		mg/kg wet	*3.750*		*80*	*30-130*			
Surrogate: Nitrobenzene-d5	*2.22*		mg/kg wet	*2.500*		*89*	*30-130*			
Surrogate: Phenol-d6	*3.23*		mg/kg wet	*3.750*		*86*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.67*		mg/kg wet	*2.500*		*107*	*30-130*			
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DA52044 - 3546										
Blank										
C19-C36 Aliphatics1	ND	10.0	mg/kg wet							
C9-C18 Aliphatics1	ND	10.0	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.72*		mg/kg wet	*2.000*		*86*	*40-140*			
Blank										
C11-C22 Unadjusted Aromatics1	ND	10.0	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*1.99*		mg/kg wet	*2.000*		*100*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.92*		mg/kg wet	*2.000*		*96*	*40-140*			
Surrogate: O-Terphenyl	*2.01*		mg/kg wet	*2.000*		*101*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.008	mg/kg wet							
Acenaphthene	ND	0.008	mg/kg wet							
Acenaphthylene	ND	0.008	mg/kg wet							
Anthracene	ND	0.008	mg/kg wet							
Benzo(a)anthracene	ND	0.008	mg/kg wet							
Benzo(a)pyrene	ND	0.008	mg/kg wet							
Benzo(b)fluoranthene	ND	0.008	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.008	mg/kg wet							
Benzo(k)fluoranthene	ND	0.008	mg/kg wet							
Chrysene	ND	0.008	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.008	mg/kg wet							
Fluoranthene	ND	0.008	mg/kg wet							
Fluorene	ND	0.008	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.008	mg/kg wet							
Naphthalene	ND	0.008	mg/kg wet							
Phenanthrene	0.015	0.008	mg/kg wet							
Pyrene	ND	0.008	mg/kg wet							
LCS										
C19-C36 Aliphatics1	13.0	10.0	mg/kg wet	16.00		81	40-140			
C9-C18 Aliphatics1	8.1	10.0	mg/kg wet	12.00		68	40-140			
Surrogate: 1-Chlorooctadecane	*1.75*		mg/kg wet	*2.000*		*87*	*40-140*			

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DA52044 - 3546										
LCS										
C11-C22 Unadjusted Aromatics1	29.8	10.0	mg/kg wet	34.00		88	40-140			
Surrogate: 2-Bromonaphthalene	*1.87*		mg/kg wet	*2.000*		*93*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.82*		mg/kg wet	*2.000*		*91*	*40-140*			
Surrogate: O-Terphenyl	*2.03*		mg/kg wet	*2.000*		*102*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										
2-Methylnaphthalene	1.42	0.040	mg/kg wet	2.000		71	40-140			
Acenaphthene	1.38	0.040	mg/kg wet	2.000		69	40-140			
Acenaphthylene	1.45	0.040	mg/kg wet	2.000		72	40-140			
Anthracene	1.52	0.040	mg/kg wet	2.000		76	40-140			
Benzo(a)anthracene	1.44	0.040	mg/kg wet	2.000		72	40-140			
Benzo(a)pyrene	1.38	0.040	mg/kg wet	2.000		69	40-140			
Benzo(b)fluoranthene	1.36	0.040	mg/kg wet	2.000		68	40-140			
Benzo(g,h,i)perylene	1.41	0.040	mg/kg wet	2.000		71	40-140			
Benzo(k)fluoranthene	1.48	0.040	mg/kg wet	2.000		74	40-140			
Chrysene	1.54	0.040	mg/kg wet	2.000		77	40-140			
Dibenzo(a,h)Anthracene	1.42	0.040	mg/kg wet	2.000		71	40-140			
Fluoranthene	1.71	0.040	mg/kg wet	2.000		85	40-140			
Fluorene	1.55	0.040	mg/kg wet	2.000		78	40-140			
Indeno(1,2,3-cd)Pyrene	1.41	0.040	mg/kg wet	2.000		70	40-140			
Naphthalene	1.20	0.040	mg/kg wet	2.000		60	40-140			
Phenanthrene	1.41	0.040	mg/kg wet	2.000		70	40-140			
Pyrene	1.48	0.040	mg/kg wet	2.000		74	40-140			
LCS Dup										
C19-C36 Aliphatics1	13.8	10.0	mg/kg wet	16.00		86	40-140	6	25	
C9-C18 Aliphatics1	8.1	10.0	mg/kg wet	12.00		68	40-140	0.2	25	
Surrogate: 1-Chlorooctadecane	*1.82*		mg/kg wet	*2.000*		*91*	*40-140*			
LCS Dup										
C11-C22 Unadjusted Aromatics1	31.7	10.0	mg/kg wet	34.00		93	40-140	6	25	
Surrogate: 2-Bromonaphthalene	*1.95*		mg/kg wet	*2.000*		*98*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*1.88*		mg/kg wet	*2.000*		*94*	*40-140*			
Surrogate: O-Terphenyl	*2.13*		mg/kg wet	*2.000*		*107*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DA52044 - 3546										
2-Methylnaphthalene	1.49	0.040	mg/kg wet	2.000		75	40-140	5	30	
Acenaphthene	1.46	0.040	mg/kg wet	2.000		73	40-140	5	30	
Acenaphthylene	1.51	0.040	mg/kg wet	2.000		76	40-140	4	30	
Anthracene	1.66	0.040	mg/kg wet	2.000		83	40-140	9	30	
Benzo(a)anthracene	1.61	0.040	mg/kg wet	2.000		80	40-140	11	30	
Benzo(a)pyrene	1.55	0.040	mg/kg wet	2.000		77	40-140	11	30	
Benzo(b)fluoranthene	1.57	0.040	mg/kg wet	2.000		78	40-140	14	30	
Benzo(g,h,i)perylene	1.60	0.040	mg/kg wet	2.000		80	40-140	12	30	
Benzo(k)fluoranthene	1.64	0.040	mg/kg wet	2.000		82	40-140	11	30	
Chrysene	1.73	0.040	mg/kg wet	2.000		86	40-140	11	30	
Dibenzo(a,h)Anthracene	1.60	0.040	mg/kg wet	2.000		80	40-140	12	30	
Fluoranthene	1.93	0.040	mg/kg wet	2.000		96	40-140	12	30	
Fluorene	1.66	0.040	mg/kg wet	2.000		83	40-140	7	30	
Indeno(1,2,3-cd)Pyrene	1.59	0.040	mg/kg wet	2.000		80	40-140	12	30	
Naphthalene	1.25	0.040	mg/kg wet	2.000		62	40-140	4	30	
Phenanthrene	1.55	0.040	mg/kg wet	2.000		78	40-140	10	30	
Pyrene	1.64	0.040	mg/kg wet	2.000		82	40-140	10	30	
8081B Organochlorine Pesticides										
Batch DA52005 - 3546										
Blank										
4,4´-DDD	ND	0.0025	mg/kg wet							
4,4´-DDD [2C]	ND	0.0025	mg/kg wet							
4,4´-DDE	ND	0.0025	mg/kg wet							
4,4´-DDE [2C]	ND	0.0025	mg/kg wet							
4,4´-DDT	ND	0.0025	mg/kg wet							
4,4´-DDT [2C]	ND	0.0025	mg/kg wet							
Aldrin	ND	0.0025	mg/kg wet							
Aldrin [2C]	ND	0.0025	mg/kg wet							
alpha-BHC	ND	0.0025	mg/kg wet							
alpha-BHC [2C]	ND	0.0025	mg/kg wet							
alpha-Chlordane	ND	0.0025	mg/kg wet							
alpha-Chlordane [2C]	ND	0.0025	mg/kg wet							
beta-BHC	ND	0.0025	mg/kg wet							
beta-BHC [2C]	ND	0.0025	mg/kg wet							
Chlordane (Total)	ND	0.0200	mg/kg wet							
Chlordane (Total) [2C]	ND	0.0200	mg/kg wet							
delta-BHC	ND	0.0025	mg/kg wet							
delta-BHC [2C]	ND	0.0025	mg/kg wet							
Dieldrin	ND	0.0025	mg/kg wet							
Dieldrin [2C]	ND	0.0025	mg/kg wet							
Endosulfan I	ND	0.0025	mg/kg wet							

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch DA52005 - 3546										
Endosulfan I [2C]	ND	0.0025	mg/kg wet							
Endosulfan II	ND	0.0025	mg/kg wet							
Endosulfan II [2C]	ND	0.0025	mg/kg wet							
Endosulfan Sulfate	ND	0.0025	mg/kg wet							
Endosulfan Sulfate [2C]	ND	0.0025	mg/kg wet							
Endrin	ND	0.0025	mg/kg wet							
Endrin [2C]	ND	0.0025	mg/kg wet							
Endrin Ketone	ND	0.0025	mg/kg wet							
Endrin Ketone [2C]	ND	0.0025	mg/kg wet							
gamma-BHC (Lindane)	ND	0.0015	mg/kg wet							
gamma-BHC (Lindane) [2C]	ND	0.0015	mg/kg wet							
gamma-Chlordane	ND	0.0025	mg/kg wet							
gamma-Chlordane [2C]	ND	0.0025	mg/kg wet							
Heptachlor	ND	0.0025	mg/kg wet							
Heptachlor [2C]	ND	0.0025	mg/kg wet							
Heptachlor Epoxide	ND	0.0025	mg/kg wet							
Heptachlor Epoxide [2C]	ND	0.0025	mg/kg wet							
Hexachlorobenzene	ND	0.0025	mg/kg wet							
Hexachlorobenzene [2C]	ND	0.0025	mg/kg wet							
Methoxychlor	ND	0.0025	mg/kg wet							
Methoxychlor [2C]	ND	0.0025	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0111*		mg/kg wet	*0.01250*		*88*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0112*		mg/kg wet	*0.01250*		*90*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0115*		mg/kg wet	*0.01250*		*92*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0109*		mg/kg wet	*0.01250*		*88*	*30-150*			
LCS										
4,4´-DDD	0.0150	0.0025	mg/kg wet	0.01250		120	40-140			
4,4´-DDD [2C]	0.0147	0.0025	mg/kg wet	0.01250		117	40-140			
4,4´-DDE	0.0156	0.0025	mg/kg wet	0.01250		125	40-140			
4,4´-DDE [2C]	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
4,4´-DDT	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
4,4´-DDT [2C]	0.0135	0.0025	mg/kg wet	0.01250		108	40-140			
Aldrin	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
Aldrin [2C]	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
alpha-BHC	0.0135	0.0025	mg/kg wet	0.01250		108	40-140			
alpha-BHC [2C]	0.0136	0.0025	mg/kg wet	0.01250		109	40-140			
alpha-Chlordane	0.0135	0.0025	mg/kg wet	0.01250		108	40-140			
alpha-Chlordane [2C]	0.0133	0.0025	mg/kg wet	0.01250		107	40-140			
beta-BHC	0.0133	0.0025	mg/kg wet	0.01250		106	40-140			
beta-BHC [2C]	0.0130	0.0025	mg/kg wet	0.01250		104	40-140			
delta-BHC	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
delta-BHC [2C]	0.0136	0.0025	mg/kg wet	0.01250		108	40-140			

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch DA52005 - 3546										
Dieldrin	0.0151	0.0025	mg/kg wet	0.01250		121	40-140			
Dieldrin [2C]	0.0148	0.0025	mg/kg wet	0.01250		118	40-140			
Endosulfan I	0.0125	0.0025	mg/kg wet	0.01250		100	40-140			
Endosulfan I [2C]	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Endosulfan II	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
Endosulfan II [2C]	0.0138	0.0025	mg/kg wet	0.01250		110	40-140			
Endosulfan Sulfate	0.0134	0.0025	mg/kg wet	0.01250		107	40-140			
Endosulfan Sulfate [2C]	0.0135	0.0025	mg/kg wet	0.01250		108	40-140			
Endrin	0.0141	0.0025	mg/kg wet	0.01250		113	40-140			
Endrin [2C]	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
Endrin Ketone	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Endrin Ketone [2C]	0.0132	0.0025	mg/kg wet	0.01250		106	40-140			
gamma-BHC (Lindane)	0.0141	0.0015	mg/kg wet	0.01250		113	40-140			
gamma-BHC (Lindane) [2C]	0.0136	0.0015	mg/kg wet	0.01250		109	40-140			
gamma-Chlordane	0.0158	0.0025	mg/kg wet	0.01250		126	40-140			
gamma-Chlordane [2C]	0.0155	0.0025	mg/kg wet	0.01250		124	40-140			
Heptachlor	0.0132	0.0025	mg/kg wet	0.01250		106	40-140			
Heptachlor [2C]	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Heptachlor Epoxide	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
Heptachlor Epoxide [2C]	0.0138	0.0025	mg/kg wet	0.01250		111	40-140			
Hexachlorobenzene	0.0116	0.0025	mg/kg wet	0.01250		93	40-140			
Hexachlorobenzene [2C]	0.0111	0.0025	mg/kg wet	0.01250		89	40-140			
Methoxychlor	0.0127	0.0025	mg/kg wet	0.01250		102	40-140			
Methoxychlor [2C]	0.0127	0.0025	mg/kg wet	0.01250		102	40-140			
Surrogate: Decachlorobiphenyl	*0.0111*		mg/kg wet	*0.01250*		*89*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0113*		mg/kg wet	*0.01250*		*91*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0121*		mg/kg wet	*0.01250*		*97*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0115*		mg/kg wet	*0.01250*		*92*	*30-150*			
LCS Dup										
4,4´-DDD	0.0157	0.0025	mg/kg wet	0.01250		125	40-140	4	30	
4,4´-DDD [2C]	0.0153	0.0025	mg/kg wet	0.01250		122	40-140	4	30	
4,4´-DDE	0.0157	0.0025	mg/kg wet	0.01250		126	40-140	0.5	30	
4,4´-DDE [2C]	0.0141	0.0025	mg/kg wet	0.01250		113	40-140	2	30	
4,4´-DDT	0.0137	0.0025	mg/kg wet	0.01250		110	40-140	1	30	
4,4´-DDT [2C]	0.0133	0.0025	mg/kg wet	0.01250		106	40-140	1	30	
Aldrin	0.0140	0.0025	mg/kg wet	0.01250		112	40-140	0.9	30	
Aldrin [2C]	0.0141	0.0025	mg/kg wet	0.01250		113	40-140	2	30	
alpha-BHC	0.0137	0.0025	mg/kg wet	0.01250		109	40-140	1	30	
alpha-BHC [2C]	0.0138	0.0025	mg/kg wet	0.01250		111	40-140	2	30	
alpha-Chlordane	0.0137	0.0025	mg/kg wet	0.01250		109	40-140	0.9	30	
alpha-Chlordane [2C]	0.0135	0.0025	mg/kg wet	0.01250		108	40-140	1	30	
beta-BHC	0.0130	0.0025	mg/kg wet	0.01250		104	40-140	2	30	

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch DA52005 - 3546										
beta-BHC [2C]	0.0131	0.0025	mg/kg wet	0.01250		105	40-140	1	30	
delta-BHC	0.0129	0.0025	mg/kg wet	0.01250		103	40-140	2	30	
delta-BHC [2C]	0.0137	0.0025	mg/kg wet	0.01250		109	40-140	0.7	30	
Dieldrin	0.0152	0.0025	mg/kg wet	0.01250		122	40-140	0.8	30	
Dieldrin [2C]	0.0150	0.0025	mg/kg wet	0.01250		120	40-140	1	30	
Endosulfan I	0.0127	0.0025	mg/kg wet	0.01250		102	40-140	1	30	
Endosulfan I [2C]	0.0133	0.0025	mg/kg wet	0.01250		106	40-140	1	30	
Endosulfan II	0.0141	0.0025	mg/kg wet	0.01250		113	40-140	2	30	
Endosulfan II [2C]	0.0141	0.0025	mg/kg wet	0.01250		112	40-140	2	30	
Endosulfan Sulfate	0.0136	0.0025	mg/kg wet	0.01250		109	40-140	2	30	
Endosulfan Sulfate [2C]	0.0139	0.0025	mg/kg wet	0.01250		111	40-140	3	30	
Endrin	0.0142	0.0025	mg/kg wet	0.01250		114	40-140	0.4	30	
Endrin [2C]	0.0140	0.0025	mg/kg wet	0.01250		112	40-140	0.8	30	
Endrin Ketone	0.0135	0.0025	mg/kg wet	0.01250		108	40-140	3	30	
Endrin Ketone [2C]	0.0137	0.0025	mg/kg wet	0.01250		110	40-140	4	30	
gamma-BHC (Lindane)	0.0140	0.0015	mg/kg wet	0.01250		112	40-140	0.4	30	
gamma-BHC (Lindane) [2C]	0.0138	0.0015	mg/kg wet	0.01250		110	40-140	1	30	
gamma-Chlordane	0.0158	0.0025	mg/kg wet	0.01250		127	40-140	0.5	30	
gamma-Chlordane [2C]	0.0157	0.0025	mg/kg wet	0.01250		126	40-140	1	30	
Heptachlor	0.0132	0.0025	mg/kg wet	0.01250		105	40-140	0.4	30	
Heptachlor [2C]	0.0132	0.0025	mg/kg wet	0.01250		106	40-140	0.5	30	
Heptachlor Epoxide	0.0140	0.0025	mg/kg wet	0.01250		112	40-140	0.6	30	
Heptachlor Epoxide [2C]	0.0139	0.0025	mg/kg wet	0.01250		111	40-140	0.8	30	
Hexachlorobenzene	0.0117	0.0025	mg/kg wet	0.01250		94	40-140	1	30	
Hexachlorobenzene [2C]	0.0113	0.0025	mg/kg wet	0.01250		91	40-140	1	30	
Methoxychlor	0.0127	0.0025	mg/kg wet	0.01250		101	40-140	0.4	30	
Methoxychlor [2C]	0.0127	0.0025	mg/kg wet	0.01250		102	40-140	0.1	30	
Surrogate: Decachlorobiphenyl	*0.0112*		mg/kg wet	*0.01250*		*90*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0111*		mg/kg wet	*0.01250*		*89*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0118*		mg/kg wet	*0.01250*		*95*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0112*		mg/kg wet	*0.01250*		*90*	*30-150*			
Classical Chemistry										
Batch DA52143 - General Preparation										
Blank										
Total Organic Carbon (1)	ND	500	mg/kg							
Total Organic Carbon (2)	ND	500	mg/kg							
LCS										
Total Organic Carbon (1)	8880	500	mg/kg	10010		89	80-120			
Total Organic Carbon (2)	9080	500	mg/kg	10010		91	80-120			
LCS Dup										

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch DA52143 - General Preparation										
Total Organic Carbon (1)	9250	500	mg/kg	10010		92	80-120	4	25	
Total Organic Carbon (2)	9860	500	mg/kg	10010		99	80-120	8	25	
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DA52404 - 3540C										
Blank										
BZ#101	ND	0.00027	mg/kg wet							
BZ#101 [2C]	ND	0.00027	mg/kg wet							
BZ#105	ND	0.00027	mg/kg wet							
BZ#105 [2C]	ND	0.00027	mg/kg wet							
BZ#118	ND	0.00027	mg/kg wet							
BZ#118 [2C]	ND	0.00027	mg/kg wet							
BZ#128	ND	0.00027	mg/kg wet							
BZ#128 [2C]	ND	0.00027	mg/kg wet							
BZ#138	ND	0.00027	mg/kg wet							
BZ#138 [2C]	ND	0.00027	mg/kg wet							
BZ#153	ND	0.00027	mg/kg wet							
BZ#153 [2C]	ND	0.00027	mg/kg wet							
BZ#170	ND	0.00027	mg/kg wet							
BZ#170 [2C]	ND	0.00027	mg/kg wet							
BZ#18	ND	0.00027	mg/kg wet							
BZ#18 [2C]	ND	0.00027	mg/kg wet							
BZ#180	ND	0.00027	mg/kg wet							
BZ#180 [2C]	ND	0.00027	mg/kg wet							
BZ#187	ND	0.00027	mg/kg wet							
BZ#187 [2C]	ND	0.00027	mg/kg wet							
BZ#195	ND	0.00027	mg/kg wet							
BZ#195 [2C]	ND	0.00027	mg/kg wet							
BZ#206	ND	0.00027	mg/kg wet							
BZ#206 [2C]	ND	0.00027	mg/kg wet							
BZ#209	ND	0.00027	mg/kg wet							
BZ#209 [2C]	ND	0.00027	mg/kg wet							
BZ#28	ND	0.00027	mg/kg wet							
BZ#28 [2C]	ND	0.00027	mg/kg wet							
BZ#44	ND	0.00027	mg/kg wet							
BZ#44 [2C]	ND	0.00027	mg/kg wet							
BZ#52	ND	0.00027	mg/kg wet							
BZ#52 [2C]	ND	0.00027	mg/kg wet							
BZ#66	ND	0.00027	mg/kg wet							
BZ#66 [2C]	ND	0.00027	mg/kg wet							
BZ#8	ND	0.00027	mg/kg wet							
BZ#8 [2C]	ND	0.00027	mg/kg wet							

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DA52404 - 3540C										
Surrogate: Tetrachloro-m-xylene	*0.00270*		mg/kg wet	*0.003333*		*81*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00265*		mg/kg wet	*0.003333*		*79*	*30-150*			
LCS										
BZ#101	0.00351	0.00027	mg/kg wet	0.003333		105	40-140			
BZ#101 [2C]	0.00349	0.00027	mg/kg wet	0.003333		105	40-140			
BZ#105	0.00370	0.00027	mg/kg wet	0.003333		111	40-140			
BZ#105 [2C]	0.00360	0.00027	mg/kg wet	0.003333		108	40-140			
BZ#118	0.00316	0.00027	mg/kg wet	0.003333		95	40-140			
BZ#118 [2C]	0.00351	0.00027	mg/kg wet	0.003333		105	40-140			
BZ#128	0.00308	0.00027	mg/kg wet	0.003333		92	40-140			
BZ#128 [2C]	0.00336	0.00027	mg/kg wet	0.003333		101	40-140			
BZ#138	0.00337	0.00027	mg/kg wet	0.003333		101	40-140			
BZ#138 [2C]	0.00333	0.00027	mg/kg wet	0.003333		100	40-140			
BZ#153	0.00320	0.00027	mg/kg wet	0.003333		96	40-140			
BZ#153 [2C]	0.00315	0.00027	mg/kg wet	0.003333		94	40-140			
BZ#170	0.00331	0.00027	mg/kg wet	0.003333		99	40-140			
BZ#170 [2C]	0.00349	0.00027	mg/kg wet	0.003333		105	40-140			
BZ#18	0.00324	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#18 [2C]	0.00282	0.00027	mg/kg wet	0.003333		85	40-140			
BZ#180	0.00336	0.00027	mg/kg wet	0.003333		101	40-140			
BZ#180 [2C]	0.00350	0.00027	mg/kg wet	0.003333		105	40-140			
BZ#187	0.00317	0.00027	mg/kg wet	0.003333		95	40-140			
BZ#187 [2C]	0.00317	0.00027	mg/kg wet	0.003333		95	40-140			
BZ#195	0.00343	0.00027	mg/kg wet	0.003333		103	40-140			
BZ#195 [2C]	0.00342	0.00027	mg/kg wet	0.003333		103	40-140			
BZ#206	0.00334	0.00027	mg/kg wet	0.003333		100	40-140			
BZ#206 [2C]	0.00332	0.00027	mg/kg wet	0.003333		100	40-140			
BZ#209	0.00322	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#209 [2C]	0.00319	0.00027	mg/kg wet	0.003333		96	40-140			
BZ#28	0.00342	0.00027	mg/kg wet	0.003333		103	40-140			
BZ#28 [2C]	0.00321	0.00027	mg/kg wet	0.003333		96	40-140			
BZ#44	0.00318	0.00027	mg/kg wet	0.003333		95	40-140			
BZ#44 [2C]	0.00339	0.00027	mg/kg wet	0.003333		102	40-140			
BZ#52	0.00277	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#52 [2C]	0.00342	0.00027	mg/kg wet	0.003333		103	40-140			
BZ#66	0.00351	0.00027	mg/kg wet	0.003333		105	40-140			
BZ#66 [2C]	0.00334	0.00027	mg/kg wet	0.003333		100	40-140			
BZ#8	0.00334	0.00027	mg/kg wet	0.003333		100	40-140			
BZ#8 [2C]	0.00318	0.00027	mg/kg wet	0.003333		95	40-140			
Surrogate: Tetrachloro-m-xylene	*0.00274*		mg/kg wet	*0.003333*		*82*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00275*		mg/kg wet	*0.003333*		*83*	*30-150*			

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082 Polychlorinated Biphenyls (PCB) / Congeners										
Batch DA52404 - 3540C										
LCS Dup										
BZ#101	0.00348	0.00027	mg/kg wet	0.003333		104	40-140	1	30	
BZ#101 [2C]	0.00342	0.00027	mg/kg wet	0.003333		102	40-140	2	30	
BZ#105	0.00368	0.00027	mg/kg wet	0.003333		110	40-140	0.7	30	
BZ#105 [2C]	0.00369	0.00027	mg/kg wet	0.003333		111	40-140	2	30	
BZ#118	0.00334	0.00027	mg/kg wet	0.003333		100	40-140	5	30	
BZ#118 [2C]	0.00360	0.00027	mg/kg wet	0.003333		108	40-140	3	30	
BZ#128	0.00316	0.00027	mg/kg wet	0.003333		95	40-140	2	30	
BZ#128 [2C]	0.00352	0.00027	mg/kg wet	0.003333		106	40-140	5	30	
BZ#138	0.00338	0.00027	mg/kg wet	0.003333		101	40-140	0.2	30	
BZ#138 [2C]	0.00343	0.00027	mg/kg wet	0.003333		103	40-140	3	30	
BZ#153	0.00320	0.00027	mg/kg wet	0.003333		96	40-140	0.2	30	
BZ#153 [2C]	0.00302	0.00027	mg/kg wet	0.003333		91	40-140	4	30	
BZ#170	0.00356	0.00027	mg/kg wet	0.003333		107	40-140	7	30	
BZ#170 [2C]	0.00371	0.00027	mg/kg wet	0.003333		111	40-140	6	30	
BZ#18	0.00325	0.00027	mg/kg wet	0.003333		97	40-140	0.3	30	
BZ#18 [2C]	0.00302	0.00027	mg/kg wet	0.003333		91	40-140	7	30	
BZ#180	0.00352	0.00027	mg/kg wet	0.003333		106	40-140	5	30	
BZ#180 [2C]	0.00366	0.00027	mg/kg wet	0.003333		110	40-140	5	30	
BZ#187	0.00324	0.00027	mg/kg wet	0.003333		97	40-140	2	30	
BZ#187 [2C]	0.00333	0.00027	mg/kg wet	0.003333		100	40-140	5	30	
BZ#195	0.00365	0.00027	mg/kg wet	0.003333		110	40-140	6	30	
BZ#195 [2C]	0.00364	0.00027	mg/kg wet	0.003333		109	40-140	6	30	
BZ#206	0.00364	0.00027	mg/kg wet	0.003333		109	40-140	9	30	
BZ#206 [2C]	0.00359	0.00027	mg/kg wet	0.003333		108	40-140	8	30	
BZ#209	0.00341	0.00027	mg/kg wet	0.003333		102	40-140	6	30	
BZ#209 [2C]	0.00339	0.00027	mg/kg wet	0.003333		102	40-140	6	30	
BZ#28	0.00383	0.00027	mg/kg wet	0.003333		115	40-140	11	30	
BZ#28 [2C]	0.00315	0.00027	mg/kg wet	0.003333		94	40-140	2	30	
BZ#44	0.00340	0.00027	mg/kg wet	0.003333		102	40-140	7	30	
BZ#44 [2C]	0.00330	0.00027	mg/kg wet	0.003333		99	40-140	3	30	
BZ#52	0.00278	0.00027	mg/kg wet	0.003333		83	40-140	0.4	30	
BZ#52 [2C]	0.00340	0.00027	mg/kg wet	0.003333		102	40-140	0.7	30	
BZ#66	0.00368	0.00027	mg/kg wet	0.003333		110	40-140	5	30	
BZ#66 [2C]	0.00339	0.00027	mg/kg wet	0.003333		102	40-140	2	30	
BZ#8	0.00336	0.00027	mg/kg wet	0.003333		101	40-140	0.6	30	
BZ#8 [2C]	0.00337	0.00027	mg/kg wet	0.003333		101	40-140	6	30	
Surrogate: Tetrachloro-m-xylene	*0.00272*		mg/kg wet	*0.003333*		*81*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.00267*		mg/kg wet	*0.003333*		*80*	*30-150*			

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA
ESS Laboratory Work Order: 25A0540

Notes and Definitions

U	Analyte included in the analysis, but not detected
Q	Calibration required quadratic regression (Q).
P	Percent difference between primary and confirmation results exceeds 40% (P).
LC	Lower value is used due to matrix interferences (LC).
ICV-	Initial Calibration Verification recovery is below lower control limit (ICV-).
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
B	Present in Method Blank (B).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

ESS Laboratory
DIVISION OF THE RISE GROUP

BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Client Name: Thielsch Engineering, Inc.
Client Project ID: Route 38 Bridge Maple Meadow Brook Wilmington MA

ESS Laboratory Work Order: 25A0540

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Thielsch Engineering, Inc - ESS

Shipped/Delivered Via: Client

ESS Project ID: 25A0540
Date Received: 1/20/2025
Project Due Date: 1/27/2025
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 1.4 Iced with: Ice Pack
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? (Yes) / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered — Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: 1/10/25 Time: NIA By: Client

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted: Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	633575	Yes	N/A	Yes	8 oz jar	NP	
1	633576	Yes	N/A	Yes	8 oz jar	NP	
1	633577	Yes	N/A	Yes	8 oz jar	NP	
1	633581	Yes	N/A	Yes	4 oz. Jar	NP	
1	633583	Yes	N/A	Yes	VOA Vial	DI Water	
1	633584	Yes	N/A	Yes	VOA Vial	DI Water	
1	633587	Yes	N/A	Yes	VOA Vial	MeOH	
2	633578	Yes	N/A	Yes	8 oz jar	NP	
2	633579	Yes	N/A	Yes	8 oz jar	NP	
2	633580	Yes	N/A	Yes	8 oz jar	NP	
2	633582	Yes	N/A	Yes	4 oz. Jar	NP	
2	633585	Yes	N/A	Yes	VOA Vial	DI Water	
2	633586	Yes	N/A	Yes	VOA Vial	DI Water	
2	633588	Yes	N/A	Yes	VOA Vial	MeOH	

2nd Review
Were all containers scanned into storage/lab? Initials TD (Yes) / No
Are barcode labels on correct containers? Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / (NA)

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Thielsch Engineering, Inc - ESS

ESS Project ID: 25A0540

Date Received: 1/20/2025

Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: [signature] Date & Time: 1/20/25 1140.

Reviewed By: Date & Time: 1/20/25 1206

ESS LABORATORY
185 Frances Avenue
Cranston, RI 02910
Phone: 401-461-7181
Fax: 401-461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 25A0540 | Page 1 of 1

Turn Time (Days) ☐ > 5 ☑ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day
Regulatory State: MA **Criteria:** 401 WQ
Is this project for any of the following?: ☐ CT RCP ☐ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)
☑ Limit Checker ☐ State Forms ☐ EQuIS
☑ Excel ☐ State Upload ☐ Enviro Data
☐ CLP-Like Package ☐ Other (Specify) →

CLIENT INFORMATION

Client: Thielsch Engineering
Address: 195 Frances Avenue, Cranston, RI 01910
Phone: (401) 339-8020
Email Distribution List: ben@tgandbmarine.com, kroland@thielsch.com, cknight@thielsch.com, ofartushnaya@greenintl.com

PROJECT INFORMATION

Project Name: Route 38 Bridge over Maple Meadow Brook
Project Location: Wilmington, MA
Project Number: 74-25-0002.401
Project Manager: Camila Knight/Kris Roland
Bill to: CTS
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VOC	EPH w/PAH	Metals (As, Cd, Cr, Cu, Pb, Ni, Hg, Zn)	PCB Congeners	Total Organic Carbon	Percent Water	SVOC	Pesticides	Total Number of Bottles
1	1/16/25	1305	Grab/Composite	Soil	SS-1	X	X	X	X	X	X	X	X	7
2	1/16/25	1344	Grab/Composite	Soil	SS-2	X	X	X	X	X	X	X	X	7

Type text here

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

	V	AG	AG	AG	AG	AG	AG											
Container Volume:	7	10	10	10	10	10	10											14
Preservation Code:	6 10	1	1	1	1	1	1											

Sampled by : Mark Avakian

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): -1C
ice 1.4

Comments: * Please specify "Other" preservative and containers types in this space
Required HARD 5-day TAT. Sieves Analysis is being already performed by the CTS Laboratory.
8 Metals (As, Cd, Cr, Cu, Pb, Ni, Hg, Zn)
Vials were frozen on 1/16/25.

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration
☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
Camila Knight	1/20/25	1117	Mayor Davis				
Relinquished by (Signature)	**Date**	**Time**	**Received by (Signature)**	**Relinquished by (Signature)**	**Date**	**Time**	**Received by (Signature)**

Thielsch
DIVISION OF THE RISE GROUP

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
cts.thielsch.com
Let's Build a Solid Foundation

Client Information:		Project Information:	
TG&B Marine Services		**Route 38 Bridge Over Maple Meadow Brook**	
Monument Beach, MA		**Wilmington, MA**	
(508) 326-3686		Project Number:	7425-0002.401
Project Contact:	Camila Knight	Summary Page:	1 of 1
Collected By:	Mark Avakian	Report Date:	1/27/2025

LABORATORY TESTING DATA SHEET, Report No.: 7425-A-202

Material Source	Sample ID	Depth (ft)	Laboratory No.	Identification Tests									Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Rcvd Moisture Content %	LL %	PL %	OD LL	Gravel %	Sand %	Fines %	Org. %	pH	g_d MAX (pcf) W_{opt} (%)	g_d MAX (pcf) W_{opt} (%) (Corr.)	Dry unit wt. (pcf)	Test Moisture Content %	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318			D6913			D2974	D4792	D1557								
Onsite	SS-1	-	25-S-294	45.8				2.8	68.1	29.1											Dark Brown Organic silty sand
Onsite	SS-2	-	25-S-295	27.7				24.8	74.4	0.8											Dark Brown poorly graded sand with gravel

Date Received: **1/1/2025** Reviewed By: Date Reviewed: **1/27/2025**

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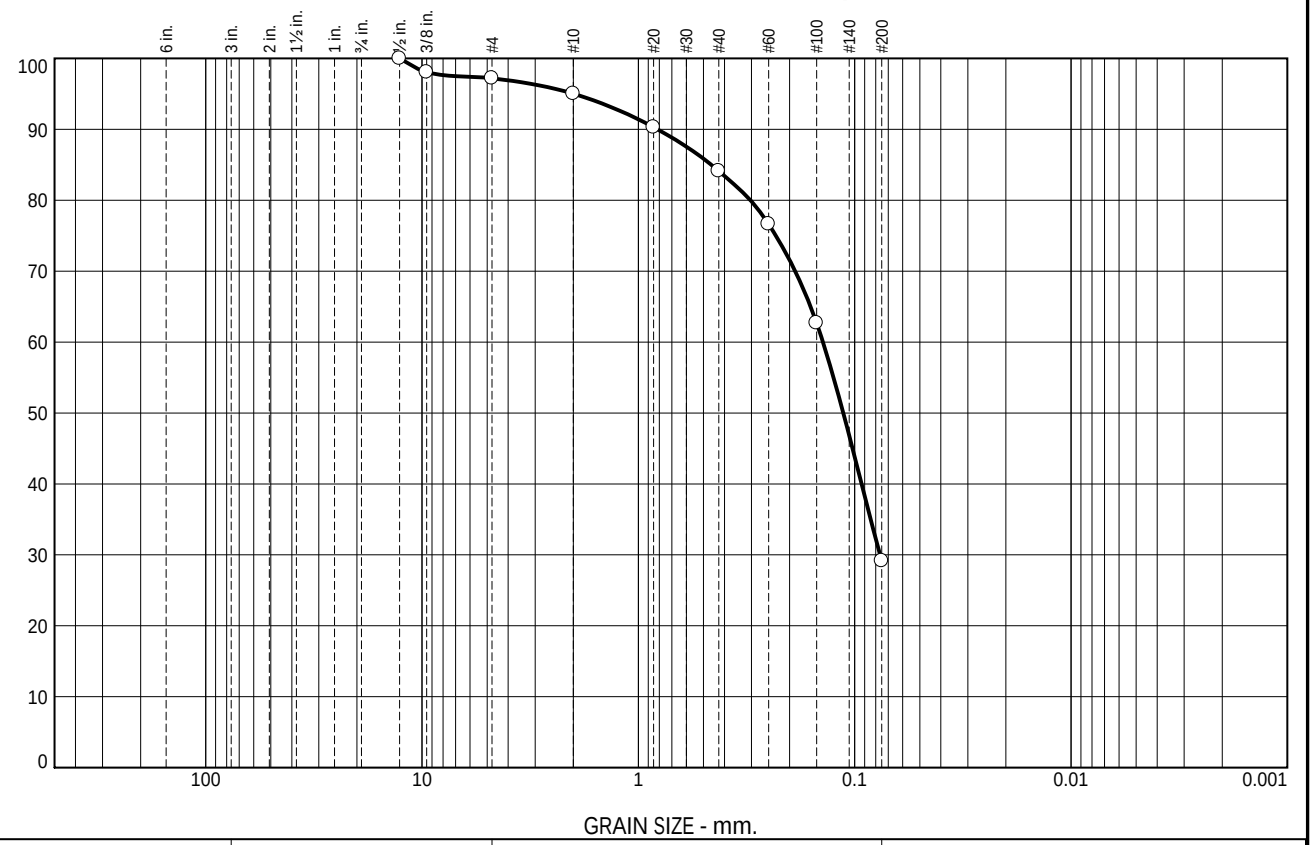
This report shall not be reproduced, except in full, without prior written approval from the Agency, as defined in ASTM E329.

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.8	2.2	10.9	55.0	29.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	98.1		
#4	97.2		
#10	95.0		
#20	90.3		
#40	84.1		
#60	76.6		
#100	62.7		
#200	29.1		

* (no specification provided)

Soil Description

Dark Brown Organic silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.8161 D_{85}= 0.4599 D_{60}= 0.1402
D_{50}= 0.1129 D_{30}= 0.0763 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Source of Sample: Onsite
Sample Number: SS-1

Date: 1/20/25

Thielsch Engineering Inc.

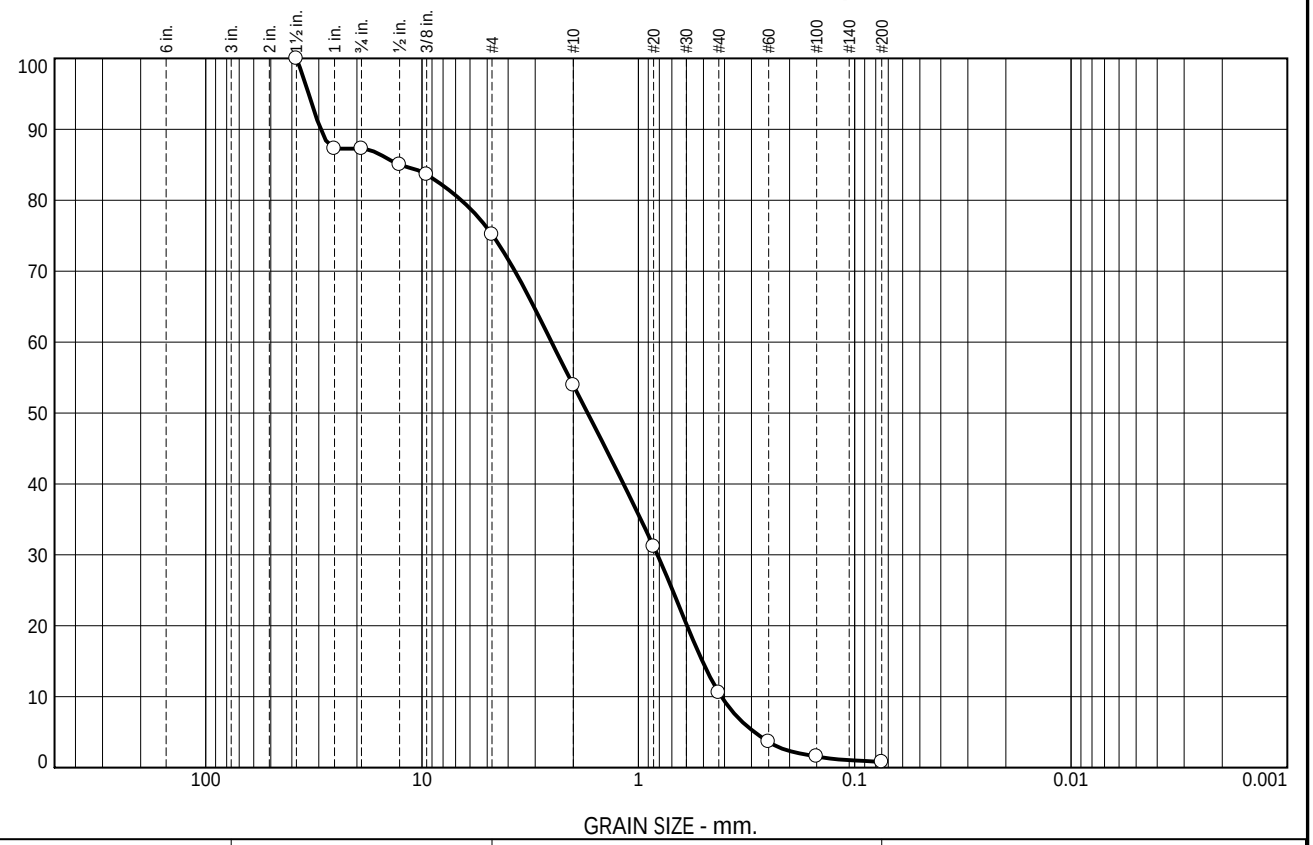
Cranston, RI

Client: TG&B Marine Services
Project: Route 38 Bridge over Maple Meadow Brook
Wilmington, MA
Project No: 74-25-0002.401 Fig. 25-S-294

Tested By: RB/MCS/SBR Checked By: Kris Roland

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.7	12.1	21.3	43.3	9.8	0.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	87.3		
3/4"	87.3		
1/2"	85.0		
3/8"	83.6		
#4	75.2		
#10	53.9		
#20	31.2		
#40	10.6		
#60	3.6		
#100	1.6		
#200	0.8		

* (no specification provided)

Soil Description

Dark Brown poorly graded sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 29.4055 D_{85}= 12.6121 D_{60}= 2.5187
D_{50}= 1.7163 D_{30}= 0.8158 D_{15}= 0.5059
D_{10}= 0.4133 C_u= 6.09 C_c= 0.64

Classification

USCS= SP AASHTO= A-1-b

Remarks

Sample received with standing water.

Source of Sample: Onsite
Sample Number: SS-2

Date: 1/20/25

Thielsch Engineering Inc.

Cranston, RI

Client: TG&B Marine Services
Project: Route 38 Bridge over Maple Meadow Brook
Wilmington, MA
Project No: 74-25-0002.401 Fig. 25-S-295

Tested By: RB/MCS/SBR Checked By: Kris Roland

Station SS-1

The area of the proposed station SS-1 was made up of mostly soft black muck on the surface to a depth of about six inches. After three attempts at the proposed location we decided to move towards the center of the channel. There were able to drive a sample to the required depth of eight feet.

Driving a vibrocore sample at SS-1

Photos

Station SS-1 0’ to 2’

SS-1 2’ to 4’

SS-1 4’ to 6’

SS-1 6’ to 7.2’

PID no detect

Station SS-2

The area of station SS-2 was all gravel and coarse sand on the surface. We probed the area with a length of 3/8” rebar and detected what appeared to be rocks under a 2” to 4” layer of this gravel and coarse sand. Because of the makeup of these sediments and the shallow depth we were not able to successfully collect a core sample. Instead, we took grab samples and deposited them directly into the sample jars. The location of this sample was taken in proximity to the proposed location of SS-2.

Station SS-2 0” to 4”

PID no detect

Construction Testing Services
195 Frances Avenue, Cranston RI
Tel. (401) 467-6454
cts.thielsch.com

SOIL ASSIGNMENT SHEET

Turnaround Time (please circle/highlight)

Standard	4-Day	3-Day	2-Day	1-Day
0%	25%	50%	75%	100%

TEI Project / Report #:

Company Name	Project Name
Thielsch/TG&B	Route 38 Bridge over Maple Meadow Brook
Contact Person	**Project Address**
Camila Knight	Wilmington MA
Company Address	**Project Number** / **PO/Proposal #**
	CTS-74-25.0002,401 /
Company City, State, Zip	**Telephone Number** / **Email Address**
	/

Boring	Sample ID	Depth (ft.)	Container Type	TEI Lab No.	% Water Content D2216	Atterberg Limits D4318	% Organic D2974	pH D4972	Sieve [WASHED] -200% D6913/C136	Hydrometer D7928	% Finer C1170	Specific Gravity T100	Modified Proctor D1557	Standard Proctor D698	Sand Permeability D2434	Clay Permeability D5084	CBR D1883	Direct Shear D3080 / D6528	Tube Density/Torvane D8121	Unconfined Compression D2166	Unconsolidated Undrained D2850	Consolidated Undrained D4767	Consolidated Drained D7181	Standard Consolidation D2435	End of Primary Consolidation D2435	* Notes
On-site	STS-1	2.3	Core liner		✓	✓			✓																	
↓	STS-2	3.1	↓		✓	✓			✓	✓						✓										
	STS-3	3.5			✓	✓			✓	✓						✓										
	STS-4	1.9			✓	✓			✓	✓						✓										

Sampled by:

***Specify Test Conditions (Project/Material Specification, Density and Moisture, Test Normal Loads, Test Confining Stresses, etc.):**

Preform ASTM D2166 on all samples

Comments:

Please notify CTS if there are project/material specifications your material needs to meet

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

ESS LABORATORY
185 Frances Avenue
Cranston, RI 02910
Phone: 401-461-7181
Fax: 401-461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab #	Page 1 of 1

Turn Time (Days) ☐ > 5 ☑ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day

Regulatory State: MA **Criteria:** 401 WQ

Is this project for any of the following?:
☐ CT RCP ☐ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)
☑ Limit Checker ☐ State Forms ☐ EQuIS
☑ Excel ☐ State Upload ☐ Enviro Data
☐ CLP-Like Package ☐ Other (Specify) →

CLIENT INFORMATION

Client: Thielsch Engineering
Address: 195 Frances Avenue, Cranston, RI 01910
Phone: (401) 339-8020
Email Distribution List: kroland@thielsch.com, cknight@thielsch.com, ofartushnaya@greenintl.com

PROJECT INFORMATION

Project Name: Route 38 Bridge over Maple Meadow Brook
Project Location: Wilmington, MA
Project Number:
Project Manager: Camila Knight/Kris Roland
Bill to: CTS
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VOC	EPH w/PAH	Metals (As, Cd, Cr, Cu, Pb, Ni, Hg, Zn)	PCB Congeners	Total Organic Carbon	Percent Water	SVOC	Pesticides								Total # of core tubes	~~Total Number of Bottles~~
	1/16/2024	10:05	Core	Soil	STS-1																1	
	1/16/2024	10:43	Core	Soil	STS-2																1	
	1/16/2024	09:40	Core	Soil	STS-3																1	
	1/16/2024	11:12	Core	Soil	STS-4																1	
Container Type:	AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial					V	AG	AG	AG	AG	AG	AG										
Container Volume:	1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*					7	10	10	10	10	10	10										
Preservation Code:	1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*					6 10	1	1	1	1	1	1										

Sampled by :

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): _____

Comments: * Please specify "Other" preservative and containers types in this space
Required HARD 5-day TAT. Sieves Analysis is being already performed by the CTS Laboratory.
8 Metals (As, Cd, Cr, Cu, Pb, Ni, Hg, Zn)

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration
☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)

ATTACHMENT F – SPECIAL PROVISIONS

ITEM 102.3 HERBICIDE TREATMENT OF INVASIVE PLANTS HOUR

This work must be performed by persons who meet the qualifications below and are approved by the Landscape Design Section.

Work under this item consists of herbicide treatment of invasive plants currently existing within the project limits and as directed. An Invasive Plant Management Strategy (IPMS) shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on-site. The IPMS shall be written and submitted per Item 102.33 Invasive Plant Management Strategy and shall be measured and paid for under that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Payment is per hour on-site and shall be compensation for a minimum crew of 2 licensed applicators, 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work. If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

Date and time stamped photos indicating start and stop time of work must be submitted if requested.

This item is not intended for manual removal of plants.

Management of plants determined to have been introduced to the site via imported loam, compost, mulch, plants, equipment, or other construction activities will be the Contractor's responsibility and at the Contractor's expense.

Herbicide shall be applied during daytime hours only.

Measures to prevent the introduction of invasive plant species to the site and to address introduction due to construction-related activities shall be covered under the Standard Specifications, Division I - Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this item shall be as determined in the field per the site walk and as specified in the IPMS.

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): "non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems."

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section may be contacted at: Tara.Mitchell@dot.state.ma.us.

QUALIFICATIONS

The applicators shall submit and meet the qualifications outlined below. A list of contractors specializing in invasive management and approved by MassDOT Landscape Design Section is available on the following website: https://www.mass.gov/lists/landscape-design-and-roadside-maintenance under Invasive Plant Management.

Requirements

1. Company must provide proof of qualifications by providing the following:
    a. Narrative describing company, its expertise and experience with invasive plant control.
    b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas.
    c. Describe company's technical qualifications and past performance.

2. Company must meet licensing requirements:
    a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
    b. At least one or more applicator must have a ROW certification, if required for work.
    c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
    d. Company must provide documentation of any warnings, penalties or fines received in the last three (3) years.

3. Company must provide proof of experience with invasive plant control and include following:
    a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
    b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
    c. Photo documentation of these projects.
    d. GPS coordinates of project locations, if available.

4. Crew leader must have expertise with invasive plant control and provide the following:
    a. Have held Core license for at least five (5) years.
    b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.

SUBMITTALS

No work shall begin without approval of the submittals.

Submittals include the following items:

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work done under this item shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide to the Engineer and the MassDOT Landscape Architect a completed and signed MassDOT Herbicide Use Report.

Photo Documentation

Digital photos with date and time of herbicide application work, showing start time and completion time, are required and must be submitted for measurement of payment upon request.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

METHODS

All methods used shall be as approved in the IPMS which shall be determined during the Initial Site Walk as described under Item 102.33 Invasive Plant Management Strategy.

The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

The Contractor shall notify the Engineer a minimum of 3 days prior to date of expected herbicide application. Applicators shall notify the Engineer upon arriving on-site and upon leaving the site.

Herbicide Applications

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

Contractor is responsible for any damage to vegetation not designated for removal or treatment. Vegetation damaged shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

Contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material must be approved by the Engineer and included in the IMPS.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

Where feasible, it is preferable to dispose of plants on-site or to bury them on-site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this item.

The Contractor shall be responsible for treating or otherwise managing areas of re-growth due to improper disposal. Treatment shall be at the Contractor's expense.

Follow-Up Treatment

Plants and areas shall be re-treated as necessary and as appropriate to the time of year. Treatment shall be for the duration of the contract and per the IPMS.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the Hour of verified crew time spent on the project doing herbicide application as and where specified herein and in the IPMS. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

BASIS OF PAYMENT

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment will be based upon verified time spent on the project doing herbicide application as and where specified in the IPMS and upon receipt and approval of submittals. Payment will not include travel time to and from the Contractor's place of business and nor time for investigative field trips.

If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

ITEM 102.33 INVASIVE PLANT MANAGEMENT STRATEGY HOUR
REV. 2023.03.01 *(REV. DATE TO BE REMOVED BY CONTRACTS)*

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants currently existing on the project site and/or as directed and shall be coordinated with Item 102.3 Herbicide Treatment of Invasive Plants. The IPMS shall be submitted for review and approval and the IPMS shall be implemented on-site.

Herbicide treatment for invasive plants shall be as described under Item 102.3 Herbicide Treatment of Invasive Plants and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation as relevant to the project.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control and submit qualifications as described below.

(a) QUALIFICATIONS

Individual shall be from the same company as that providing services for Item 102.3 Herbicide Treatment of Invasive Plants and shall submit the following, if not submitted under Item 102.3:

- Submit copy of current Core license.
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management.
- References shall be submitted if requested.

SUBMITTALS

Task Summary & Reports

For measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the tasks performed. At a minimum, the tasks shall include the Initial Site Walk, the IPMS Written Report, and if necessary to accommodate project or site changes, a Follow-up Site Inspection and accompanying IPMS Amendment.

Interim Site Monitoring Reports and/or a Final Report shall be submitted if requested by the MassDOT Landscape Design contact. The MassDOT Landscape Design contact must be notified to attend the final walk through when a Final Report has been requested.

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to construction activities and/or any proposed treatment, submit a written IPMS proposal for approval by the Engineer and MassDOT Landscape Architect. All chemicals and methods proposed shall be consistent with applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall be completed in coordination with the Roadway Contractor and the Engineer and shall include the following as appropriate to the project:

I. Project Information

a. Company writing IPMS and performing herbicide application.
b. Date of site walk
c. Attendees at site walk
d. Expected end date of contract and expected last treatment (month/season)

II. Brief Description of Conditions

a. Provide a free-hand sketch on construction plans or aerial image showing species, location, and as relevant, show or note extent of population as relevant to Strategy (i.e., population extends off ROW preventing eradication, small population and eradication deemed feasible within contract schedule, etc.).

III. Coordination with Roadway Contractor regarding other work

a. Tree Work: Note coordination to be implemented with tree removal, clearing, and clearing and grubbing as applicable to the project.
b. Wetland Mitigation - Include management proposed for wetland mitigation areas in the IPMS, if and as required.
c. Planting: If there will be planting in areas proposed for treatment, propose treatment and schedule to avoid herbicide damage to plants.
d. Mowing: If coordination is required with state mowers, note need in IPMS.

IV. Soil Management

a. Provide specifics on how soil with invasive plant roots (in particular) or seeds will be handled (i.e., separate stockpiles, plant material will be buried on-site, re-used on-site, disposed off site and if so, where?).
b. Show stockpile locations on plan and include treatment schedule.
c. Note measures that will be implemented to avoid spread through equipment, including how and where equipment will be cleaned.

V. Invasive Plant Treatment & Management

a. Proposed chemical and methods of treatment for each species or area.
b. Time of treatment based on target plant species.
c. Submit product label including application methods and rates (entire MSDS information need not be submitted if available online).
d. Proposed performance metrics or measure of treatment success if different from that specified under Item 102.3.
e. Method for disposing invasive plant material. This includes material that may result in spread (i.e., seeds, roots) and material that has been treated and/or is not viable (foliage, dead wood, etc.). Methods may include grinding in place, stockpiling and treating, and incinerating offsite.
f. Expected follow-up treatment for duration of contract.

VI. **Monitoring Schedule** if requested by MassDOT.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide an approved IPMS may jeopardize this item, in which case, the contractor will be responsible for management of invasive plants found on-site at no cost to the contract.

Photo Documentation

Digital photos with date and time verification shall be provided with the IPMS and with any follow-up monitoring or reporting.

METHODS

Initial Site Walk

Prior to any construction activities and soil disturbance, the Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect to determine the IPMS. During the site walk the Contractor shall identify limits of work and, as necessary, mark locations of areas designated for treatment and individual plants targeted for treatment or removal. The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

IPMS Follow-up Amendment

The IPMS may be amended to address additional concerns or adjust to conditions if required by the MassDOT Landscape Architect. The amended IPMS shall be submitted to the Engineer and MassDOT Landscape Architect for approval at least fourteen (14) days prior to any proposed treatment.

Interim Site Monitoring Inspection Reports

If required by the MassDOT Landscape Architect and Engineer, Interim Site Monitoring and an accompanying report shall be conducted.

Final Inspection

A final inspection and report documenting the status of the invasive control may be required for regulatory purposes or for instances where control will be continued by others. The report shall include photo documentation of pre-construction (existing) and post-treatment conditions, notations on a plan or aerial image of area treated, summary of treatment performed, and control achieved.

METHOD OF MEASUREMENT

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal.

BASIS OF PAYMENT

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment shall not include travel time to and from the Contractor's place of business.

ITEM 102.511 TREE PROTECTION – ARMORING AND PRUNING EACH

REV. 2024.11.22 (REV. DATE TO BE REMOVED BY CONTRACTS)

The work under this item shall conform to the relevant provisions of Sections 771 of the Standard Specifications and the following:

Tree protection – armoring and pruning shall be used for instances where construction activity (the use of heavy equipment), comes within proximity to potentially damage tree trunk(s) or limbs.

The work shall include the furnishing and installing of temporary tree trunk protection, minor limb pruning, or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities; as shown on the Drawings; and/or as required by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Material used for trunk armoring or mounting shall be such that installation and removal shall not damage the trunk.

Acceptable trunk armoring materials shall include two by four (2x4) wood cladding, mounted with wire or metal strapping, or when duration of construction activities is less than three months, slotted corrugated plastic pipe, mounted with duct tape. Eight (8) once untreated burlap shall be used to wrap the tree trunk prior to installation of cladding.

Alternative armoring methods or materials may be acceptable if approved by the Engineer.

The height of tree trunk cladding shall be measured from the base of the tree (including root flare) to the bottom of the first branch, or to a height of eight (8) feet, or as may be required by the Engineer.

METHODS OF WORK

Prior to construction activities, the Engineer, Contractor, and the Arborist (if item is included in the contract), shall review trees noted on the Drawings to be protected. Final decision and selection of trees to be armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be maintained such that it is effective for as long as required or replaced when materials are found to be damaged or ineffective, as determined by the Engineer. Replacement, if required, shall be incidental to the work. Armoring shall be removed immediately upon completion of work activities adjacent to the protected tree(s).

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

DAMAGES OR LOSS

If trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist, described in Item 102.55. The Arborist shall be approved by MassDOT.

If, based on the recommendation of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury; soil compaction remediation; pruning; soil injection fertilization; and/or watering; the damage shall be repaired as soon as possible, within the appropriate season for such work and according to industry standards.

If, based on the recommendation of the Arborist, the Engineer determines that damages are irreparable, or that the damages are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such tree removal(s), grinding, debris removal, and topsoil filling, shall be at the Contractor's expense.

Tree removal from improper or inadequate tree protection shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per EACH tree to be armored and pruned. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract or as required by the Engineer.

Payment for work under this item will be scheduled as follows:

- 40% of the value shall be paid upon installation of trunk armoring and completion of pruning work, if required.
- 60% of the value shall be paid at the end of construction operations that would potentially damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

No separate payment will be made for costs of remedial actions, including Arborist services, tree removal, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

ITEM 102.521 TREE AND PLANT PROTECTION FENCE FOOT

REV. 2024.11.19 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

The work under this Item shall conform to the relevant provisions of Sections 644 and 771 of the Standard Specifications and the following:

Work under this item shall consist of furnishing, installing, and maintaining tree and plant protection fence(s) in a vertical and taut position; removing and resetting fencing as may be required; and final

removal of protection fence(s) at the completion of construction activities, or as otherwise required by the Engineer.

The purpose of the fencing is to signify a construction work-free zone and physical barrier, thereby preventing damage to tree roots, tree trunks, soil, and all other vegetation within this delineated Tree and Plant Protection Zone (TPPZ), as shown on the Drawings, as required by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise required by the Engineer.

MATERIALS

Tree and plant protection fence(s) shall provide a minimum forty-eight (48) inch tall barrier, that remains vertical and taut. The Fence shall be orange plastic safety fence (recommended where high visibility is necessary), or wooden snow fencing, or other approved material. Posts and anchoring materials shall be incidental to the work.

Per requirements of the Engineer, additional posts, deeper post depths, and/or additional attachments shall be used if the fabric or fence sags, leans or otherwise is not providing visible or physical protection to the TPPZ.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this item.

ESTABLISHMENT OF THE TPPZ

Fencing shall be used to delineate and establish the TPPZ, adjacent to construction areas, staging areas, stockpile areas, as shown on the Drawings, and/or as required by the Engineer.

Fencing shall be located as close to the work zone limit and as far from tree trunk(s) and plants as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the drip line of each tree or as close as possible to the drip line, and/or as shown on the Drawings. The drip line is defined as the outermost limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer. Activities may including operating, moving, or storing equipment, supplies, or materials; and locating temporary facilities, including trailers or portable toilets, Accessing or traversing the TPPZ shall not be permitted.

METHOD OF WORK

TPPZ fencing shall be installed prior to any construction work or staging activities. Fence(s) shall be repositioned where and as necessary for optimum tree and plant protection. Repositioning shall be incidental to this item. TPPZ fencing shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance.

After construction activities are completed, or when required by the Engineer, fencing, stakes, and other anchoring materials, if any, shall be removed and disposed off-site by the Contractor.

REQUIRED WORK WITHIN THE TPPZ

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading; the use of six (6) inch depth of wood chips or approved matting for root protection; pruning of branches; and/or trunk protection. These protection measures shall be paid under applicable contract items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where handwork is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

TREE AND PLANT INJURY OR LOSS

If the TPPZ is encroached by construction activity without approval, at the discretion of the Engineer, the Contractor may be required to provide a more durable barrier (e.g., Jersey Barriers, chain link fence (if not already in use) to secure the area. Costs of furnishing and installing additional or more durable barrier(s) shall be borne by the Contractor.

In such cases of encroachment, soils shall be considered compacted and tree root injury will be assumed. Action shall be taken as specified below.

In the event that trees designated for protection under this item are injured, including root injury from unapproved trespassing onto the root zone, the Contractor shall, at his own expense, secure the services of an Arborist, described under Item 102.55. The Arborist shall be approved by MassDOT.

In the event of spills, compaction or injury, the Contractor shall take corrective action immediately using methods approved by the Engineer, in coordination with the Arborist.

If, based on the recommendations of the Arborist, the Engineer determines that injuries can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering; the injury shall be repaired as soon as possible, within the appropriate season for such work, and according to industry standards.

If, based on the recommendations of the Arborist, the Engineer determines that injuries are irreparable, or that the injuries are such that the tree is sufficiently compromised to pose a future safety hazard, the tree shall be removed. Tree removal shall include cleanup of all wood, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil. Such tree removal(s), grinding, debris removal, and filling, shall be at the Contractor’s expense.

Tree removal from improper or inadequate protection of the TPPZ shall result in the Engineer assessing the Contractor monetary damages consistent with industry standards for assessed value and/or replacement.

Shrubs removals from improper or inadequate protection of the TPPZ shall be replaced with plants of similar species and equal size or the largest size plants reasonably available. The Engineer shall approve the size, quality, and quantity of the replacement plant(s). Each replacement shall include a minimum of one year of watering and establishment care, specified under Section 771.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Tree and Plant Protection Fence will be measured by the FOOT, complete in place, by the length along the top of the fence.

Tree and plant protection fence will be paid for under the contract unit price per FOOT, complete in place and shall include all materials, labor, and equipment required to furnish, install, anchor, maintain, and remove the fence upon completion, as described herein. Posts, temporary footings, anchoring and removal upon completion, shall be incidental to this item.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, Arborist services, tree or plant removal, shrub replacement and establishment, but all costs in connection therewith shall be included in the Contract unit price bid.

Tree damages assessed, due to lack of or improper tree and plant protective measures being taken, shall be deducted from the contract price of the work.

Payment for work under this item will be scheduled as follows:

- Forty (40) percent of the value payment will be made upon installation of fencing.
- Sixty (60) percent of the value payment will be made when fencing materials have been maintained to function as specified, for the intended duration, and removed and disposed off-site at the completion of protection measure requirement.

ITEM 102.531 TREE CARE - PRUNING EACH

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

The work under this item shall conform to the relevant provisions of Sections 771 and shall be for when specialized or significant limb pruning is required. Pruning shall be to prevent injury to the tree from construction equipment and activities, pruning of dead limbs, and/or pruning for health and balance of the tree to mitigate impacts of construction activities on the root zone.

Trees to be pruned shall be those listed below.

258+25 Right

QUALIFICATIONS

Individuals performing the work must have, at a minimum, an ISA Certified Tree Worker or demonstrate equivalent training and experience. Certification shall be submitted to the Engineer for approval prior to work.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

METHODS OF WORK

Prior to construction activities, the Engineer, the Contractor, and the Arborist shall review trees noted on the plans and listed herein to be pruned. Final decision as to trees pruned shall be per the Engineer.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.531 will be measured and paid at the contract unit price per Each. This will include full compensation for all labor, equipment, tools, materials, and incidentals for the satisfactory completion of the work.

ITEM 102.522 TREE AND PLANT PROTECTION FENCE - CHAIN LINK FOOT

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

The work under this Item shall conform to the relevant provisions of Sections 644 and 771 of the Standard Specifications and the following:

Work under this item consists of furnishing, installing, removing and resetting, maintaining fence in a vertical and effective position at all times, and final removal of temporary fence.

The purpose of the fence is to prevent damage to tree roots, tree trunks, soil, and all other vegetation within a delineated Tree and Plant Protection Zone (TPPZ) as shown on the plans, as directed by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise directed.

MATERIALS

Chain Link Fence shall be six-foot tall metal chain link set in metal frame panels on movable core drilled concrete blocks of sufficient size to hold the fence erect in areas of existing paving to remain.

Panels shall be such that they create a barrier to encompass the entire root zone area to the extent possible.

Unless otherwise indicated, the following types of chain link fence are acceptable:

- New materials or previously used salvaged chain link fencing in good condition, subject to inspection and approval by the Engineer.
- Posts: Galvanized steel pipe of diameter to provide rigidity.
- Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this item.

ESTABLISHMENT OF TPPZ

Fencing shall be used for construction areas, staging areas, and stockpile areas as shown on the plans and as directed by the Engineer to establish the Tree and Plant Protection Zone (TPPZ).

Fence shall be located as close to the work zone limit and as far from the trunk as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the Drip Line of each tree

or as close as possible to the Drip Line, and as shown on the plans and details. The Drip Line is defined as the limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer, including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets; and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks.

METHOD OF WORK

Fence shall be installed prior to any construction work or staging activities and shall be installed and maintained in a vertical and effective position at all times.

Fence shall be repositioned where and as necessary for optimum effectiveness. Repositioning shall be incidental to this item. Fence shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance.

After construction activities are completed, or when directed by the Engineer, fence, stakes, and other materials shall be removed and disposed off-site by the Contractor.

REQUIRED WORK WITHIN THE TPPZ

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading, the use of six-inch depth of wood chips or approved matting for root protection, pruning of branches, and/or trunk protection. These protection measures will be paid under applicable items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where hand work is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

TREE AND PLANT DAMAGES OR LOSS

If the TPPZ is intruded upon, at the discretion of the Engineer, the Contractor will be required to provide a more durable barrier (e.g., Jersey Barriers) to secure the area. Cost of furnishing and installing additional or more durable barrier shall be borne by the Contractor.

If the Contractor intrudes into a TPPZ without approval, soil will be considered compacted and tree root damage will be assumed. Action will be taken as specified below.

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

ITEM 755.35 INLAND WETLAND REPLICATION AREA LUMP SUM

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

The work under this item shall conform to the relevant provisions of Sections 120, 770, 771 of the Standard Specifications and the following:

Work under this item shall include furnishing material and the construction and maintenance of inland wetland replication areas as shown on the drawings and as required by the Engineer. Inland Wetland Replication Area shall hereafter be referred to as Replication Area. All work shall be in coordination with an approved Wetland Specialist as specified under that item.

Wetland Restoration work shall be as specified and compensated under that item. Construction of tidal wetlands shall be as specified under the appropriate item for tidal wetland mitigation.

The Replication Area shall be constructed prior to wetland impacts unless otherwise approved by the Engineer, specified herein, or specified in permit conditions and approvals. Construction schedule shall be appropriate to planting and seeding season (see below). Changes to this schedule will require written approval from the Engineer.

DESCRIPTION OF WORK

Construction of the Replication Area shall be completed as shown on the drawings at the following location(s):

Area/s A at Station: ***256+50*** Area = ***3,510*** sf.

Replication Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers Permit.

The Contractor is responsible for protection and preservation of natural areas adjacent to the Replication Area both within and outside the project limits and for the duration of the Contract; including but not limited to damage to soils or vegetation due to erosion, sedimentation, compaction, trampling, vehicles, storage of materials, or other negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

The Wetland Specialist overseeing the Wetland Replication construction work shall not be from the same company as that which is performing planting, seeding, or participating in any aspect of the Wetland Replication construction.

SUBMITTALS - DOCUMENTS

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): As specified below, shall be submitted to the Engineer for distribution to appropriate regulatory agencies.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.75 and 755.76.

SUBMITTALS - MATERIAL

Soil and Amendments

No soil, compost, or other soil amendment imported to the work site shall contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants.

At least sixty (60) days prior to installation and prior to ordering, the Contractor shall submit for approval sources of soil, compost, and amendments. Submittal shall include the supplier and location of the source. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Samples of tested and approved wetland soil and soil amendments for soil texture, organic carbon content or other routine soil analysis parameters (e.g., pH, Cation Exchange Capacity, Percent Base Saturation) and Soil Organic Matter Analysis will be required if requested by the Engineer. The grab samples shall be collected by the Contractor or Wetland Specialist from multiple representative locations in the wetland topsoil mix following the "Umass Soil and Plant Tissue Testing Laboratory Sampling and Collection Protocols" (or equivalent certification paperwork provided by the soil supplier). The lab analysis shall be provided to the Engineer along with written certification from the Contractor or Wetland Specialist that the wetland topsoil was collected per the referenced protocol and meets the desired specification. The analysis and written certification of same shall be provided to the Engineer prior to placing the wetland topsoil in the Replication Area.

Seed Mix

Certificate of Materials from the supplier shall be submitted 30 days prior to seeding and must be approved prior to ordering materials. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

Bill of lading or notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Plant Certification

Plant Certification shall be per the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications. The nursery source shall certify the provenance or origin of all plants.

Other Material: Submittals shall be per the respective item.

MATERIALS

Sediment Control Barrier and Erosion Prevention Measures
Sediment control barriers shall be per Item 767.121.

Erosion prevention measures for disturbed areas adjacent to the Replication Area shall include but not necessarily be limited to compost blankets, jute mesh, seeding, and/or combinations thereof as approved by the Engineer.

Sediment controls and erosion prevention devices and measures shall be compensated under the respective items.

Wetland Soil

Soil appropriate for the Replication Area may be either hydric soil excavated from the impacted wetland, a manufactured mix of compost and on-site borrow, or a combination thereof, as approved by the Engineer.

Hydric soil from the impacted wetland area may be spread on the surface of the constructed Replication Area as an inoculant or can be placed in a bulk fashion in a roughly 1:1 ratio of area and depth. Soil shall be handled such that the original soil structure is preserved and shall not be compacted, screened, or otherwise processed.

Hydric soil from the impacted wetland that is infested with invasive plant species identified on the Massachusetts Invasive Plant Advisory Group (MIPAG) shall not be used in the Replication Area unless approved by the Wetland Specialist and Engineer. To the extent possible, infested soil shall be disposed of within the project limits in an upland area outside of regulated areas and as approved by the Invasive Plant Management Strategy item (if in the contract) or by the Engineer.

A manufactured mix suitable for wetlands shall consist of on-site borrow from the proposed Replication Area (if approved by the Wetland Specialist and Engineer) thoroughly mixed with compost to achieve a target organic carbon content of 10-12% (up to 21% percent organic matter) by dry weight. The organic material used for mixing shall be well or partially decomposed. Clean leaf compost is the preferred soil amendment to achieve these standards though other materials may be used if approved by the Wetland Specialist and Engineer. Note that “clean” refers both to a negligible amount (<1%) of physical contaminants such as plastic and to the lack of chemical contaminants that might pose a hazard to plants or animals. Off-site borrow may be used for mixing if approved in advance by the Engineer.

No soil or soil amendment shall be brought on site without approval of the material source by the Wetland Specialist and the Engineer. Soils used in the replacement area shall be free of rocks greater than 4 inches in diameter.

Plants

Plant material shall conform to the applicable requirements of Section 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the latest edition of the Standard Specifications and as amended below.

Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion.

Plant species and sizes to be included in the Replication Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the Wetland Specialist, MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries that have been inspected by state and/or federal agencies.

Seed Mix

Seeding shall conform to the Standard Specifications Section M6, ROADSIDE DEVELOPMENT MATERIALS.

Mix 765.551 Wetland Mix – FACW Meadow Mix

Botanical Name	Common Name	% PLS by Weight
Grass		
Carex vulpinoidea	Fox Sedge	26.00%
Elymus riparius	Riverbank Wild Rye	23.00%
Carex lurida	Shallow Sedge	17.00%
Carex lupulina	Hop Sedge	8.00%
Scirpus atrovirens	Green Bulrush	3.00%
Juncus effusus	Soft Rush	2.50%
Cinna arundinacea	Sweet Woodreed	2.00%
Carex comosa	Bearded Sedge	2.00%
Glyceria canadensis	Manna Grass	1.00%
Scirpus cyperinus	Woolgrass	1.00%
Juncus tenuis	Path Rush	0.50%
		86.00%
Herb/Forb		
Verbena hastata	Blue Vervain	4.00%
Asclepias incarnata	Swamp Milkweed	2.00%
Aster prenanthoides	Zig Zag Aster	1.00%
Sisyrinchium angustifolium	Narrowleaf blue-eyed grass	1.00%
Eupatorium maculatum	Joe-pye Weed	1.00%
Aster puniceus	Aster - Swamp	1.00%
Aster novae-angliae	New England Aster	1.00%
Vernonia noveboracensis	New York Ironweed	1.00%
Eupatorium perfoliatum	Boneset	1.00%
Aster umbellatus	Flat Topped White Aster	0.50%
Mimulus ringens	Monkey Flower	0.50%
		14.00%
		100.00%

Seeding Rate

Apply this mix at 20 lbs PLS/acre on areas of less than 3:1 slope and 60 lbs PLS on areas of greater than 3:1 slope.

Cover Crop: Add 30 lbs/acre of either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding item.

Fertilizers shall not be used.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

Mulch/Topdressing for Seeding

Hydromulch shall be per the manufacturer's recommendations and shall be wood fiber or straw mulch only. Compost topdressing, if used, shall meet the material and submittal requirements of that Item and shall be applied as specified below. Mulch or compost topdressing for seeding shall be incidental to this item.

CONSTRUCTION METHODS & SEQUENCE

SITE PROTECTION MEASURES

Minimizing Damage

The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into Replication Area and nearby resource areas.

Construction of and access to the Replication Area shall minimize damage to existing vegetation and soils as specified herein. Damage to soils or vegetation shall be repaired to the satisfaction of the Engineer and at the Contractor's expense. If required for soil remediation, tilling and the addition of compost shall be at the Contractor's expense.

The Contractor shall use boards, mats, or other approved material as necessary, to protect existing and/or new wetlands from compaction due to heavy foot traffic or if equipment is required to travel over wetland soil. All labor and materials required for protection and preservation of site shall be incidental to this item.

Stockpiling of Soil

Stockpiling of soil, including hydric soil for replication, shall be outside the wetland resource area and at least 100 feet from the edge of the wetland unless approved otherwise by the Engineer. Stockpiled soils shall be securely stabilized and contained. In the event that there is excess borrow, it shall be disposed of under Excavation, Item 120.1.

Sediment Barriers

Placement: Sediment barriers shall be installed along the downslope perimeter of the Replication Area beginning and ending in the surrounding upland so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Where construction work is immediately upgradient of the wetland, barriers shall be located so as to protect the Replication Area until slopes are stabilized. Sediment barriers shall be in place and approved by the Engineer prior to excavation work. No work shall take place outside the barriers.

Maintenance: The Contractor shall ensure that all sediment barriers function as intended and at all times per the specifications of those respective items.

Existing Trees to Remain

Tree protection shall be per the relevant specifications and as shown on the plans or as required by the Engineer. To protect root systems of existing trees to remain, the limits of the Replication Area may be adjusted, but, the total area of replication required by the permits shall not be reduced. Access route may be adjusted as required.

Trees to be retained as snags (upright dead or dying trees left for wildlife habitat) within or adjacent to the Replication Area shall be as shown on the plans or as directed by the Wetland Specialist or Landscape Architect during the initial site walk. Trees to remain as snags shall be clearly marked prior to clearing. Trees that pose a potential fall hazard (i.e., are near a roadway) should have limbs and trunk cut such that the tree does not pose a fall hazard.

Coarse woody debris in the form of cut trees, stumps, logs, and brush shall be incorporated as shown on the plans or as directed by the Wetland Specialist or Landscape Architect. On site material shall be selected and marked by the Wetland Specialist, retained on the project site, and placed as specified below under Incorporation of Coarse Woody Debris.

All trees, stumps, or brush not specified to remain shall be removed and shall not be stockpiled in the wetland resource areas while awaiting disposal.

Work shall be coordinated with Clearing or Tree Removal Item and compensated under that Item.

PRE-WETLAND CONSTRUCTION SITE WALK

Delineating the Replication Area and Access Route. The Contractor shall stake out the Replication Area boundaries and the intended access route and set grade stakes for approval by the

Wetland Specialist and Engineer. Following staking and demarcation of areas, the Engineer and Wetland Specialist shall approve or modify as necessary the limits of work, the access route, final location and configuration of replication, grade stake elevations, proposed location of sediment barriers, and review proposed construction methods.

As part of the delineation and approval process, the Wetland Specialist shall mark trees to be converted to snags, select course woody debris to be retained for re-use, and select rocks or other elements to be used for habitat features.

Invasive Plants: As part of the initial site walk, the wetland to be impacted and the proposed replication site shall be inspected for the presence of invasive plants. If invasive plants are found they shall be addressed as described herein under Invasive Plants.

SOIL WORK

Final grades in the Replication Area shall meet the target elevations as shown on the Plans or as adjusted by the Wetland Specialist. If adjustments are required, a Request for Information (RFI) shall be submitted to the Engineer for approval. Adjustments shall be documented and included in the As-Built plans (if required) and/or other applicable required documents.

Excavation & Grading

When required by permits, the Wetland Specialist shall notify MADEP at least 72 hours prior to excavation.

Excavate replication area as shown on the drawings or to a depth of 12 inches if no depth is shown. Where replication area is adjacent to existing wetland, finish grade of replication shall match existing. Prior to placement of backfill, scarify subgrade to a depth of 4 to 6 inches.

Soil in the proposed wetland areas that must be removed for grades to conform to the proposed elevations shall be stripped and disposed of, or, if suitable for reuse, be stockpiled in an approved location. Stockpiled soils shall be kept wet and not allowed to dry out. Procedures for maintaining appropriate moisture levels shall be documented by the Wetland Specialist and provided to the Engineer and the Contractor.

Placement of Wetland Soil

Following excavation and scarification and grading of sub-grade, and after the sub-grade elevations are approved by the Wetland Specialist, suitable soil previously removed or manufactured soil shall be spread over the proposed wetland areas as shown on the plans and as directed by the Wetland Specialist.

Vehicles used to transport soil from offsite shall be washed or cleaned with air pressure to prevent exotic or invasive seeds or root fragments from contaminating the replication area.

Final Grading

The finished grade of the Replication Area shall be at an elevation that will provide a hydrologic connection between the Replication Area and adjacent resource areas. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland. The Contractor shall verify that this elevation is not at a level that could negatively alter the hydrology of an adjacent wetland. Microtopography in the form of hummocks, pits and mounds shall be as shown on the plans or as adjusted by the Wetland Specialist. Final elevations and grading of wetland soil shall be approved by the Wetland Specialist and the Engineer.

To avoid compaction once soil has been placed, no heavy equipment shall travel across placed soil and no work shall occur in wet or moist soil. Soil that is compacted due to construction activities shall be replaced with soil as specified herein and at the Contractor's expense.

Installation of Monitoring Wells

For wetlands over 1000 square feet, monitoring wells shall be installed in locations as shown on the Plans. Monitoring wells shall include data loggers. Data shall be collected by the Wetland Specialist and submitted with Monitoring Reports and as required by applicable permits. Wells shall be installed immediately following completion of construction of the wetland.

RESTORING VEGETATION

Incorporation of Coarse Woody Material

If specified within this Contract or if directed by the Wetland Specialist or Landscape Architect during the initial site walk, woody debris shall be incorporated into the Replication Area and/or adjacent upland buffer. Material shall be placed as shown on the plans or as directed following placement of wetland soil and prior to application of compost and/or seed. Woody material shall cover a minimum of 5-20 percent of the Replication Area, depending on whether it is a meadow or woodland wetland and how much wood is available from construction clearing. Where trees are cut for construction purposes, logs of a minimum length of 8 feet must comprise a minimum of 50% of the woody material left on site. Brush shall be included along with logs and stumps as directed. Woody material shall be placed in a deliberate and naturalistic manner.

Planting

Following placement of wetland soil and approval of final grade and conditions, Replication Area shall be planted. Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season shall be May 15-June 15 and September 1-November 1 unless approved following written request from the Contractor.

Prior to planting, the Wetland Specialist shall approve the condition of the plant material and the method of installation and shall oversee the planting work. Replication Area shall be planted in the dry and according to the planting details within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer or Wetland Specialist with replacement at the Contractor's expense.

Seeding

Following placement of wetland soil and planting (if included), the Replication Area shall be seeded using one of the following methods:

- Hand broadcast seed and straw mulch.
- Seeding with hydromulch per the Standard Specifications and per the manufacturer's directions.
- Hand broadcast seed with compost topdressing pneumatically applied at the same time to ensure light cover of soil topdressing over seed.

If required, seeding limits for different seed mixes shall be determined by the Wetland Specialist.

PLANT ESTABLISHMENT AND INVASIVE MANAGEMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to established shall be over-seeded as required by the Engineer. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Weed control is incidental to this item.

Invasive Plants: Corrective measures shall be taken to remove or treat invasive plant species in the Replication Areas. Invasive plants shall include those listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the US Army Corp of Engineer's New England District's Compensatory Mitigation Guidance

- If chemical treatment of invasive plants is necessary, the strategy for treatment shall be as determined under Item 102.3 Invasive Plant Management Strategy. That strategy shall be coordinated with the Wetland Specialist and all applicable permits and permitting agencies. Chemical application under 102.33 Invasive Plant Management On-site shall be compensated under that item and shall be for the duration of the contract only.

- The strategy for chemical and/or manual removal shall be as directed by the Wetland Specialist, shall continue for the duration of the monitoring period, and shall be incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland construction work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Scientist demonstrating that the construction work was done according to plans (or how modified) and meets required permit conditions. The narrative shall include photo documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Replication Area and surrounding areas. The following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The final finished target elevations have been met and maintained. Areas that are too high or too low should be identified along with suggested corrective measures.
- Hydrology meets performance standards.
- Specified seed mix has been seeded. If inspected 30 or more days after seeding, seeded species in the wetland and adjacent upland shall show signs of good germination and healthy growth.
- Planted woody and herbaceous species meet specifications and are establishing well.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- There are no invasive plants visible in the replication area.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Replication work is not approved, MassDOT will issue a rejection letter requiring corrective actions. The Wetland Specialist shall recommend corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

REQUEST FOR CERTIFICATE OF COMPLIANCE

If required, a request for a Certificate of Compliance (Partial or Full) pursuant to the Massachusetts Wetlands Protection Act regulations shall be prepared and submitted to MassDOT within 30 days following Conditional Acceptance.

The Request for Certificate of Compliance shall include the following:

- A brief narrative of the work on company letterhead signed by the Wetland Specialist. Narrative shall be in MS Word document and shall include substantive explanation that demonstrates compliance with EACH relevant permit condition. Narrative shall note variations from the originally permitted design.
- As-built Drawings signed by the Contractor's PE registered in the Commonwealth of Massachusetts. As-built drawings shall show hydrologic conditions, status of plantings and seeding, and shall include a narrative and minimum of 4 photographs documenting site conditions. Plans should note variations from the originally permitted design.

  When required, drawings shall meet the Army Corp of Engineer's New England District's Compensatory Replication Guidance, including: scale in the range of 1"=20' to 1" = 100', contours at 1' intervals, spot elevations for intermediate elevations, and polygons outlining each Replication Area, and, as applicable, plant community types. The As-built Drawings shall be provided to the Engineer electronically in Portable Document Format (PDF). If requested by the Engineer, the Drawings shall be provided in printed paper format (11" x 17" sheets, unless otherwise directed). Drawings must be scalable.

- Other documents as required.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Contractor, Wetland Specialist and regulatory representative (if required) shall assess the Replication Area. Final Acceptance will initiate the start of the Wetland Monitoring Period.

The following conditions shall be inspected and approved for acceptance and payment.

- Hydrology is functioning as intended.
- Seeded species are establishing well and cover 95 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

If the mitigation work does not meet the above condition and is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions. Work not approved will be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.35 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, equipment, submittals, maintenance, all required soil, site preparation, grading, wetland seeding, mulching, watering, monitoring wells, as-built plans, Request for Certificate of Compliance, and all incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 60% upon Conditional Acceptance.
- 20% after receipt and acceptance of Certificate of Compliance by the Engineer and once all permit construction requirements have been met and approved.
- 20% upon Final Acceptance.

Excavation will be paid under Item 120.1
Compost Topdressing will be paid under Item 751.72 unless used in conjunction with seeding.
Sediment Barrier will be paid under Item 767.121
Wetland Specialist will be paid under Item 755.75
Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

TEM 755.45 WETLAND RESTORATION SQUARE YARD

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

Mix 765.551 Wetland Mix – FACW Meadow Mix

Botanical Name	Common Name	% PLS By Weight
Grass	Fox Sedge	26.00%
Elymus riparius	Riverbank Wild Rye	23.00%
Carex lurida	Shallow Sedge	17.00%
Carex lupulina	Hop Sedge	8.00%
Scirpus atrovirens	Green Bulrush	3.00%
Juncus effusus	Soft Rush	2.50%
Cinna arundinacea	Sweet Woodreed	2.00%
Carex comosa	Bearded Sedge	2.00%
Glyceria canadensis	Manna Grass	1.00%
Scirpus cyperinus	Woolgrass	1.00%
Juncus tenuis	Path Rush	0.50%
		86.00%
Herb/Forb		
Verbena hastata	Blue Vervain	4.00%
Asclepias incarnata	Swamp Milkweed	2.00%
Aster prenanthoides	Zig Zag Aster	1.00%
Sisyrinchium angustifolium	Narrowleaf blue-eyed grass	1.00%
Eupatorium maculatum	Joe-pye Weed	1.00%
Aster puniceus	Aster - Swamp	1.00%
Aster novae-angliae	New England Aster	1.00%
Vernonia noveboracensis	New York Ironweed	1.00%
Eupatorium perfoliatum	Boneset	1.00%
Aster umbellatus	Flat Topped White Aster	0.50%
Mimulus ringens	Monkey Flower	0.50%
		14.00%
		100.00%

Seeding Rate

Apply this mix at 20 lbs PLS/acre on areas of less than 3:1 slope and 60 lbs PLS on areas of greater than 3:1 slope.

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Restoration Upon Completion of Roadway Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and temporary separation fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification

Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall ***be seeded with mulch*** as specified below. Seeding shall immediately follow soil preparation.

Seeding with Mulch
Upon approval of prepared soil, area shall be seeded. Seeding shall be hand broadcast with straw mulch applied per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

Seed tags shall be submitted at time of seeding.

SEED ESTABLISHMENT

Seeding that fails to establish according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK
Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a

rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports,

the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

Excavation of temporary fill will be paid under Item 120.1
Sediment Control Barrier will be paid under Item 767.121
Wetland Specialist will be paid under Item 755.75
Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

ITEM 755.75 WETLAND SPECIALIST HOUR

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

Work under this Item shall be for services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications hereafter referred to as the "Wetland Specialist."

"Wetland Mitigation" shall be used herein for applicable wetland work. For this project, applicable wetland work is for: **Item 755.35 Inland Wetland Replication Area, Item 755.45 Wetland Restoration, and Item 120.01 Excavation in Flood Compensation Area for protection and restoration of vegetation.**

The Wetland Specialist shall demonstrate knowledge and expertise to coordinate and oversee all work associated with the Wetland Mitigation as defined herein, as shown on the Plans, as required by permits, and as specified under the relevant Wetland Mitigation items.

Regulatory monitoring reports following Final Acceptance of the Wetland Mitigation shall be per Item 755.76, Wetland Monitoring Reports.

For all onsite work, the Wetland Specialist shall sign in and sign out with the Engineer.

The Wetland Specialist shall not be from the same company as the company responsible for planting, seeding, and/or maintaining the wetland.

QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the Contract mitigation. When required by permits, at least ten (10) years of experience may be required. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District.

SUBMITTALS - QUALIFICATION

Within sixty (60) days following the Notice to Proceed, the Contractor shall provide proof of qualifications for the Wetland Specialist to the Engineer for approval. Submittals shall include, but not be limited to, the following:

- Resume of the individual on-site implementing the Wetland Specialist work. If the Wetland Specialist changes over the course of the project, the new individual shall submit resume and qualifications for approval 30 days prior to doing any work on-site.
- Resume of any personnel working on-site in place of the Wetland Specialist. Individual shall be approved prior to work on-site.
- Narrative describing the company, its expertise, technical qualifications and experience with wetland construction.
- At least three (3) references from prior work of a similar nature completed in the last five (5) years and by the individuals who will perform the work. Provide contact information for each reference including address, phone number and email.
- A summary of each reference project including nature of the work, project size, dates, and period of construction and monitoring, methodologies used, and summary of success (or not) in terms of meeting performance objectives. Summary shall include a minimum of one before and one after photo for each project.

SUBMITTALS – DOCUMENTATION AND REPORTS

Wetland Construction Oversight

Wetland Specialist shall provide documentation of pre-existing conditions and wetland construction as specified below and as part of fulfilling the Scope of Work described below. Documentation shall include photos that are clear and legible. Photos are incidental to this item.

- ***Site Walk Prior to Disturbance and Construction of Wetlands:*** Provide brief assessment with photos, including documentation of the existing wetlands to be impacted (both permanent and temporary), proposed wetland replication area, and reference/model wetland areas (typically an adjacent undisturbed wetland or the existing wetland to be impacted). Photos of existing wetlands that will be temporarily impacted shall include a view from at least 3 angles.

- ***Excavation and Grading:*** Documentation shall include minimum of two photos of the excavated wetland and two photos after final grading prior to planting and seeding. For restoration areas, photos shall show soil preparation (i.e, tilling and grading), if applicable.
- ***Approval of Subgrades****:* The Wetland Specialist shall inspect the sub-grade of the Replication Area to ensure that proper hydrology is likely to be established and shall provide the Engineer with written confirmation and photographs upon completion of subgrade excavation work. Written confirmation shall include recommended field adjustments, based on field observations, to achieve the desired hydrology and designed wetland system.
- ***Planting and Seeding:*** Provide assessment and photos of vegetation upon completion of planting and seeding work.
- ***Data logger output from Monitoring Wells*** shall be submitted with reports, if applicable and requested.

Wetland construction documentation and reports shall be submitted with Request for Conditional Acceptance and for the Order of Conditions, Water Quality Certifications, and other regulatory permits as required.

Requests for Acceptance of Work & Regulatory Compliance

The Wetland Specialist shall submit the following documents if and as specified herein and under Item the relevant Wetland Mitigation items:

- Request for Conditional Acceptance.
- Request for Certificate of Compliance (Partial or Full) when applicable.
- Request for Final Acceptance.

SCOPE OF WORK

In the event of discrepancies with the applicable permits, the Wetland Specialist shall submit a Request for Information (RFI) to the Engineer.

General

The Wetland Specialist shall be responsible for the following:

- Review and have a comprehensive knowledge of the environmental permits relevant to the specific mitigation work being done so as to ensure compliance throughout the duration of the contract.
- Identify and inform the Contractor and Engineer of unique site conditions which may require adjustments to the schedule, design, or construction methods. For example, wildlife nesting, illegal dumping, or rare species.
- Identify and inform the Contractor and Engineer of any sediment or erosion control problems observed within mitigation areas.
- Advise so as to avoid impacts to adjacent areas and regulated wetland resources.
- Participate in necessary meetings as required by permits and when requested by the Engineer.

Inspections & Construction Oversight

The Wetland Specialist shall be responsible for, but not limited to, the following:

- Pre-Construction Site Walk
    - Following surveying, flagging, and staking of all relevant boundaries and elevations by the Contractor, the Wetland Specialist shall walk the site with the Engineer and the Contractor to review existing and proposed conditions, recommend changes if necessary, and approve the following: location and boundaries of the Mitigation Area, target elevations and grades, location of tree protection associated with the Mitigation Area, and final layout and limits of clearing for access route.
    - Select and mark snags, logs, and woody material to be retained for placement in the Wetland Mitigation, as appropriate.
    - Note invasive plants in and adjacent to Wetland Mitigation.
    - Provide summary report if and as specified under Wetland Mitigation items.

- Excavation, Soil Placement, Grading for Replication Areas
    - Approve excavated depth and grading for appropriate wetland hydrology, subsoil preparation, and finished grade of placed wetland soil.
    - Adjust grades as required and approve microtopography. If grades need to be adjusted, submit an RFI to the Engineer.
    - If requested by the Engineer, the Wetland Specialist shall inspect stockpiled wetland soil for moisture content and signs of undesirable weeds.
- Soil Protection and Restoration Measures for Restoration Areas
    - Review and approve methods of soil protection and restoration if required.
    - Confirm decompaction will adequately restore appropriate wetland hydrology. If decompaction measures need to be adjusted, submit an RFI to the Engineer.
- Re-vegetation of Mitigation Area
    - Placement of woody material to be re-used.
    - Verify seed used complies with specifications and site conditions, determine limits for wetland seeding based on elevations, approve seeding and mulching methods, and collect seed tags to submit with Request for Conditional Acceptance.
    - Review planting methods (if applicable) prior to installation and oversee layout of wetland plants.

Conditional Acceptance

Upon completion of construction of the wetland, as part of the Request for Conditional Acceptance, the Wetland Specialist shall provide a brief narrative demonstrating that the wetland construction work was done according to plans (or how modified) and meets the conditions required for acceptance as specified under the Wetland Mitigation items. Submittal shall include a report and photo documention of pre-construction conditions, construction work, seeding, planting, and other work as specified under the Wetland Mitigation items. Photos of completed Wetland Restoration areas shall include the same views as the pre-construction reference photos.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the Wetland Mitigation items.

Upon approval, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Mitigation work is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

Request for Certificate of Compliance

If required, a Request for Certificate of Compliance shall be prepared and submitted to the Engineer immediately following Conditional Acceptance. Request shall be as specified under the relevant Wetland Mitigation items.

Request for Final Acceptance

Following one full growing season, the Wetland Specialist shall provide a brief narrative of the status of the Wetland Mitigation to be submitted with the Request for Final Acceptance.

Upon receipt of the Request, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the relevant Wetland Mitigation items.

If the Wetland Mitigation is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

METHOD OF MEASUREMENT

Item 755.75 Wetland Specialist shall be measured per hour for on-site service provided by the Wetland Specialist.

Work shall include all inspections, photos, submittals, and associated tasks for construction and restoration oversight, narratives for Conditional and Final Acceptance, Request for Certificate of Compliance (Partial or Full) if required, documentation required for permits, and all other work specified above. Payment shall not include travel time or time spent off-site on reports. Decimal Pay Limits will be 0.25 hours.

BASIS OF PAYMENT

Item 755.75 Wetland Specialist shall be paid at the Contractor bid price for each hour, or fraction thereof, spent on-site to perform the work as described above. Reports and photo documentation are required for payment.

Post wetland construction reports shall be per Item 755.76, Wetland Monitoring Reports.

ITEM 755.76 WETLAND MONITORING REPORTS LUMP SUM

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

Work under this item shall be for the submittal of Wetland Monitoring Reports following the completion of wetland construction and shall include all inspections, photos, and other work required to complete those reports as specified herein.

"Wetland Mitigation" shall be used herein for applicable wetland work, whether Wetland Replication (creation of a new wetland) and/or Wetland Restoration (restoration after temporary impacts).

The Contractor shall retain the services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications, hereafter referred to as the "Wetland Specialist," to complete the Wetland Monitoring reports. Wetland Specialist shall meet requirements specified under Item 755.75 Wetland Specialist.

All on-site Wetland Specialist services required to complete the construction and revegetation of the wetland replication, including preparation and submission of monitoring reports during construction, shall be per Item 755.75 Wetland Specialist.

SCOPE OF WORK

Post-Construction Wetland Monitoring Reports

Final Acceptance of the wetland construction work as specified under item 755.35 and/or 755.45 shall initiate the beginning of the Monitoring Period.

Inspections and reports shall be performed to ensure compliance with mitigation requirements defined under the relevant Wetland Mitigation items and with all applicable environmental permits. Monitoring reports shall cover the following:

- Identification of all plant species present
- Percent cover for each plant species and overall percent surface area cover by indigenous wetland plant species for replication area and upland
- Description of the viability, health, and vigor of installed plants as well as volunteer plant species within the replication areas
- Description of remedial measures taken to ensure criteria are met
- Depth to apparent water table and/or depth of surface inundation, both as measured from the soil surface and data loggers, as appropriate.
- A conclusion regarding the success of the wetland mitigation area relative to the performance standards at 310 CMR 10.55(4)(b) (unless varied), the design plans, and performance criteria established by MADEP in the variance conditions (when applicable), and the reference wetland.
- Recommendation for a corrective plan of action if needed.

Reports shall be submitted to the Engineer as a digital copy in Portable Document Format (PDF) unless otherwise requested. Hard copies shall be provided as requested by the Engineer. All reports shall be marked with the applicable permit numbers and identifying information as required in the permits. Reports shall include photo documentation of the wetland/s being monitored and shall include a minimum of 3 views from different orientations. Views shall be labeled.

Spring Reports, when required, shall be submitted to the Engineer by July 1 for dispersal to the appropriate permitting agencies.

End of Year Reports (which may serve as the Fall Report) shall be based on inspections that occur prior to October 15th. Reports shall be submitted to the Engineer no later than November 1 of each year.

Monitoring Reports shall be as follows for ***2*** years:

- *MassDEP: # Reports - (1 end of year).*
- *ACOE: # Reports (1 end of year).*
- *Conservation Commission: # Reports (1 end of year).*

BASIS OF PAYMENT AND METHOD OF MEASUREMENT

Item 755.76 Wetland Monitoring Reports and associated inspections shall be at the Contract unit price per Lump Sum and shall include all labor, materials, equipment, and all incidental costs required to complete the work. Lump Sum will be paid in equal installments of the Lump Sum divided by the number of reports submitted. Payment shall be upon submittal and acceptance of each report, based on the following schedule:

- Year 1 = ***1 end of year report***
  Year 2 = ***1 end of year report***

ITEM 758.1 INFILTRATION BASIN LUMP SUM

This work under this item shall conform to the relevant provisions of Section 120, Section 144, Section 150, Section 751, the contract plans and the following:

The work shall consist of creating an infiltration basin conforming with the requirements of the Massachusetts D.E.P. Massachusetts Stormwater Handbook, as shown on the plans.

Construction Sequence

1. The Contractor shall stake out the infiltration basin area boundaries in the field. The location of the staked out area shall first be approved by the Engineer prior to excavation of the site.

2. Install sediment control barrier measures as shown in the plans.

3. Remove trees within the boundaries of the approved staked out excavation area. Excavate existing topsoil and stockpile in upland area for reuse in basin.

4. Excavate subsoil within the infiltration area to the depth indicated in the contract plans. No heavy equipment shall be allowed within the limits of the floor of the infiltration basin. Infiltration area floor shall be smooth and free of all sharp objects includes glass, metal shards and nails, stones, rocks, sticks, root or debris of any kind.
5. Scarify areas where emankment fill is to be placed.

6. Fill materials shall be placed in layers with a maximum thickness of 8 inches prior to compaction.

7. Compact fill in accordance with Section 150.

8. Seed basin bottom with Wetland Seasonally Flooded Mix Item 765.554. Seed side slopes with Native Short Grassland Seed Mix Item 765.411. Apply Compost Blanket 751.7 to seeded areas.

Schedule of Quantities

Within ten (10) days of Award of Contract, the Contractor shall submit for approval by the Engineer, a schedule of quantities and price for the infiltration basin as Lump Sum. The Lump Sum quantity will include the complete installation of Infiltration Basin such as cleaning and grubbing, excavation, fine grading, loam borrow, and spillway rockfill to complete the installation. The cost for labor and materials for any item not listed shall be considered incidental to these Items and no further compensation will be allowed for this work. Outlet piping and flared end sections shall be measured for payment under the applicable pay items for these components.

Method of Measurement

Item 758.1 Infiltration Basin shall be measured lump sum.

Basis of Payment

Item 758.1 Infiltration Basin shall be paid for at the contract unit price per lump sum at the proposed location and shall include all work described herein and full compensation for all labor, materials, unclassified excavations, equipment and incidentals necessary to complete the work. Work for native seed mixes on basin side slopes and bottom shall be paid for under the following items Native Seeding and Establishment Item 765.635, Wetland Seasonally Flooded Mix Item 765.554, Native Short Grassland Seed Mix Item 765.411, and Compost Blanket Item 751.7 Sediment Forebay Pavers will be paid under Item 988.01. Costs for outlet piping and flared end sections shall be paid under the applicable pay items for these components.

ITEM 983.6 STREAMBED RESTORATION LUMP SUM

DESCRIPTION

This work shall consist of removing, stockpiling, and replacing riverbed material in the proposed bridge replacement within the channel excavation portion as shown on the plans in the limits of work. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, roughness, shape, profile, and appearance. The ultimate product will, to the extent possible, replicate the function and appearance of the natural stream channel, as illustrated by photo-documentation herein (Figures A & B).

The Contractor shall ensure all required equipment is available on-site to complete the work in this manner. The streambed restoration is required to comply with environmental permits issued for the project. MassDOT Environmental Services will provide a Fluvial Geomorphologist (Geomorphologist) to provide a pre-construction meeting, on-site oversight during construction, and assistance during streambed restoration construction to ensure the restoration is constructed as shown on the Plans, as required by these Special Provisions and in accordance with permit requirements.

At least 30 days prior to the commencement of construction, the Contractor shall coordinate with David Paulson (MassDOT Wildlife Unit Supervisor, (508) 389-6366 / david.j.paulson@state.ma.us) to set up an initial (virtual or in person) meeting with MassDOT's Geomorphologist, Contractor, and Resident Engineer. At this meeting, the Geomorphologist will provide an overview of the restoration work. The Contractor should be prepared to discuss the anticipated means, methods, and schedule.

Process Approval:

In lieu of a mockup, the Contractor shall schedule an onsite meeting to discuss the streambed restoration with the Geomorphologist and respective parties from MassDOT. The Geomorphologist shall be onsite during initial streambed restoration. The Contractor shall provide the Geomorphologist adequate access to observe, direct, and inspect the channel restoration work throughout the duration of the removal, stockpile, and reinstallation of the existing streambed material. If material is being brought to the site for streambed restoration, the Contractor shall provide the Geomorphologist with photographs to see the material.

MATERIAL

The streambed material excavated from the existing streambed shall be removed and stockpiled to facilitate reinstallation and replication of the natural streambed. The excavated streambed material shall also be reused to fill the voids in the proposed riprap placed below the top streambed restoration layer.

In the event that the excavated material is not suitable or there is not enough suitable material available, additional streambed restoration material shall be locally sourced that matches the

composition of the existing native riverbed. The median grain size (D50) ranges from 0.11 in SS1 to 1.72 in SS2. The average grain size across the 2 samples is 0.92 mm (coarse sand) in the areas of the channel to be impacted by the proposed work on the substructure. Note that the streambed located downstream of the bridge contains a higher proportion of larger sediment fragments as compared to the upstream portion. The downstream area also contained a small percentage of coarse gravel fragments, while the upstream reach did not, and thus a small percentage of coarse gravel is desired downstream of the bridge to replicate the natural conditions in the areas of the riverbed to be restored. The following gradation developed using the results of the grain size analysis performed in the areas to be impacted by the proposed work in the river shall be used as a guide.

Stream Bed Material Gradation:

Particle	**Percent (%) Composition**
Boulder	0
Cobble (maximum 2-3 inches in size)	0
Coarse Gravel	13
Fine Gravel	7
Coarse Sand	12
Medium Sand	24
Fine Sand	29
Fines	15

The streambed material shall be approved by the Resident Engineer and Geomorphologist prior to use.

Related Items

Crushed Stone. Shall conform to the requirements of Item 156.2 Crushed Stone for Slope Treatment and shall be paid for under that item.

Riprap Stone shall conform to the requirements of Item 983. and shall be paid for under that item.

CONSTRUCTION

Channel

The streambed material shall be reinstalled over riprap (MassDOT Item 983.522, as depicted on the plans, to an average thickness of 1.5 feet, with variations in thickness as necessary to replicate existing channel conditions. The initial placement of streambed material shall fill the voids in the underlying riprap. Fill voids by shaking stone with the teeth of an excavator bucket, hand tamping with metal tamping rods, and by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose of filling the voids is to prevent subsurface flow where surface water disappears into large voids between the stone fill below the channel bed surface

during low flow conditions. The final streambed shape and appearance shall be finalized in the field as directed by the Geomorphologist.

Reinstallation of the stockpiled streambed material shall be placed on top of the riprap to restore streambed habitat and fish passage. The streambed materials shall be installed during normal low water conditions behind cofferdams in accordance with the environmental permits.

Completion

Once all material has been placed in the stream channel and approved by the Geomorphologist and Resident Engineer, the Contractor shall remove the cofferdams in such a way as to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed shall maintain the general configuration of the existing streambed bedform and there shall be minimal subsurface flow upon final inspection by the Resident Engineer and Geomorphologist. The project must be passable by fish and other aquatic organisms following construction.

The streambed restoration to be measured for payment will be the complete and accepted work for restoration of the streambed within the limits shown on the Plans as approved by the Resident Engineer and Geomorphologist.

BASIS OF PAYMENT

The accepted streambed restoration will be paid for on a lump sum basis. Payment will be full compensation for excavating, stockpiling, transporting, and placing the material specified and for furnishing all labor, tools, equipment, testing, and incidentals necessary to complete the work.

The Geomorphologist will be provided by MassDOT at no cost to the Contractor.

FIGURES

Figure A: View of the riverbed from the upstream side of the bridge

Figure B: Overview of the riverbed from the downstream side of the bridge.

ITEM 991.1 CONTROL OF WATER – STRUCTURE NO. W-38-011 LUMP SUM

The work under this Item shall conform to the relevant provisions of Section 140 and Section 950 and consist of designing, furnishing, installing, operating and removing all temporary water control systems and dewatering systems needed to demolish the existing bridge parapets, repairs, construct the proposed wingwalls and highway guardrail transitions, embankments, and any other work requiring water control systems.

The system must ensure that all concrete comprising the bridge structure and foundations are placed and cured in the dry as shown on the plans, or as directed by the Engineer. The work shall include all incidental dewatering, pumping, sandbagging, filtration or sedimentation and dewatering basins, or other measures inclusive of sheeting, necessary for enough water control to accomplish the construction of the proposed structure and foundations in the dry.

The Contractor shall be prepared to furnish a groundwater control system for construction operations at the bottom of excavation level, as well as a surface water collection and disposal system in accordance with the provisions contained herein.

The Contractor may elect to use a water diversion system consisting of sandbags with polyethylene sheets for control of seepage. It is the intent of the water diversion system to maintain water level represented by the 2-year flood elevation within a restricted waterway channel. The Contractor may elect to use alternate methods of water diversion subject to prior approval of the Engineer and conformance to project design and permitting requirements, and in coordination with proposed bridge erection methodology. There may be further restrictions on the time when work can be performed in the waterway. It is suggested that the work shall be done during the low flow period. Reference is made to the Water Quality Certification and ACOE 404 Massachusetts General Permit for period of work restrictions and other requirements.

The Contractor shall prepare working drawings in which the materials and methods of control of water are shown for approval by the Engineer. The working drawings shall be submitted for the proposed type of water diversion system, dewatering systems, arrangement, location and depths of system components, the method of disposal of pumped water, and a description of equipment and instrumentation to be used. Design computations shall be submitted for all parts of the water control system as applicable. The working drawings shall be stamped, signed and certified by a Professional Engineer registered in the Commonwealth of Massachusetts. Approval of the working drawings does not relieve the Contractor of the responsibility of providing for the safety of the work and the successful completion of the project.

The dewatering system shall reduce the hydrostatic pressure and lower the groundwater levels a minimum of 12 inches below the bottom of excavation elevations indicated on the Plans. All concrete work shall be done in the dry. The dewatering system shall prevent heaving of the bottom of the excavation, and shall not result in damage to adjacent properties, structures, utilities, and other work. Acceptable dewatering methods include sump pumping, single or multiple stage well point systems, educator and ejector type systems, deep wells or combinations thereof. Temporary surface water control measures shall be provided to prevent surface water from entering the excavation. A sufficient number of pumps with adequate capacity shall be provided at the site.

Provisions shall be made for having backup power generation and groundwater control system components available for maintaining continuous operations should failure of the primary equipment occur.

Dewatering procedures that cause or threaten to cause damage to new or existing construction shall be modified by the Contractor at no additional expense to the Department.

The dewatering system shall be installed, maintained, and removed in such a manner as to prevent movement, settlement, loss of ground or damage to new and existing structures.

Collection and disposal of groundwater discharge shall be performed, in accordance with all Federal, State, and local codes, rules and regulations. Sedimentation control shall be used to segregate silt from the groundwater that is recharged into the river outside of the limits of excavation in compliance with all environmental regulations specified in the Water Quality Certification and ACOE 404 permits. Pumped groundwater shall not be discharged directly into the waterway or into the roadway Right-of-Way.

Measures shall be taken to control the discharge of pollutants into the water resource area, including but not limited to the following:

- Rigorous management of construction operations involving potentially hazardous material, such as refueling and maintenance of construction equipment
- Formulation of contingency plans to control accidental spillage from potentially hazardous materials
- Locating construction staging areas outside of the waterway buffer zones
- Scheduling of work within the waterway to avoid periods of high flood and forecasted storm events
- Installation and continuous maintenance of staked hay bales, staked compost filter tubes, and filter fence to prevent sediment migration into adjacent waterway resource areas. Placement of erosion controls shall be shown on the plans, as specified herein, or as directed by the Engineer, so as to provide maximum control of project related sediment mobilization. Additional erosion control measures shall be employed as necessary to prevent erosion and sedimentation of the stream bed. These measures shall be maintained for the duration of the contract.

After the removal of systems, the site locations shall be restored to their original condition.

The Contractor is advised that the project Section 401 Water Quality Certification and Army Corps of Engineers Massachusetts General Permit Approval may include certain Time of Year restrictions on driving of piles, earthwork, and other activities. They may also contain other applicable conditions. It is the Contractor's responsibility to review these approvals and incorporate relevant conditions into the Contactor's plans, schedules, and other documents relating to this task.

The Engineer shall make partial payments in proportion as the foundation work progresses with the final 10 percent (10%) paid upon the satisfactory removal of the entire water control system from the site after it is no longer required, and site restored to its original condition.

Measurement and Payment

The Item 991.1 "Control of Water for Structure No. W-38-011" will be paid in the unit of Lump Sum at the Contract Bid Price, which shall include full compensation for the design of the water control schemes, all equipment, materials, tools and labor necessary for the installation, maintenance, removal and disposal of the materials used for water control including all cost associated with obtaining the necessary permits.

ITEM 991.2 CONTROL OF WATER – SPECIAL DRAINAGE STRUCTURE NO. 1 LUMP SUM

The work to be done under these Items shall consist of designing, furnishing, installing, operating, and removing temporary water control systems with pumping operations to lower and control water during the installation of the precast concrete box culvert sections and wingwalls as required by the Engineer. This work shall be done in accordance with the following provisions and the relevant requirements of Subsection 140.60.

The Contractor shall be prepared to furnish a groundwater control system for construction operations at the bottom of excavation level, as well as a surface water collection and disposal system in accordance with the provisions contained herein.

The Contractor shall prepare working drawings in which the materials and methods of control of water are shown for approval by the Engineer. The working drawings shall be submitted for the proposed type of dewatering systems, arrangement, location and depths of system components, the method of disposal of pumped water, and a description of equipment and instrumentation to be used. Design computations shall be submitted for all parts of the dewatering system as applicable. The working drawings shall be certified by a Professional Engineer registered in the Commonwealth of Massachusetts. Approval of the working drawing does not relieve the Contractor of the responsibility of providing for the safety of the work and the successful completion of the project.

The Contractor shall submit a plan for management of surface and groundwater flow and potential sedimentation thereof during the installation period to the Engineer and Wilmington Conservation Commission for approval prior to any work. Contractor to control surface and groundwater through the duration of the project including the stabilization period after completion of construction activities and as per the Wilmington Conservation Commission.

The dewatering system shall reduce the hydrostatic pressure and lower the groundwater levels a minimum of 12 inches below the bottom of excavation elevations indicated on the Plans. All concrete work shall be done in the dry. The dewatering system shall prevent heaving of the bottom of the excavation, and shall not result in damage to adjacent properties, structures, utilities, and other work. Acceptable dewatering methods include sump pumping, single or multiple stage well point systems, eductor and ejector type systems, deep wells or combinations thereof. Temporary surface water control measures shall be provided to prevent surface water from entering the excavation. A sufficient number of pumps with adequate capacity shall be provided at the site. Provisions shall be made for having backup power generation and groundwater control system components available for maintaining continuous operations should failure of the primary equipment occur.

Dewatering procedures that cause or threaten to cause damage to new or existing construction shall be modified by the Contractor at no additional expense to the Department.

The dewatering system shall be installed, maintained, and removed in such a manner as to prevent movement, settlement, loss of ground or damage to new and existing structures.

Collection and disposal of groundwater discharge shall be performed, in accordance with all Federal, State, and local codes, rules and regulations. Sedimentation control shall be used to segregate silt from the groundwater that is recharged into the brook outside of the limits of excavation. Pumped groundwater shall not be discharged into the roadway Right-of-Way.

Method of Measurement

Items 991.2 shall be measured on a LUMP SUM basis.

Basis of Payment

Items 991.2 shall be paid for at the Contract LUMP SUM price; which price shall be full compensation for the design of the water control systems, all labor, materials, equipment, transportation, additional site testing, maintenance, removal and disposal of materials and structures, and other incidental costs required to complete the work.

ATTACHMENT G – OTHER FEDERAL & STATE CLEARENCES

MassDOT - Cultural Resources Unit (Project #608051)

Section 106 Notification Checklist for USACOE Section 404 Permit - Project Notification Forms (PNF)

1. State Historic Preservation Office (SHPO)

- ☐ PNF submitted by certified mail (receipt attached)
- ☒ SHPO stamped PNF received (attached)
- ☐ No comments received within 30-day review period
- ☐ No PNF submitted in accordance with 2013 letter from USACOE, MassDOT in-house Section 106 clearance attached
- ☐ Section 106 No Adverse Effect or Adverse Effect documentation attached

2. Board of Underwater Archaeological Resources (BUAR)

- ☒ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☒ No comments received within 30-day review period

3. Mashpee Wampanoag Tribe (MTHPO)

- ☒ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☒ No comments received within 30-day review period

4. Wampanoag Tribe of Gay Head Aquinnah (ATHPO)

- ☒ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☒ No comments received within 30-day review period

5. Stockbridge-Munsee Community (SMTHPO)

- ☐ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☐ No comments received within 30-day review period
- ☒ N/A (Project not within tribe's area of interest)

6. Narragansett Indian Tribe (NTHPO)

- ☒ PNF submitted by e-mail with delivery receipt (attached)
- ☐ Comments received within 30-day review period (attached)
- ☒ No comments received within 30-day review period

CULTURAL RESOURCES PROJECT RECORD

City/Town: Wilmington

Project # 608051

Date Cleared 10/11/2023

Project Name: Reconstruction on Route 38 (Main Street), from Route 62 to the Woburn C.L.

Date Filed:

FHWA to MHC:

Finding Under Review ☐

Project Type: Highway Reconstr - Minor Widening

Review: Section 106 (PA)

Finding: Stip VB - No historic properties affected

Early Coord. Letter Sent: ☑

Comment Received: ☐ MHC ☐ LHC

Reviewer: MP

Consultant:

Comments: LHC letter sent by Green International Affiliates, Inc. on 10/20/2017. PNF sent to ATHPO, MTHPO, NTHPO, and BUAR on 10/10/2023 and to SHPO on 10/13/2023. MHC stamped PNF--Project unlikely to affect significant historic or archaeological resources--on 11/8/2023.

Determination based on: ☑ Scope of Work ☑ Plan ☑ Inventory ☐ Site Visit ☐ Archaeological Survey

Attach appropriate documentation for checked items

Projects Requiring No Massachusetts SHPO Review

Programmatic Agreement, Appendix 1 (check all that apply) :

- ☐ 1) Interstate bridge or roadway projects
- ☐ 2) Resurfacing, repair existing roadways
- * ☐ 3) Reconstruction on existing roadway
- * ☐ 4) Roadway geometrics, intersections
- * ☐ 5) Curbs and sidewalks
- ☐ 6) Pavement markings, rumble strips, etc
- ☐ 7) Curbs, sidewalks (MAAB, ADA)
- * ☐ 8) Removal of trees
- ☐ 9) Landscaping
- ☐ 10) Utilities
- ☐ 11) Railroad crossing
- ☐ 12) Stream stabilization and restoration
- ☐ 13) Wetland mitigation area
- * ☐ 14) Bridge (NR "Not Eligible" or "Conditionally Not Eligible")
- * ☐ 15) Bridge (concrete slab post 1900, steel stringer)
- ☐ 16) Bridge (less than 20' span)
- * ☐ 17) Highway safety improvement
- ☐ 18) Drainage system element
- * ☐ 19) Traffic signal, safety improvement
- * ☐ 20) Intelligent Transportation System project
- ☐ 21) Rest area, maintenance facility
- * ☐ 22) Bicycle, pedestrian lane, path or facility
- ☐ 23) Lighting system
- ☐ 24) Sign
- ☐ 25) Hazardous waste
- ☐ 26) Highway fencing
- ☐ 27) Emergency repair
- ☐ 28) Erosion control
- ☐ 29) Noise barrier

* National Register eligibility evaluation required

-OR-

No Historic Properties Affected
Programmatic Agreement Stipulation V.B. (check one):

- ☑ No NR listed or -eligible properties within Area of Potential Effect
- ☐ No effect on National Register listed or -eligible properties

Reviewer's Initials: MP JMH

CULTURAL RESOURCES PROJECT RECORD

Summary of MassDOT Highway Division Finding
(Appendix 1 and Section V.B. Projects only)

The Massachusetts Department of Transportation (MassDOT) and the Town of Wilmington are proposing to expend federal funds to reconstruct an approximately 2.2-mile segment of Route 38 (Main Street) that extends southerly between the Route 38 and Route 62 (Burlington Avenue and Church Street) intersection and the Woburn City Line.

The existing two-lane two-way road will be reconstructed and widened to generally provide two 11-foot travel lanes and two 5-foot bicycle lanes along the project corridor. There will be two 11-foot southbound travel lanes and a 2-foot shoulder for 900 feet south of the Route 38 and Route 62 intersection. The existing Route 38 pavement requires full-depth reconstruction from Route 62 to Eames Street, except for the Route 38 and Route 129 (Lowell Street) intersection, which will be milled and resurfaced. Micro-milling and resurfacing are also proposed along Route 38 from Eames Street to the Woburn City Line.

Project work at the intersection of Route 38 and Route 62 will include minor widening, re-striping to provide additional or improved turning lanes for the northern, southern, and western legs of the intersection, and adding bicycle detection, as well as construction of a new retaining wall along the MBTA railroad tracks south of this intersection.

At the intersection of Route 38 and Route 129 (Lowell Street), project work will be minimal and include only pavement resurfacing and minor widening because this section of Route 38 was reconstructed relatively recently.

At the intersection of Route 38 with Cross Street and Butters Row, the side street approaches will be realigned and a left turn lane from northbound Route 38 to Butters Row will be added. Realignment is proposed for the Route 38 intersections with Eames Street and Old Main Street as well.

The project will also develop pedestrian and bicycle accommodations along the Route 38 (Main Street) corridor, especially in the vicinity of the MBTA Wilmington Commuter Rail Station and the Yentile Farm recreational facility. In addition to the two 5-foot bicycle lanes along Route 38, a 5.5-foot ADA-compliant concrete sidewalk with wheelchair accessible ramps will be constructed on one or both sides of the roadway depending on location. There is an existing sidewalk on the east side of the road from Church Street to 579 Main Street and on both sides of the roadway from 579 Main Street to just south of the Lowell Street intersection. There are no existing sidewalks from just south of the Lowell Street intersection to the Woburn Town Line.

To improve safety and accessibility for all roadway users, a new traffic signal will be installed at Cross Street, and traffic signals at the Route 62 and Route 129 intersections will be upgraded. Granite curb, guardrails, and bridge rail over the Maple Meadow Brook Bridge will be installed, and signage and pavement markings will be refreshed. Existing granite curbs will be removed and reset as part of the project. The curbs on both sides of the road will help channel water to the proposed closed drainage system; areas with curbs on only one side of the road will utilize country drainage. Existing headwalls, outfalls, catch basins, and culverts will be replaced as necessary. Landscape work involves establishing a wetland replication area near Station 256+50 Left, planting trees and shrubs, spreading loam and seed, and installing erosion control devices.

Existing underground utilities in the project area include electric, telecommunication, water, sewer, and gas lines. Sections of the gas line will be relocated, and the Town of Wilmington will fund the installation of a new water system along Route 38 from the Route 62 intersection to Eames Street. Project work will primarily occur within the existing state highway layout (SHLO), which is typically 50 feet wide, but numerous temporary and permanent easements are required.

Review of the National Register of Historic Places (NRHP) and the Inventory of Historical Assets of the Commonwealth in MACRIS revealed one listed district in the vicinity of the project area: Middlesex Canal Historic and Archaeological District (WMG.H). The Middlesex Canal District in Wilmington extends 3.8 miles southerly and encompasses 25 historic resources, which date from circa 1802 onward. There are no resources associated with the former canal within the project's area of potential effect (APE).

Inventoried properties in the vicinity of the project area include: WMG.41 (Richardson, Heartwell House), which was demolished, WMG.906 (Dublin Street Signal Bridge), WMG.909 (Main Street Bridge), and WMG.911 (B&M

Reviewer's Initials: _____

RR New Hampshire Main Line Bridge). Excluding WMG.909, these resources are outside the direct APE and will not be impacted by the proposed work. WMG.909, a steel-girder bridge built in 1928, is within the APE, but the Massachusetts Historical Commission determined in 1981 that it is not eligible for the NRHP and recommended it be replaced. The bridge roadway will be resurfaced, but no other work on WMG.909 is proposed as part of this project.

Review of the MHC archaeological base maps in MACRIS revealed no recorded pre-Contact archaeological sites in the vicinity of the project area. The nearest recorded pre-Contact sites include 19-MD-324 (Bucks Hill), 19-MD-435 (Burill Field), and 19-MD-991 (Maple Meadow Brook Site), which are located between 0.35–0.55 miles east of the project area, and 19-MD-674 (unnamed), which is located 0.9 miles west of the project area. The nearest recorded historical sites include WMG.HA.2 (Maple Meadow Aqueduct Stone Quarry), WMG.HA.6 (911 Main Street Middlesex Canal Towpath), and WMG.HA.7 (Middlesex Canal Maple Meadow Brook Aqueduct), which are located between 0.1–0.2 miles west of the project area. These historical sites are contributing properties to the Middlesex Canal Historic and Archaeological District.

Numerous archaeological surveys have been conducted since 1976 in advance of utility projects in the vicinity of the Route 38 project area. A 1990 survey, which involved the excavation of 1,372 shovel test pits, including 45 bracket units and 8 judgmental units, recovered pre-Contact artifacts from 15 areas. These artifacts were either surface finds or isolated finds in shovel test pits and not considered archaeologically significant. Two pre-Contact sites were also identified, but no further work was recommended (see MHC Report #25-989). Surveys have not identified any significant historical sites associated with the Middlesex Canal in the project area.

Although the Middlesex Canal alignment is near the project area, it is the opinion of the MassDOT Archaeologist, Megan Postemski, that the project's direct APE has low sensitivity based on the absence of recorded sites, the results of previous archaeological surveys, the impacts of previous roadway, drainage, and utility construction, and roadway development. Work will be confined to disturbed areas within and adjacent to the roadway. Underground utilities such as electric, telecommunication, water, sewer, and gas lines are located within the project's direct APE. A review of borings and test pits conducted by New England Boring Contractors in 2020 indicates that in the vicinity of the proposed retaining wall, soils generally consisted of 11.2–26.5 feet of fill overlying cobbles and glacial till.

Reviewer's Initials: _____

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

RECEIVED
OCT 16 2023
MASS. HIST. COMM
RC.73928

PROJECT NOTIFICATION FORM

Project Name:	Reconstruction on Route 38 (Main Street), from Route 62 to the Woburn C.L. (MassDOT Project #608051)
Location /Address:	Route 38 between the Route 62 intersection and Woburn City Line
City/Town:	Wilmington

Project Proponent

Name:	Massachusetts Department of Transportation
Address:	10 Park Plaza
City/Town/Zip/Telephone:	Boston, MA 02116

After review of MHC files and the materials you submitted, it has been determined that this project is unlikely to affect significant historic or archaeological resources.
RC.73928
11/8/23
Joshua Dorin Date
Preservation Planner
Massachusetts Historical Commission

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
FHWA	Federal Funding (FHWA is lead federal agency)
USACOE	Section 404 Permit

Project Description (narrative):

The Massachusetts Department of Transportation (MassDOT) and the Town of Wilmington are proposing to expend federal funds to reconstruct an approximately 2.2-mile segment of Route 38 (Main Street) that extends southerly between the Route 38 and Route 62 (Burlington Avenue and Church Street) intersection and the Woburn City Line.

The existing two-lane two-way road will be reconstructed and widened to generally provide two 11-foot travel lanes and two 5-foot bicycle lanes along the project corridor. There will be two 11-foot southbound travel lanes and a 2-foot shoulder for 900 feet south of the Route 38 and Route 62 intersection. The existing Route 38 pavement requires full-depth reconstruction from Route 62 to Eames Street, except for the Route 38 and Route 129 (Lowell Street) intersection, which will be milled and resurfaced. Micro-milling and resurfacing are also proposed along Route 38 from Eames Street to the Woburn City Line.

Project work at the intersection of Route 38 and Route 62 will include minor widening, re-striping to provide additional or improved turning lanes for the northern, southern, and western legs of the intersection, and adding bicycle detection, as well as construction of a new retaining wall along the MBTA railroad tracks south of this intersection.

At the intersection of Route 38 and Route 129 (Lowell Street), project work will be minimal and include only pavement resurfacing and minor widening because this section of Route 38 was reconstructed relatively recently.

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APPENDIX A (continued)

At the intersection of Route 38 with Cross Street and Butters Row, the side street approaches will be realigned and a left turn lane from northbound Route 38 to Butters Row will be added. Realignment is proposed for the Route 38 intersections with Eames Street and Old Main Street as well.

The project will also develop pedestrian and bicycle accommodations along the Route 38 (Main Street) corridor, especially in the vicinity of the MBTA Wilmington Commuter Rail Station and the Yentile Farm recreational facility. In addition to the two 5-foot bicycle lanes along Route 38, a 5.5-foot ADA-compliant concrete sidewalk with wheelchair accessible ramps will be constructed on one or both sides of the roadway depending on location. There is an existing sidewalk on the east side of the road from Church Street to 579 Main Street and on both sides of the roadway from 579 Main Street to just south of the Lowell Street intersection. There are no existing sidewalks from just south of the Lowell Street intersection to the Woburn Town Line.

To improve safety and accessibility for all roadway users, a new traffic signal will be installed at Cross Street, and traffic signals at the Route 62 and Route 129 intersections will be upgraded. Granite curb, guardrails, and bridge rail over the Maple Meadow Brook Bridge will be installed, and signage and pavement markings will be refreshed. Existing granite curbs will be removed and reset as part of the project. The curbs on both sides of the road will help channel water to the proposed closed drainage system; areas with curbs on only one side of the road will utilize country drainage. Existing headwalls, outfalls, catch basins, and culverts will be replaced as necessary. Landscape work involves establishing a wetland replication area near Station 256+50 Left, planting trees and shrubs, spreading loam and seed, and installing erosion control devices.

Existing underground utilities in the project area include electric, telecommunication, water, sewer, and gas lines. Sections of the gas line will be relocated, and the Town of Wilmington will fund the installation of a new water system along Route 38 from the Route 62 intersection to Eames Street. Project work will primarily occur within the existing state highway layout (SHLO), which is typically 50 feet wide, but numerous temporary and permanent easements are required.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

N/A

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

N/A

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

See plans

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

Review of the National Register of Historic Places (NRHP) and the Inventory of Historical Assets of the Commonwealth in MACRIS revealed one listed district in the vicinity of the project area: Middlesex Canal Historic and Archaeological District (WMG.H). The Middlesex Canal District in Wilmington extends 3.8 miles southerly and encompasses 25 historic resources, which date from circa 1802 onward. There are no resources associated with the former canal within the project's area of potential effect (APE).

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APPENDIX A (continued)

Inventoried properties in the vicinity of the project area include: WMG.41 (Richardson, Heartwell House), which was demolished, WMG.906 (Dublin Street Signal Bridge), WMG.909 (Main Street Bridge), and WMG.911 (B&M RR New Hampshire Main Line Bridge). Excluding WMG.909, these resources are outside the direct APE and will not be impacted by the proposed work. WMG.909, a steel-girder bridge built in 1928, is within the APE, but the Massachusetts Historical Commission determined in 1981 that it is not eligible for the NRHP and recommended it be replaced. The bridge roadway will be resurfaced, but no other work on WMG.909 is proposed as part of this project.

Review of the MHC archaeological base maps in MACRIS revealed no recorded pre-Contact archaeological sites in the vicinity of the project area. The nearest recorded pre-Contact sites include 19-MD-324 (Bucks Hill), 19-MD-435 (Burill Field), and 19-MD-991 (Maple Meadow Brook Site), which are located between 0.35–0.55 miles east of the project area, and 19-MD-674 (unnamed), which is located 0.9 miles west of the project area. The nearest recorded historical sites include WMG.HA.2 (Maple Meadow Aqueduct Stone Quarry), WMG.HA.6 (911 Main Street Middlesex Canal Towpath), and WMG.HA.7 (Middlesex Canal Maple Meadow Brook Aqueduct), which are located between 0.1–0.2 miles west of the project area. These historical sites are contributing properties to the Middlesex Canal Historic and Archaeological District.

Numerous archaeological surveys have been conducted since 1976 in advance of utility projects in the vicinity of the Route 38 project area. A 1990 survey, which involved the excavation of 1,372 shovel test pits, including 45 bracket units and 8 judgmental units, recovered pre-Contact artifacts from 15 areas. These artifacts were either surface finds or isolated finds in shovel test pits and not considered archaeologically significant. Two pre-Contact sites were also identified, but no further work was recommended (see MHC Report #25-989). Surveys have not identified any significant historical sites associated with the Middlesex Canal in the project area.

Although the Middlesex Canal alignment is near the project area, it is the opinion of the MassDOT Archaeologist, Megan Postemski, that the project's direct APE has low sensitivity based on the absence of recorded sites, the results of previous archaeological surveys, the impacts of previous roadway, drainage, and utility construction, and roadway development. Work will be confined to disturbed areas within and adjacent to the roadway. Underground utilities such as electric, telecommunication, water, sewer, and gas lines are located within the project's direct APE. A review of borings and test pits conducted by New England Boring Contractors in 2020 indicates that in the vicinity of the proposed retaining wall, soils generally consisted of 11.2–26.5 feet of fill overlying cobbles and glacial till.

What is the total acreage of the project area?

			Productive Resources:		
Woodland	_____	acres			
Wetland	_____	acres	Agriculture	_____	acres
Floodplain	_____	acres	Forestry	_____	acres
Open Space	_____	acres	Mining/Extraction	_____	acres
Developed	_____	acres	Total Project Acreage	_____	acres

What is the acreage of the proposed new construction? _____ acres

What is the present land use of the project area?

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

The project area consists of Route 38 and rural residential and commercial development.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of person submitting this form: Megan D Postemski **Date:** 10/10/23

Name: Megan Postemski

Address: 10 Park Plaza

City/Town/Zip: Boston, MA 02717

Telephone: Email: megan.d.postemski@dot.state.ma.us

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC:

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name:	Reconstruction on Route 38 (Main Street), from Route 62 to the Woburn C.L. (MassDOT Project #608051)
Location /Address:	Route 38 between the Route 62 intersection and Woburn City Line
City/Town:	Wilmington

Project Proponent

Name:	Massachusetts Department of Transportation
Address:	10 Park Plaza
City/Town/Zip/Telephone:	Boston, MA 02116

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	**Type of License or funding (specify)**
FHWA	Federal Funding (FHWA is lead federal agency)
USACOE	Section 404 Permit

Project Description (narrative):

The Massachusetts Department of Transportation (MassDOT) and the Town of Wilmington are proposing to expend federal funds to reconstruct an approximately 2.2-mile segment of Route 38 (Main Street) that extends southerly between the Route 38 and Route 62 (Burlington Avenue and Church Street) intersection and the Woburn City Line.

The existing two-lane two-way road will be reconstructed and widened to generally provide two 11-foot travel lanes and two 5-foot bicycle lanes along the project corridor. There will be two 11-foot southbound travel lanes and a 2-foot shoulder for 900 feet south of the Route 38 and Route 62 intersection. The existing Route 38 pavement requires full-depth reconstruction from Route 62 to Eames Street, except for the Route 38 and Route 129 (Lowell Street) intersection, which will be milled and resurfaced. Micro-milling and resurfacing are also proposed along Route 38 from Eames Street to the Woburn City Line.

Project work at the intersection of Route 38 and Route 62 will include minor widening, re-striping to provide additional or improved turning lanes for the northern, southern, and western legs of the intersection, and adding bicycle detection, as well as construction of a new retaining wall along the MBTA railroad tracks south of this intersection.

At the intersection of Route 38 and Route 129 (Lowell Street), project work will be minimal and include only pavement resurfacing and minor widening because this section of Route 38 was reconstructed relatively recently.

At the intersection of Route 38 with Cross Street and Butters Row, the side street approaches will be realigned and a left turn lane from northbound Route 38 to Butters Row will be added. Realignment is proposed for the Route 38 intersections with Eames Street and Old Main Street as well.

The project will also develop pedestrian and bicycle accommodations along the Route 38 (Main Street) corridor, especially in the vicinity of the MBTA Wilmington Commuter Rail Station and the Yentile Farm recreational facility. In addition to the two 5-foot bicycle lanes along Route 38, a 5.5-foot ADA-compliant concrete sidewalk with wheelchair accessible ramps will be constructed on one or both sides of the roadway depending on location. There is an existing sidewalk on the east side of the road from Church Street to 579 Main Street and on both sides of the roadway from 579 Main Street to just south of the Lowell Street intersection. There are no existing sidewalks from just south of the Lowell Street intersection to the Woburn Town Line.

To improve safety and accessibility for all roadway users, a new traffic signal will be installed at Cross Street, and traffic signals at the Route 62 and Route 129 intersections will be upgraded. Granite curb, guardrails, and bridge rail over the Maple Meadow Brook Bridge will be installed, and signage and pavement markings will be refreshed. Existing granite curbs will be removed and reset as part of the project. The curbs on both sides of the road will help channel water to the proposed closed drainage system; areas with curbs on only one side of the road will utilize country drainage. Existing headwalls, outfalls, catch basins, and culverts will be replaced as necessary. Landscape work involves establishing a wetland replication area near Station 256+50 Left, planting trees and shrubs, spreading loam and seed, and installing erosion control devices.

Existing underground utilities in the project area include electric, telecommunication, water, sewer, and gas lines. Sections of the gas line will be relocated, and the Town of Wilmington will fund the installation of a new water system along Route 38 from the Route 62 intersection to Eames Street. Project work will primarily occur within the existing state highway layout (SHLO), which is typically 50 feet wide, but numerous temporary and permanent easements are required.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

N/A

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

N/A

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

See plans

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

Review of the National Register of Historic Places (NRHP) and the Inventory of Historical Assets of the Commonwealth in MACRIS revealed one listed district in the vicinity of the project area: Middlesex Canal Historic and Archaeological District (WMG.H). The Middlesex Canal District in Wilmington extends 3.8 miles southerly and encompasses 25 historic resources, which date from circa 1802 onward. There are no resources associated with the former canal within the project's area of potential effect (APE).

APPENDIX A (continued)

Inventoried properties in the vicinity of the project area include: WMG.41 (Richardson, Heartwell House), which was demolished, WMG.906 (Dublin Street Signal Bridge), WMG.909 (Main Street Bridge), and WMG.911 (B&M RR New Hampshire Main Line Bridge). Excluding WMG.909, these resources are outside the direct APE and will not be impacted by the proposed work. WMG.909, a steel-girder bridge built in 1928, is within the APE, but the Massachusetts Historical Commission determined in 1981 that it is not eligible for the NRHP and recommended it be replaced. The bridge roadway will be resurfaced, but no other work on WMG.909 is proposed as part of this project.

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What is the total acreage of the project area?

Woodland	_____	acres	Productive Resources:		
Wetland	_____	acres	Agriculture	_____	acres
Floodplain	_____	acres	Forestry	_____	acres
Open Space	_____	acres	Mining/Extraction	_____	acres
Developed	_____	acres	Total Project Acreage	_____	acres

What is the acreage of the proposed new construction? _____ acres

What is the present land use of the project area?

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

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Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of person submitting this form: Megan D. Postemski **Date:** 10/10/23

Name: Megan Postemski

Address: 10 Park Plaza

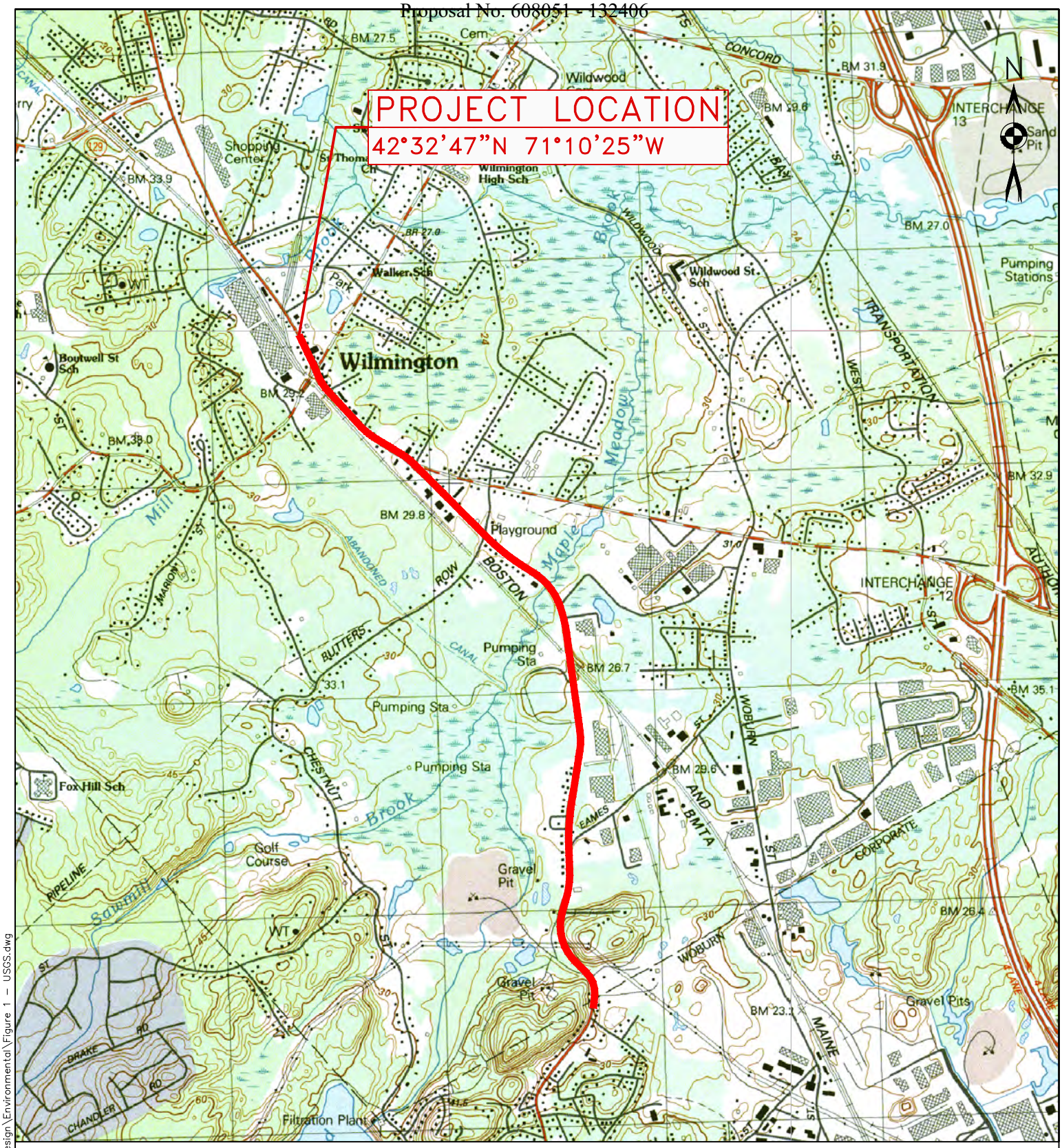
City/Town/Zip: Boston, MA 02717

Telephone: Email: megan.d.postemski@dot.state.ma.us

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

CC:



SCALE IN FEET

1000 0 1000 2000

ELEVATIONS IN METERS

USGS LOCUS MAP

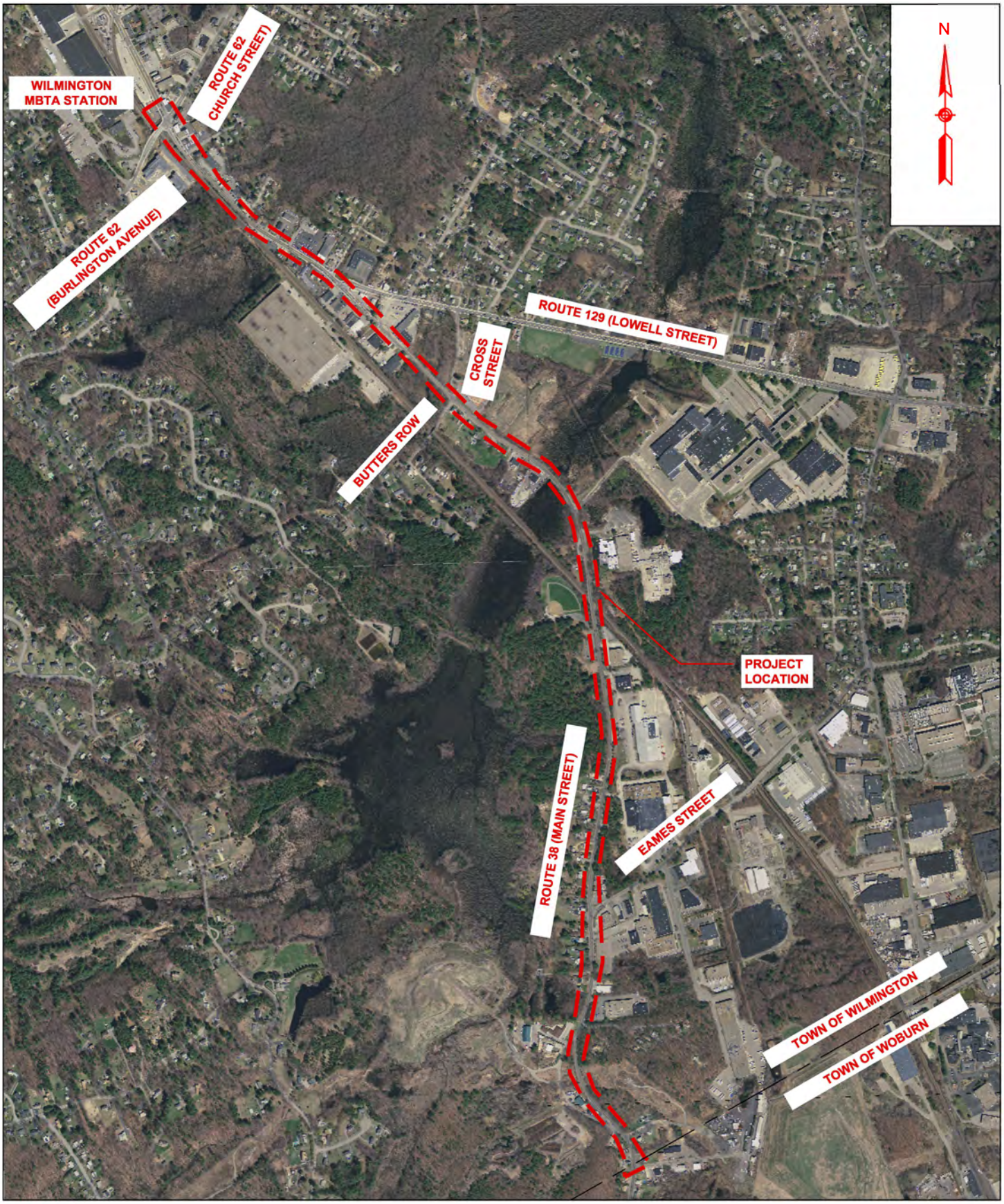
WILMINGTON – RECONSTRUCTION ON ROUTE 38 (MAIN STREET)
FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS
239 LITTLETON RD, WESTFORD, MA (978) 923-0400
24 ALBION RD, LINCOLN, RI (401) 305-7895

PREPARED FOR:
massDOT
Massachusetts Department of Transportation
Highway Division

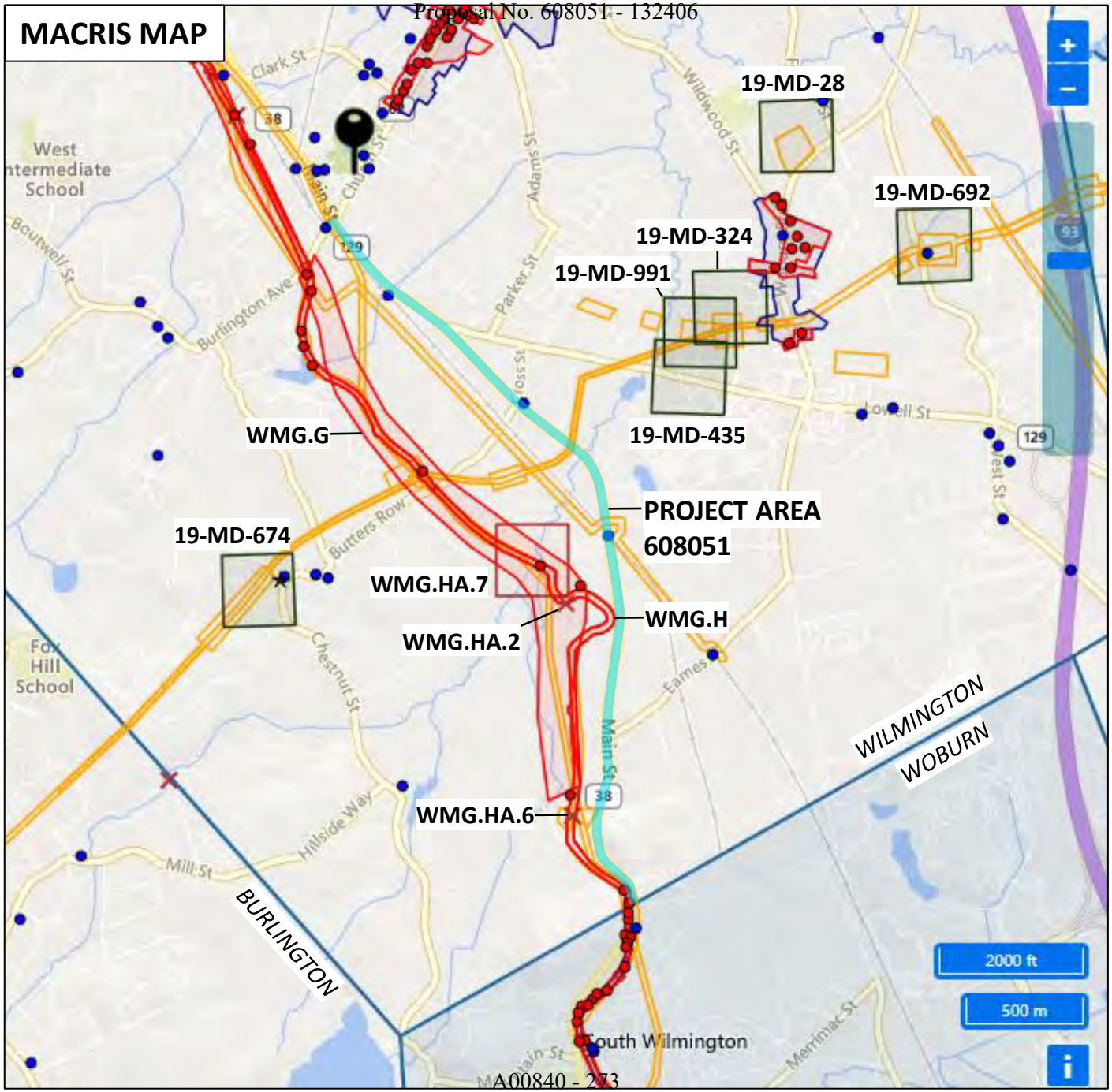
SCALE: AS NOTED	PROJECT NO. 16043.014	FIGURE 1
DATE: 10/18/2016	DRAWN BY: EA	
REVISED:	CHECKED BY: MC	

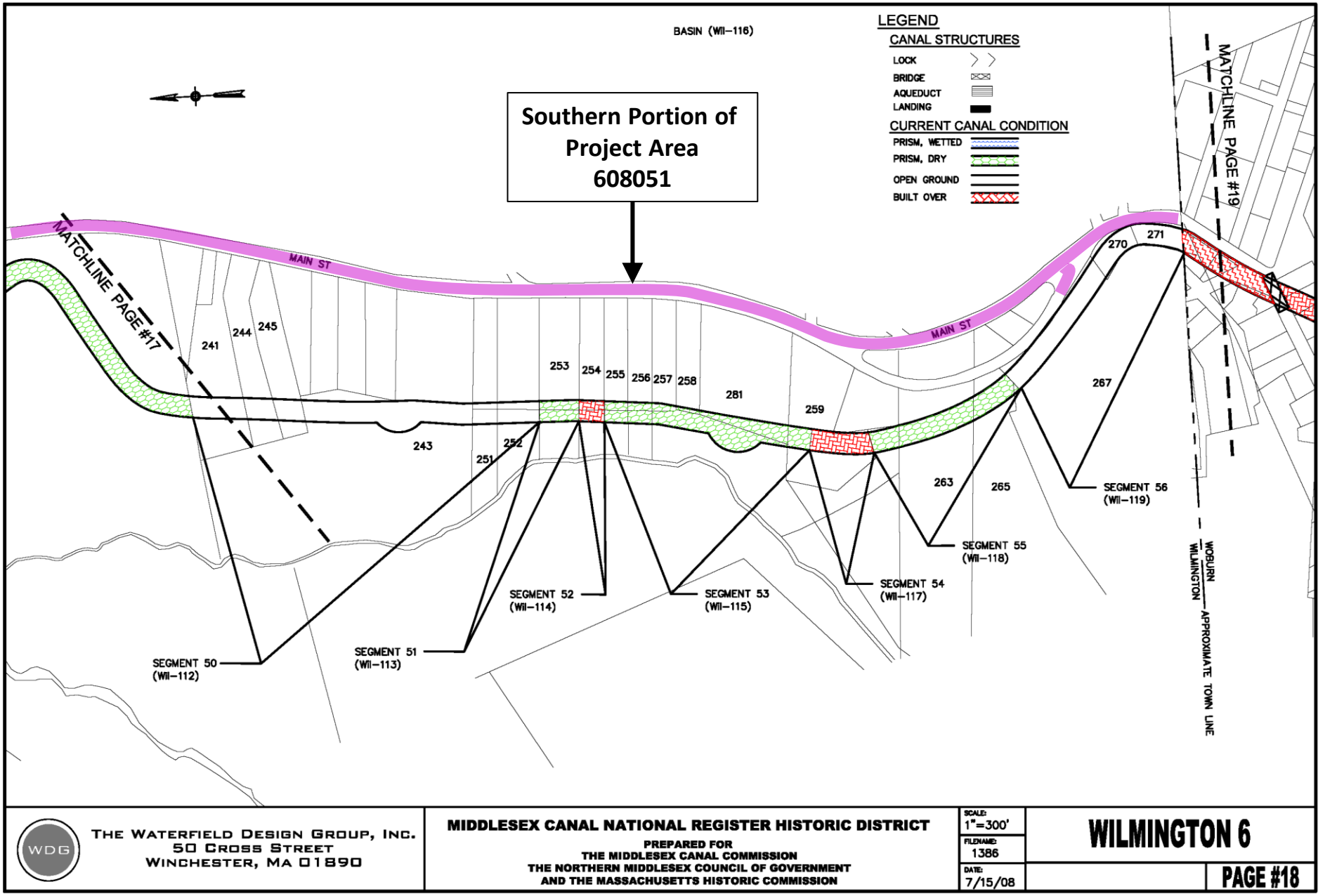
F:\Projects\2016\16043\608051\DWG\Current Design\Environmental\Figure 1 – USGS.dwg



GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS

Figure 1
Project #608051
Locus Map
Route 38
Wilmington, MA


MACRIS MAP
19-MD-28
19-MD-692
19-MD-324
19-MD-991
19-MD-435
WMG.G
PROJECT AREA
608051
19-MD-674
WMG.HA.7
WMG.H
WMG.HA.2
WMG.HA.6
WILMINGTON
WOBURN
BURLINGTON
West Intermediate School
Fox Hill School
South Wilmington
Clark St
Burlington Ave
Butters Row
Chestnut St
Hillside Way
Mill St
Main St
Parker St
Adams St
Wildwood St
Lowell St
Eames
Merrimac St
2000 ft
500 m



THE WATERFIELD DESIGN GROUP, INC.
50 CROSS STREET
WINCHESTER, MA 01890

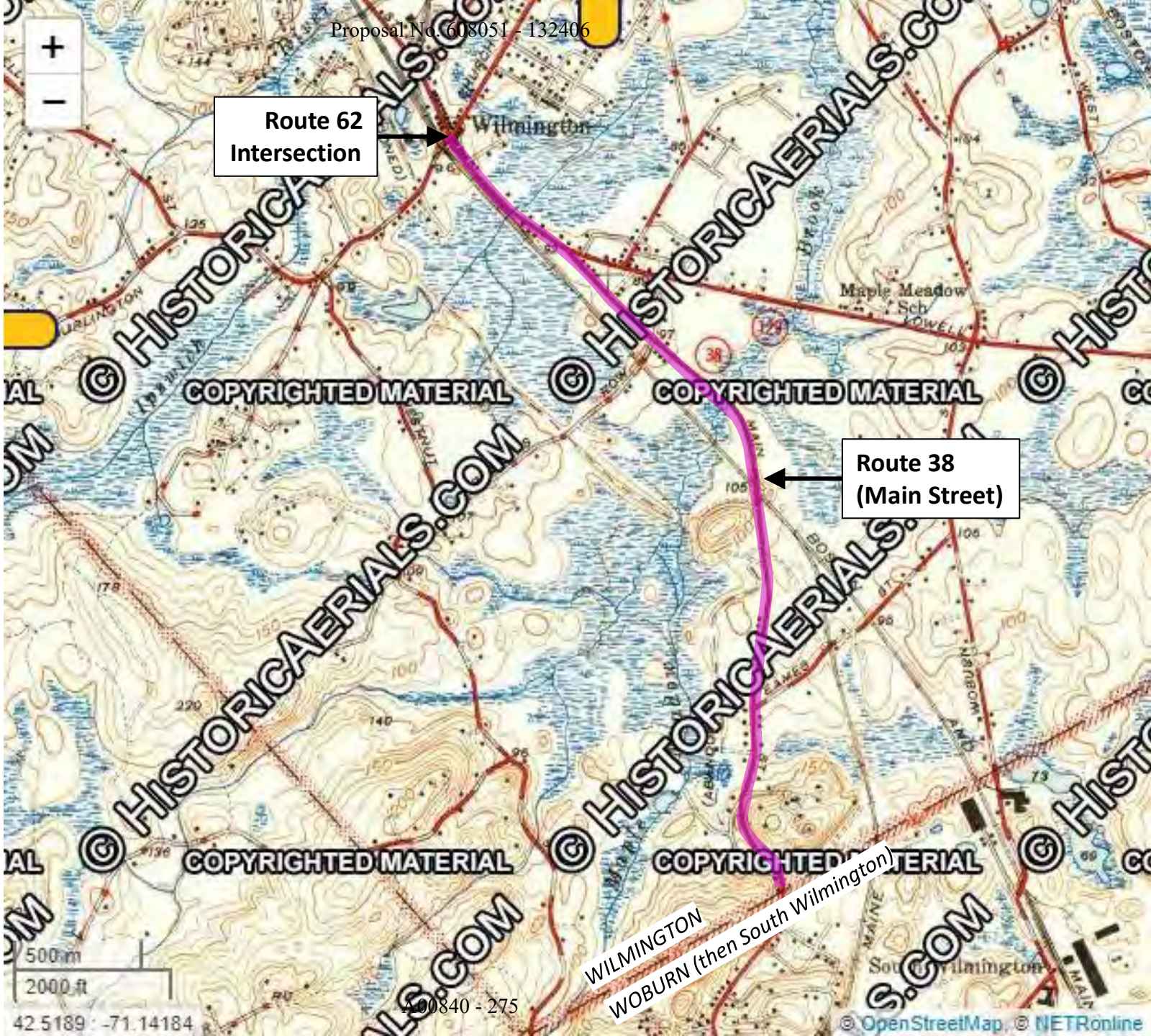
MIDDLESEX CANAL NATIONAL REGISTER HISTORIC DISTRICT

PREPARED FOR
THE MIDDLESEX CANAL COMMISSION
THE NORTHERN MIDDLESEX COUNCIL OF GOVERNMENT
AND THE MASSACHUSETTS HISTORIC COMMISSION

SCALE: 1"=300'
FILENAME: 1386
DATE: 7/15/08

WILMINGTON 6

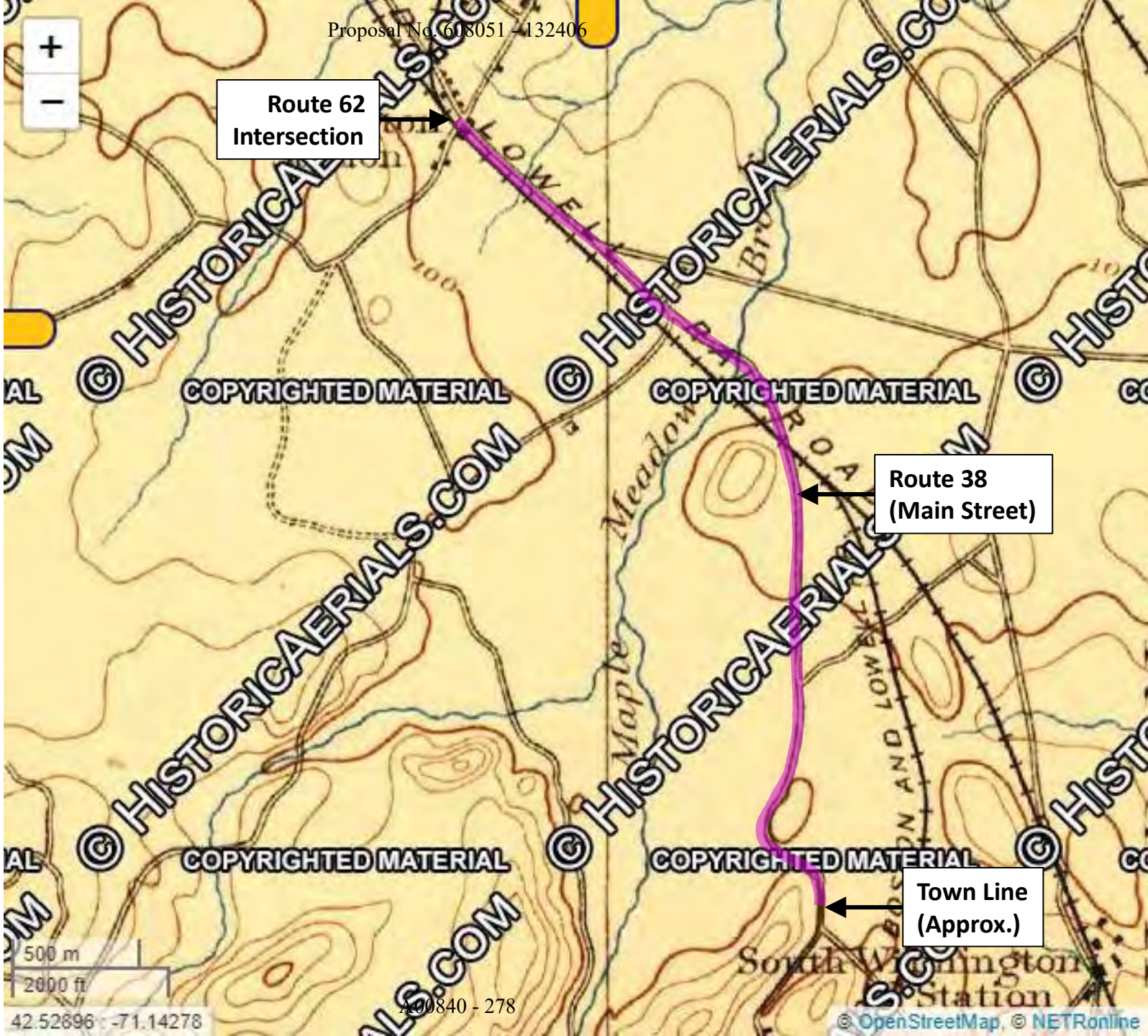
PAGE #18



Topo Map
1944

Aerial Imagery
1938

Topo Map
1918



Topo Map
1888

Postemski, Megan D. (DOT)

From: Postemski, Megan D. (DOT)
Sent: Tuesday, October 10, 2023 2:38 PM
To: Robinson, David S (EEA)
Subject: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction
Attachments: 20231010 Wilmington Rt 38 PNF & Maps (608051).pdf; 608051 Pages from Plans - 75%.pdf

Tracking:

Recipient	Delivery
Robinson, David S (EEA)	Delivered: 10/10/2023 2:38 PM

David,

MassDOT is submitting information for the above-referenced project to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us.

Thank you,
Megan

Megan Postemski, Archaeologist
Environmental Services Section
MassDOT – Highway Division
10 Park Plaza
Boston, MA 02116

Postemski, Megan D. (DOT)

From: Microsoft Outlook
To: Robinson, David S (EEA)
Sent: Tuesday, October 10, 2023 2:38 PM
Subject: Delivered: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction

Your message has been delivered to the following recipients:

Robinson, David S (EEA) (David.S.Robinson@mass.gov)

Subject: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction

MassDOT Project
608051 - Wilmi...

Postemski, Megan D. (DOT)

From: Postemski, Megan D. (DOT)
Sent: Tuesday, October 10, 2023 2:36 PM
To: thpo@wampanoagtribe-nsn.gov
Subject: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction
Attachments: 20231010 Wilmington Rt 38 PNF & Maps (608051).pdf; 608051 Pages from Plans - 75%.pdf

Dear Ms. Washington,

MassDOT is submitting information for the above-referenced project to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us.

Thank you,
Megan

Megan Postemski, Archaeologist
Environmental Services Section
MassDOT – Highway Division
10 Park Plaza
Boston, MA 02116

Postemski, Megan D. (DOT)

From: Microsoft Outlook
To: thpo@wampanoagtribe-nsn.gov
Sent: Tuesday, October 10, 2023 2:36 PM
Subject: Relayed: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

thpo@wampanoagtribe-nsn.gov (thpo@wampanoagtribe-nsn.gov)

Subject: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction

MassDOT Project
608051 - Wilmi...

Postemski, Megan D. (DOT)

From: Postemski, Megan D. (DOT)
Sent: Tuesday, October 10, 2023 2:37 PM
To: David.weeden@mwtribe-nsn.gov
Cc: 106review@mwtribe-nsn.gov
Subject: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction
Attachments: 20231010 Wilmington Rt 38 PNF & Maps (608051).pdf; 608051 Pages from Plans - 75%.pdf

Dear Mr. Weeden,

MassDOT is submitting information for the above-referenced project to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us.

Thank you,
Megan

Megan Postemski, Archaeologist
Environmental Services Section
MassDOT – Highway Division
10 Park Plaza
Boston, MA 02116

Postemski, Megan D. (DOT)

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To: David.weeden@mwtribe-nsn.gov; 106review@mwtribe-nsn.gov
Sent: Tuesday, October 10, 2023 2:37 PM
Subject: Relayed: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

David.weeden@mwtribe-nsn.gov (David.weeden@mwtribe-nsn.gov)

106review@mwtribe-nsn.gov (106review@mwtribe-nsn.gov)

Subject: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction

MassDOT Project
608051 - Wilmi...

Postemski, Megan D. (DOT)

From: Postemski, Megan D. (DOT)
Sent: Tuesday, October 10, 2023 2:39 PM
To: tashtesook@aol.com
Subject: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction
Attachments: 20231010 Wilmington Rt 38 PNF & Maps (608051).pdf; 608051 Pages from Plans - 75%.pdf

Dear Mr. Brown,

MassDOT is submitting information for the above-referenced project to the Tribal Historic Preservation Officer to meet the Section 106 consultation requirements of FHWA (lead federal agency) and the US Army Corps of Engineers. Please submit any written comments or concerns regarding historic or archaeological properties that may be affected by this project to Carrie Lavallee, P.E., Chief Engineer, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116-3973, Attn: Jameson Harwood.

You also may send comments, questions, or requests for more information by email to Jameson.Harwood@state.ma.us.

Thank you,
Megan

Megan Postemski, Archaeologist
Environmental Services Section
MassDOT – Highway Division
10 Park Plaza
Boston, MA 02116

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Sent: Tuesday, October 10, 2023 2:39 PM
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Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

tashtesook@aol.com (tashtesook@aol.com)

Subject: MassDOT Project 608051 - Wilmington Rt 38 Reconstruction

MassDOT Project
608051 - Wilmi...

GREEN INTERNATIONAL AFFILIATES, INC.
239 LITTLETON ROAD, SUITE 3, WESTFORD, MA 01886
TEL (978) 923-0400 FAX (978) 399-0033

October 20, 2017

Kathleen A. Delaney, Chairperson
Wilmington Historical Commission
430 Salem Street
Wilmington, MA 01887

Subject: **Reconstruction / Rehabilitation on Route 38 (Main Street) Wilmington, MA MassDOT File No. 608051 Section 106 Review**

Dear Ms. Delaney:

On behalf of the Massachusetts Department of Transportation – Highway Division (MassDOT), Green International Affiliates, Inc. (Green) wishes to notify you that MassDOT is proposing to reconstruct Main Street (Route 38) between Route 62 and the Woburn city line. This project will be supported in part with federal funds dispersed through the MassDOT. The project, therefore, will require review under Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). The enclosed project information is provided to you and the Wilmington Historical Commission to initiate consultation with appropriate representatives of local government in compliance with the regulations governing Section 106.

The purpose of this project is to provide safety enhancements along the southern segment of the Route 38 corridor through Wilmington for drivers and bicyclists, so as to promote improved flow of traffic.

MassDOT requests that the Wilmington Historical Commission review the enclosed materials at their earliest convenience, and solicits any comments regarding historic properties that may be within or adjacent to the project area. Please submit written comments to: Patricia A. Leavenworth, P.E., Chief Engineer, Massachusetts Department of Transportation, Highway Division, 10 Park Plaza, Boston, MA 02116, Attn: Jeffrey Shrimpton, Room 4260. Comments also may be submitted by e-mail to jeffrey.shrimpton@state.ma.us. Please include the six-digit MassDOT project number on all correspondence.

Please feel free to contact Jeffrey Shrimpton (857.368.8824) of MassDOT Highway Division's Cultural Resources Unit if you have any questions concerning this project or the Section 106 review process. Your attention to this matter is deeply appreciated.

Very Truly Yours,

Green International Affiliates, Inc.

Marc Caufield, P.E.
Senior Environmental Engineer

MRC/eca

Attached: Locus Map, Project Description
cc: Jeffrey Shrimpton, MassDOT
Brona Simon, Massachusetts Historical Commission

F:\Projects\2016\16043\608051\DOCUMENTS\Environmental\Early Environmental Coordination\Letters To Officials\Wilmington_HC.Docx

ROADWAY RECONSTRUCTION
ROUTE 38 (MAIN STREET)
FROM ROUTE 62 TO THE WOBURN CITY LINE (#608051)
WILMINGTON, MASSACHUSETTS

PROJECT DESCRIPTION

The Town of Wilmington and the Massachusetts Department of Transportation, Highway Division (MassDOT) propose to reconstruct the existing Route 38 (Main Street) roadway between its intersection with Route 62 and the Woburn city line. The road is owned and maintained by MassDOT. Route 38 is located in the southern section of the Town and runs through a variety of developed and undeveloped areas. Where land along Route 38 has been developed, land uses are primarily commercial, with sections of light industrial, and single-family residential. Route 38 is classified as an Urban Principal Arterial, with an average daily traffic flow of approximately 21,400 vehicles per day, two percent of which are estimated to be trucks.

Purpose and Need

The purpose of this project is to provide safety enhancements along the southern segment of the Route 38 corridor through Wilmington for drivers and bicyclists, so as to promote improved flow of traffic and compliance with all relevant MassDOT standards.

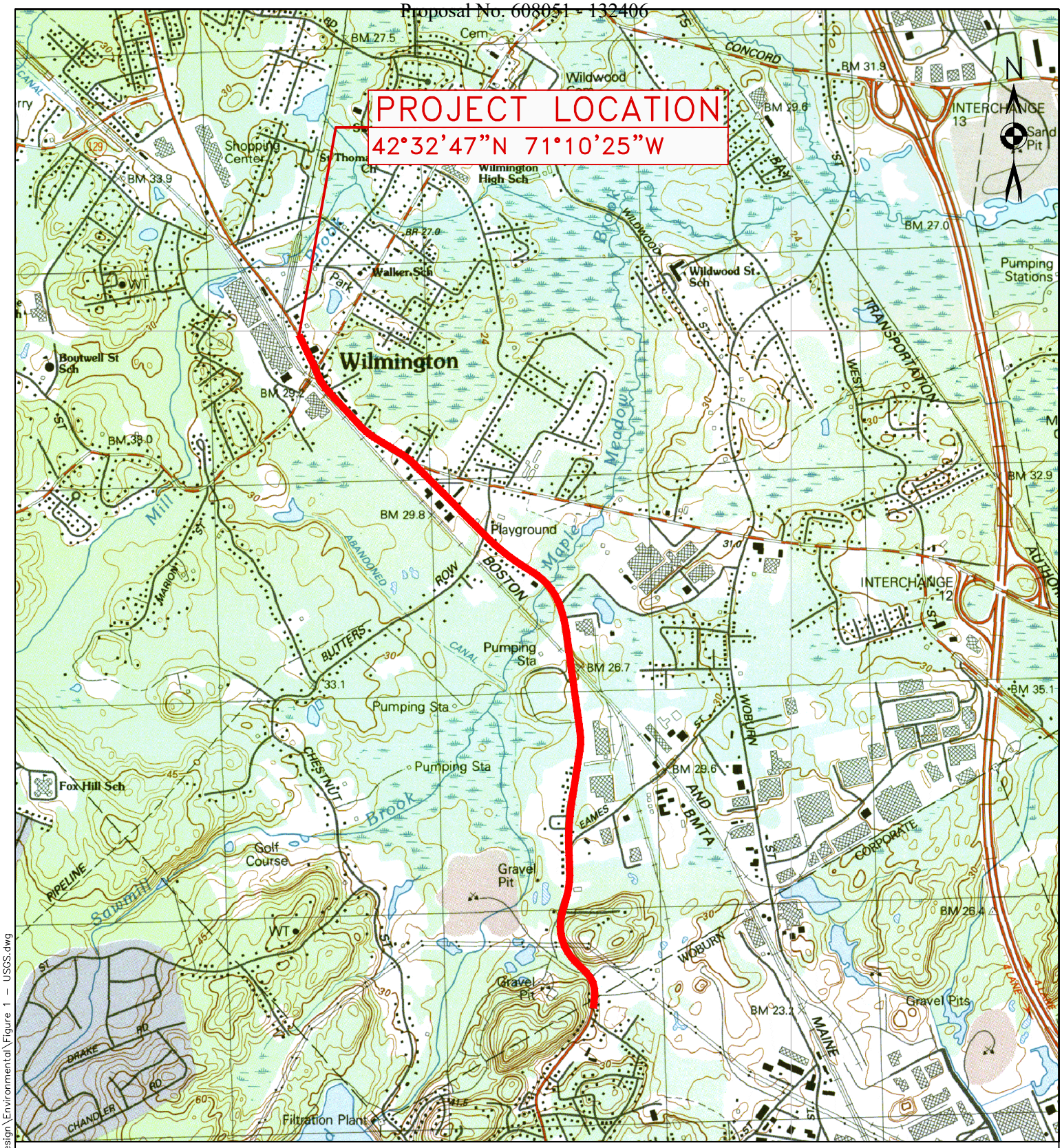
Existing Conditions

Route 38 (Main Street) is a two-lane, two-way road under MassDOT jurisdiction. Its pavement width in the project area varies from 30 feet to 46 feet wide; lane widths are approximately 14’-0” for the length of the project. Roadway pavement condition varies between fair and poor along the project corridor. There are several sections of the roadway which have sidewalks in varying conditions from good to poor.

Proposed Conditions

The project will consist of reconstructing Route 38 so that a uniform cross section is provided in each direction consisting of an 11’-0” wide travel lane, a 5’-0” wide bicycle lane, curbing and a 5’-0” wide sidewalk. This would conform to MassDOT minimum criteria for arterial roadways and also improve safety for bicyclists and pedestrians using Route 38.

The project will also include pavement resurfacing at the intersection of Route 129 (Lowell Street), installation of a new subsurface drainage system, guardrail relocation, a mid-block crossing in the proximity of Maple Meadow Brook, sewer and water improvements, and upgrading signage and pavement markings to improve driver safety along the project corridor. New signage and pavement markings also will be provided to enhance safety for bicyclists on the widened roadway.



USGS LOCUS MAP

WILMINGTON – RECONSTRUCTION ON ROUTE 38 (MAIN STREET)
FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS
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PREPARED FOR:
massDOT
Massachusetts Department of Transportation
Highway Division

SCALE: AS NOTED
PROJECT NO. 16043.014
DATE: 10/18/2016
DRAWN BY: EA
REVISED:
CHECKED BY: MC

FIGURE 1

SCALE IN FEET
1000 0 1000 2000
ELEVATIONS IN METERS

F:\Projects\2016\16043\608051\DWG\Current Design\Environmental\Figure 1 – USGS.dwg

Section 4(f) *de minimis* Impact Determination [per 23 CFR 771]

NOTE: *De minimis* impacts are defined as those that, after considering any measures to minimize harm, do not adversely affect the activities, features or attributes that qualify a significant public park, recreation area, or wildlife and/or waterfowl refuge for protection under Section 4(f) of the DOT of 1966, as amended.

This form is prepared to document the analysis of planned impacts to a Section 4(f) facility and seek concurrence from the official with jurisdiction that the below-referenced MassDOT federal-aid transportation project's minor impacts would not adversely affect the operation/function of the subject resource.

Project Information Table

Project Proponent:	MassDOT
Project Name:	WILMINGTON #608051- RECONSTRUCTION ON ROUTE 38 (MAIN STREET), FROM ROUTE 62 TO THE WOBURN C.L.
Municipality:	Wilmington
Project Description:	The project includes roadway improvements to approximately 2.1 miles of Route 38 (Main Street) to reduce traffic and improve safety for all modes of transportation. The project improvements include full-depth reconstruction of Route 38 from Route 62 to Eames Street except for Route 38/Route 129 intersection, which will be milled and resurfaced. Bicycle and pedestrian accommodations will also be enhanced through the addition of two 5-foot bicycle lanes and a 5'-6" sidewalk along the project corridor. Other improvements include enhancements to the existing closed drainage system and upgrades to the signage and pavement markings throughout the project corridor.
Section 4(f) Resource:	Wilmington Dog Park
Type of Section 4(f) Resource:	Recreational Area
Official with Jurisdiction:	Eric Slagle
Impacts to Section 4(f) Resource:	The project will require six permanent easements totaling 9,084 square feet on the Wilmington Dog Park.. The permanent easements are required to construct a detention basin and guardrail, as well as some maintenance work that includes relocating a hydrant. The project also will require four temporary easements totaling 12,597 square feet on the Wilmington Dog Park. The temporary easements are required for grading, clearing & grubbing, and loam & seed. A temporary easement does not constitute a "use" under Section 4(f) if the Official with Jurisdiction is satisfied that the following conditions will be met: 1. *Duration (of the occupancy of the dog park) will be temporary, i.e., less than the time needed for construction of the project, and there will be no change in ownership of the land;*

Ten Park Plaza, Suite 4140, Boston, MA, 02116
Tel: 857-368-4636, TTY: 857-368-0655
www.mass.gov/massdot

	2. *The scope of the work is minor, i.e., both the nature and the magnitude of the changes to the 4(f) resource are minimal;* 3. *There is no anticipated permanent adverse physical impacts, nor will there be interference with the activities or purpose of the resource, on either a temporary or permanent basis;* 4. *The land being used will be fully restored, i.e., the resource will be returned to a condition which is at least as good as that which existed prior to the project;* 5. *Per this email and written concurrence herein, as the "official with jurisdiction" you are in agreement regarding the above-mentioned conditions.*
Measures to Minimize Harm to Section 4(f) Resource:	Per FHWAs Section 4(f) policy paper, a de minimis impact determination considers all avoidance, minimization, mitigation, and/or enhancement measures. The easements serve to enhance the drainage network and improve safety and access for all users. The proposed work will not adversely affect the activities, features, or attributes that make the property eligible for Section 4(f) protection.
Public Outreach and public comments:	Public input was sought for the De Minimis impact determination through a legal notice advertised in the Wilmington Town Crier on 5/8/2024. A 25% virtual design public hearing was held on 6/12/2020. No significant concerns or issues have been raised by public comment to date.

Summary and Determination

Based on the minor scope of the above-referenced impacts, including measures to minimize harm, MassDOT Highway Division has determined that the project will not adversely affect the activities, features or attributes that qualify the resource for protection under Section 4(f).

MassDOT Intent to make a *De Minimis* Determination

This notification hereby serves to inform the official with jurisdiction of MassDOT's intent to make a *de minimis* impact determination for the described proposed "use" of the subject Section 4(f) resource.

Jeffrey Shrimpton, Program Engineer for Design
MassDOT Highway Division

Date 7/25/2024

Section 4 (f) *De Minimis* Finding Concurrence

After consideration of any comments received from the public, as the official with jurisdiction over said resource, I hereby concur with the determination that "use" will not adversely affect the activities, features, and attributes that qualify the property for protection under Section 4(f).

Eric Slagle
Town Manager
Town of Wilmington

7/24/2024
Date

MassDOT Request for Federal Highway Administration (FHWA) Approval

MassDOT Highway Division requests final approval from FHWA that the proposed "use" of the above described Section 4(f) resource meets the criteria of a *de minimis* impact, as specified under 23 CFR 774.17.

Division Administrator
Federal Highway Administration
Massachusetts Division

Date

Section 4(f) *de minimis* Impact Determination [per 23 CFR 771]

NOTE: *De minimis* impacts are defined as those that, after considering any measures to minimize harm, do not adversely affect the activities, features or attributes that qualify a significant public park, recreation area, or wildlife and/or waterfowl refuge for protection under Section 4(f) of the DOT of 1966, as amended.

This form is prepared to document the analysis of planned impacts to a Section 4(f) facility and seek concurrence from the official with jurisdiction that the below-referenced MassDOT federal-aid transportation project's minor impacts would not adversely affect the operation/function of the subject resource.

Project Information Table

Project Proponent:	MassDOT
Project Name:	WILMINGTON 608051 - RECONSTRUCTION ON ROUTE 38 (MAIN STREET), FROM ROUTE 62 TO THE WOBURN C.L.
Municipality:	Wilmington
Project Description:	The project includes roadway improvements to approximately 2.1 miles of Route 38 (Main Street) to reduce traffic and improve safety for all modes of transportation. The project improvements include full-depth reconstruction of Route 38 from Route 62 to Eames Street except for Route 38/Route 129 intersection, which will be milled and resurfaced. Bicycle and pedestrian accommodations will also be enhanced through the addition of two 5-foot bicycle lanes and a 5'-6" sidewalk along the project corridor. Other improvements include enhancements to the existing closed drainage system and upgrades to the signage and pavement markings throughout the project corridor.
Section 4(f) Resource:	Yentile Farm Recreational Facility
Type of Section 4(f) Resource:	Recreational Area
Official with Jurisdiction:	Eric Slagle
Impacts to Section 4(f) Resource:	The project will require one fee taking totaling 1,099 square feet and six permanent easements totaling 5,795 square feet on the Yentile Farm Recreational Facility. The fee taking and permanent easements are required for roadway widening and sidewalk construction, utility pole relocation, and drainage outfall construction. Five Temporary easements totaling 4,186 square feet are also required on the Yentile Farm Recreational Facility. The temporary easements are required for grading, loam and seed, and other maintenance activities. A temporary easement does not constitute a "use" under Section 4(f) if the Official with Jurisdiction is satisfied that the following conditions will be met: 1. *Duration (of the occupancy of Yentile Farm Recreational Area) will be temporary, i.e., less than the time needed for construction of the project, and there will be no change in ownership of the land;*

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Tel: 857-368-4636, TTY: 857-368-0655
www.mass.gov/massdot

	2. *The scope of the work is minor, i.e., both the nature and the magnitude of the changes to the 4(f) resource are minimal;* 3. *There is no anticipated permanent adverse physical impacts, nor will there be interference with the activities or purpose of the resource, on either a temporary or permanent basis;* 4. *The land being used will be fully restored, i.e., the resource will be returned to a condition which is at least as good as that which existed prior to the project;* 5. *Per this email and written concurrence herein, as the "official with jurisdiction" you are in agreement regarding the above-mentioned conditions.*
Measures to Minimize Harm to Section 4(f) Resource:	Per FHWAs Section 4(f) Policy Paper, a de minimis impact determination considers all avoidance, minimization, mitigation, and/or enhancement measures. The easements serve to enhance the drainage network and improve safety and access for all users. The proposed work will not adversely affect the activities, features, or attributes that make the property eligible for Section 4(f) protection.
Public Outreach and public comments:	Public input was sought for the De Minimis impact determination through a legal notice advertised in the Wilmington Town Crier on 5/8/2024. A 25% virtual design public hearing was held on 6/12/2020. No significant concerns or issues have been raised by public comment to date.

Summary and Determination

Based on the minor scope of the above-referenced impacts, including measures to minimize harm, MassDOT Highway Division has determined that the project will not adversely affect the activities, features or attributes that qualify the resource for protection under Section 4(f).

MassDOT Intent to make a *De Minimis* Determination

This notification hereby serves to inform the official with jurisdiction of MassDOT's intent to make a *de minimis* impact determination for the described proposed "use" of the subject Section 4(f) resource.

Jeffrey Shrimpton, Program Engineer for Design
MassDOT Highway Division

7/25/2024
Date

Section 4 (f) *De Minimis* Finding Concurrence

After consideration of any comments received from the public, as the official with jurisdiction over said resource, I hereby concur with the determination that "use" will not adversely affect the activities, features, and attributes that qualify the property for protection under Section 4(f).

Eric Slagle
Town Manager
Town of Wilmington

7/24/2024
Date

MassDOT Request for Federal Highway Administration (FHWA) Approval

MassDOT Highway Division requests final approval from FHWA that the proposed "use" of the above described Section 4(f) resource meets the criteria of a *de minimis* impact, as specified under 23 CFR 774.17.

Division Administrator (or designee)
Federal Highway Administration
Massachusetts Division

Date

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 10/10/2024 13:38:13 UTC
Project code: 2024-0120128
Project Name: 608051 - WILMINGTON- RECONSTRUCTION ON ROUTE 38

Subject: Concurrence verification letter for the '608051 - WILMINGTON- RECONSTRUCTION ON ROUTE 38' project under the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (NLEB).

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated October 10, 2024 to verify that the **608051 - WILMINGTON- RECONSTRUCTION ON ROUTE 38** (Proposed Action) may rely on the concurrence provided in the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures. **At least one of the qualification interview questions indicated an activity or portion of your project is consistent with a not likely to adversely affect determination therefore, the overall determination for your project is, may affect, and is not likely to adversely affect (NLAA) the endangered Indiana bat (*Myotis sodalis*) and/or the endangered northern long-eared bat (*Myotis septentrionalis*)**. Consultation with the Service pursuant to section 7(a)(2) of ESA (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) is required.

The Service has 14 calendar days to notify the lead Federal action agency or designated non-federal representative if we determine that the Proposed Action does not meet the criteria for a NLAA determination under the PBO. If we do not notify the lead Federal action agency or designated non-federal representative within that timeframe, you may proceed with the Proposed Action under the terms of the NLAA concurrence provided in the PBO. This verification period

allows Service Field Offices to apply local knowledge to implementation of the PBO, as we may identify a small subset of actions having impacts that were unanticipated. In such instances, Service Field Offices may request additional information that is necessary to verify inclusion of the proposed action under the PBO.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities: If your initial bridge/culvert or structure assessment documented signs of bat use or occupancy, or an assessment failed to detect Indiana bats and/or NLEBs, yet are later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of any potential take. In these instances, potential incidental take of Indiana bats and/or NLEBs is covered under the Incidental Take Statement in the 2018 FHWA, FRA, FTA PBO (provided that the take is reported to the Service).

If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA Section 7(a)(2) may be required.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities:
If your initial bridge/culvert or structure assessments failed to detect Indiana bats and/or NLEB use or occupancy, yet bats are later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of the incident. In these instances, potential incidental take of Indiana bats and/or NLEBs may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species, and/or any designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please contact this Service Office.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered

PROJECT DESCRIPTION

The following project name and description was collected in IPaC as part of the endangered species review process.

NAME

608051 - WILMINGTON- RECONSTRUCTION ON ROUTE 38

DESCRIPTION

608051 - WILMINGTON- RECONSTRUCTION ON ROUTE 38 (MAIN STREET), FROM ROUTE 62 TO THE WOBURN C.L.

project will reconstruct Route 38 from Route 62 to the Woburn City line. The roadway will consist of two 11 foot lanes, two 5 foot bike lanes and a 6 foot sidewalk. Turn lanes and upgraded traffic signals will be installed at Route 62.

Project limits DOES NOT include work on bridge W-38-002

Tricolored Bat: Proposed Endangered Species only. The project action will not jeopardize the continued existence of a proposed species.

Monarch Butterfly: Candidate Species only, no conservation measures at this time.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.533519,-71.15924573280542,14z

DETERMINATION KEY RESULT

Based on your answers provided, this project(s) may affect, but is not likely to adversely affect the endangered Indiana bat and/or the endangered northern long-eared bat, therefore, consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required. However, also based on your answers provided, this project may rely on the concurrence provided in the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

QUALIFICATION INTERVIEW

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the northern long-eared bat[1]?

   [1] See northern long-eared bat species profile

   Automatically answered
   Yes

3. Which Federal Agency is the lead for the action?

   A) Federal Highway Administration (FHWA)

4. Are *all* project activities limited to non-construction[1] activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

   [1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

   No

5. Does the project include *any* activities that are **greater than** 300 feet from existing road/rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   No

6. Does the project include *any* activities **within** 0.5 miles of a known Indiana bat and/or NLEB hibernaculum[1]?

   [1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

   No

7. Is the project located **within** a karst area?

   No

8. Is there *any* suitable[1] summer habitat for Indiana Bat or NLEB **within** the project action area[2]? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   [2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the User's Guide for the Range-wide Programmatic Consultation for Indiana Bat and Northern Long-eared Bat.

   Yes

9. Will the project remove *any* suitable summer habitat[1] and/or remove/trim any existing trees **within** suitable summer habitat?

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   Yes

10. Will the project clear more than 20 acres of suitable habitat per 5-mile section of road/rail?

    No

11. Have presence/probable absence (P/A) summer surveys[1][2] been conducted[3][4] **within** the suitable habitat located within your project action area?

    [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

    [2] Presence/probable absence summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate distance from hibernacula) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    [3] For projects within the range of either the Indiana bat or NLEB in which suitable habitat is present, and no bat surveys have been conducted, the transportation agency will assume presence of the appropriate species. This assumption of presence should be based upon the presence of suitable habitat and the capability of bats to occupy it because of their mobility.

    [4] Negative presence/probable absence survey results obtained using the summer survey guidance are valid for a minimum of two years from the completion of the survey unless new information (e.g., other nearby surveys) suggest otherwise.

    Yes

    SUBMITTED DOCUMENTS

    - *608051_Wilmington-bat_acoustic_report_2023.pdf https://ipac.ecosphere.fws.gov/project/RZEIN5M225HN5DTRAKLKCYNUKE/projectDocuments/146781987*

12. Did the presence/probable absence (P/A) summer surveys detect Indiana bats and/or NLEB[1]?

    [1] P/A summer surveys conducted within the fall swarming/spring emergence home range of a documented Indiana bat hibernaculum (contact local Service Field Office for appropriate home range) that result in a negative finding requires additional consultation with the local Service Field Office to determine if clearing of forested habitat is appropriate and/or if seasonal clearing restrictions are needed to avoid and minimize potential adverse effects on fall swarming and spring emerging Indiana bats.

    No

13. Were the P/A summer surveys conducted **within** the fall swarming/spring emergence range of a documented Indiana bat hibernaculum[1]?

    [1] Contact the local Service Field Office for appropriate distance from hibernacula.

    No

14. Does the project include activities **within documented NLEB habitat**[1][2]?

    [1] Documented roosting or foraging habitat – for the purposes of this consultation, we are considering documented habitat as that where Indiana bats and/or NLEB have actually been captured and tracked using (1) radio telemetry to roosts; (2) radio telemetry biangulation/triangulation to estimate foraging areas; or (3) foraging areas with repeated use documented using acoustics. Documented roosting habitat is also considered as suitable summer habitat within 0.25 miles of documented roosts.)

    [2] For the purposes of this key, we are considering documented corridors as that where Indiana bats and/or NLEB have actually been captured and tracked to using (1) radio telemetry; or (2) treed corridors located directly between documented roosting and foraging habitat.

    No

15. Will the removal or trimming of habitat or trees occur **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors?

    Yes

16. What time of year will the removal or trimming of habitat or trees **within** suitable but **undocumented NLEB** roosting/foraging habitat or travel corridors occur?

    C) During both the active and inactive seasons

17. Will *any* tree trimming or removal occur **within** 100 feet of existing road/rail surfaces?

    Yes

18. Will *any* tree trimming or removal occur **between** 100-300 feet of existing road/rail surfaces?

    No

19. Are *all* trees that are being removed clearly demarcated?

    Yes

20. Will the removal of habitat or the removal/trimming of trees involve the use of **temporary** lighting?

    Yes

21. Will the removal of habitat or the removal/trimming of trees include installing new or replacing existing **permanent** lighting?

    No

22. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

    Yes

23. Does the project include slash pile burning?

    No

24. Does the project include *any* bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

    Yes

25. Is there *any* suitable habitat[1] for Indiana bat or NLEB **within** 1,000 feet of the bridge? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

    [1] See the Service's current summer survey guidance for our current definitions of suitable habitat.

    Yes

26. Has a bridge assessment[1] been conducted **within** the last 24 months[2] to determine if the bridge is being used by bats?

    [1] See User Guide Appendix D for bridge/structure assessment guidance

    [2] Assessments must be completed no more than 2 years prior to conducting any work below the deck surface on all bridges that meet the physical characteristics described in the Programmatic Consultation, regardless of whether assessments have been conducted in the past. Due to the transitory nature of bat use, a negative result in one year does not guarantee that bats will not use that bridge/structure in subsequent years.

    Yes

    SUBMITTED DOCUMENTS

    - *608051_WILMINGTON_Bridge_Assessment.pdf https://ipac.ecosphere.fws.gov/project/RZEIN5M225HN5DTRAKLKCYNUKE/projectDocuments/150795136*

27. Did the bridge assessment detect *any* signs of Indiana bats and/or NLEBs roosting in/under the bridge (bats, guano, etc.)[1]?

    [1] If bridge assessment detects signs of *any* species of bats, coordination with the local FWS office is needed to identify potential threatened or endangered bat species. Additional studies may be undertaken to try to identify which bat species may be utilizing the bridge prior to allowing *any* work to proceed.

    Note: There is a small chance bridge assessments for bat occupancy do not detect bats. Should a small number of bats be observed roosting on a bridge just prior to or during construction, such that take is likely to occur or does occur in the form of harassment, injury or death, the PBO requires the action agency to report the take. Report all unanticipated take within 2 working days of the incident to the USFWS. Construction activities may continue without delay provided the take is reported to the USFWS and is limited to 5 bats per project.

    No

28. Will the bridge removal, replacement, and/or maintenance activities include installing new or replacing existing **permanent** lighting?

    No

29. Does the project include the removal, replacement, and/or maintenance of *any* structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

    No

30. Will the project involve the use of *any* **temporary** lighting in addition to the lighting already indicated for habitat removal (including the removal or trimming of trees), or bridge/structure removal, replacement or maintenance activities?

    Yes

31. Is there *any* suitable habitat **within** 1,000 feet of the location(s) where **temporary** lighting (other than the lighting already indicated for habitat removal (including the removal or trimming of trees) or bridge/structure removal, replacement or maintenance activities) will be used?

    Yes

32. Will the project install new or replace existing **permanent** lighting?

    No

33. Does the project include percussives or other activities (**not including tree removal/ trimming or bridge/structure work**) that will increase noise levels above existing traffic/ background levels?

    Yes

34. Will the activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the active season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

35. Will *any* activities that use percussives (**not including tree removal/trimming or bridge/ structure work**) and/or increase noise levels above existing traffic/background levels be conducted *during* the inactive season[1]?

    [1] Coordinate with the local Service Field Office for appropriate dates.

    Yes

36. Are *all* project activities that are **not associated with** habitat removal, tree removal/ trimming, bridge and/or structure activities, temporary or permanent lighting, or use of percussives, limited to actions that DO NOT cause any additional stressors to the bat species?

    Examples: lining roadways, unlighted signage , rail road crossing signals, signal lighting, and minor road repair such as asphalt fill of potholes, etc.

    Yes

37. Will the project raise the road profile **above the tree canopy**?

    No

38. Are the wetland or stream protection activities associated with compensatory wetland/ stream mitigation portion of this project consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because your activities associated with compensatory wetland/stream mitigation activities do not clear suitable summer habitat and are not within 0.5 miles of Indiana bat or NLEB hibernaculum.

39. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the active season within undocumented habitat.

40. Are the project activities that use percussives (not including tree removal/trimming or bridge/structure work) and/or increase noise levels above existing traffic/background levels consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the activities are within 300 feet of the existing road/rail surface, greater than 0.5 miles from a hibernacula, and conducted during the inactive season

41. Is the location of this project consistent with a Not Likely to Adversely Affect determination in this key?

    Automatically answered
    Yes, because no bats were detected during presence/probable absence surveys conducted during the summer survey season and outside of the fall swarming/spring emergence periods. Additionally, all activities were at least 0.5 miles from any hibernaculum.

42. Is the bridge removal, replacement, or maintenance activities portion of this project consistent with a No Effect determination in this key?

    Automatically answered
    Yes, because the bridge has been assessed using the criteria documented in the BA and no signs of bats were detected

43. **General AMM 1**
    Will the project ensure *all* operators, employees, and contractors working in areas of known or presumed bat habitat are aware of *all* FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable Avoidance and Minimization Measures?

    Yes

PROJECT QUESTIONNAIRE

1. Please describe the proposed bridge work:

Bridge W-38-011 is an existing culvert over Maple Meadow Brook in Wilmington. It consists of an open bottom with masonry walls on either side with a concrete slab roof, soil between this slab and the roadway surface. The original design was to add a structural slab over the entire culvert, keeping it in place, with new precast headwalls on each end. The current proposal although not designed yet will be a 3 sided precast concrete culvert on new footings, most likely a concrete cap on top of piles (type to be determined). It is expected that the hydraulic opening will remain the same to prevent down stream flooding.

2. Please state the timing of all proposed bridge work:

   Spring 2026 - Spring 2031

3. Please enter the date of the bridge assessment:

   8/19/2024

4. Have you made a No Effect determination for *all* other species indicated on the FWS IPaC generated species list?

   N/A

5. Have you made a May Affect determination for *any* other species on the FWS IPaC generated species list?

   N/A

6. How many acres[1] of trees are proposed for removal between 0-100 feet of the existing road/rail surface?

   [1] If described as number of trees, multiply by 0.09 to convert to acreage and enter that number.

   3.7

AVOIDANCE AND MINIMIZATION MEASURES (AMMS)

This determination key result includes the committment to implement the following Avoidance and Minimization Measures (AMMs):

GENERAL AMM 1

Ensure all operators, employees, and contractors working in areas of known or presumed bat habitat are aware of all FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable AMMs.

DETERMINATION KEY DESCRIPTION: FHWA, FRA, FTA PROGRAMMATIC CONSULTATION FOR TRANSPORTATION PROJECTS AFFECTING NLEB OR INDIANA BAT

This key was last updated in IPaC on October 30, 2023. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the endangered **northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

IPAC USER CONTACT INFORMATION

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LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

ATTACHMENT H – WQC/ACOE SUBMISSION PLANS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

WILMINGTON ROUTE 38 (MAIN STREET)			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	391
PROJECT FILE NO.	608051		

TITLE SHEET & INDEX

PLAN AND PROFILE OF

ROUTE 38 (MAIN STREET)

W-38-003 (C99), W-38-011 (802), W-38-002 (2NQ)

IN THE TOWN OF

WILMINGTON

MIDDLESEX COUNTY

FEDERAL AID PROJECT NO. -

100% SUBMITTAL

THESE PLANS ARE SUPPLEMENTED BY THE 2024 STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK.

WQC/ACOE PLAN SET
04/10/2025

INDEX

SHEET NO.	DESCRIPTION
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3	GENERAL NOTES
4	KEY PLAN
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~~6 - 8~~	~~BORING LOGS~~
15 - 19	TYPICAL SECTIONS
N/A	IMPACT PLANS 1-6
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~~171~~	~~PAVEMENT MARKING DETAILS~~
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218	WETLAND REPLICATION PLAN
219	~~COMPENSATORY FLOOD STORAGE PLAN~~
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~~225 - 227~~	~~RETAINING WALL PLANS~~
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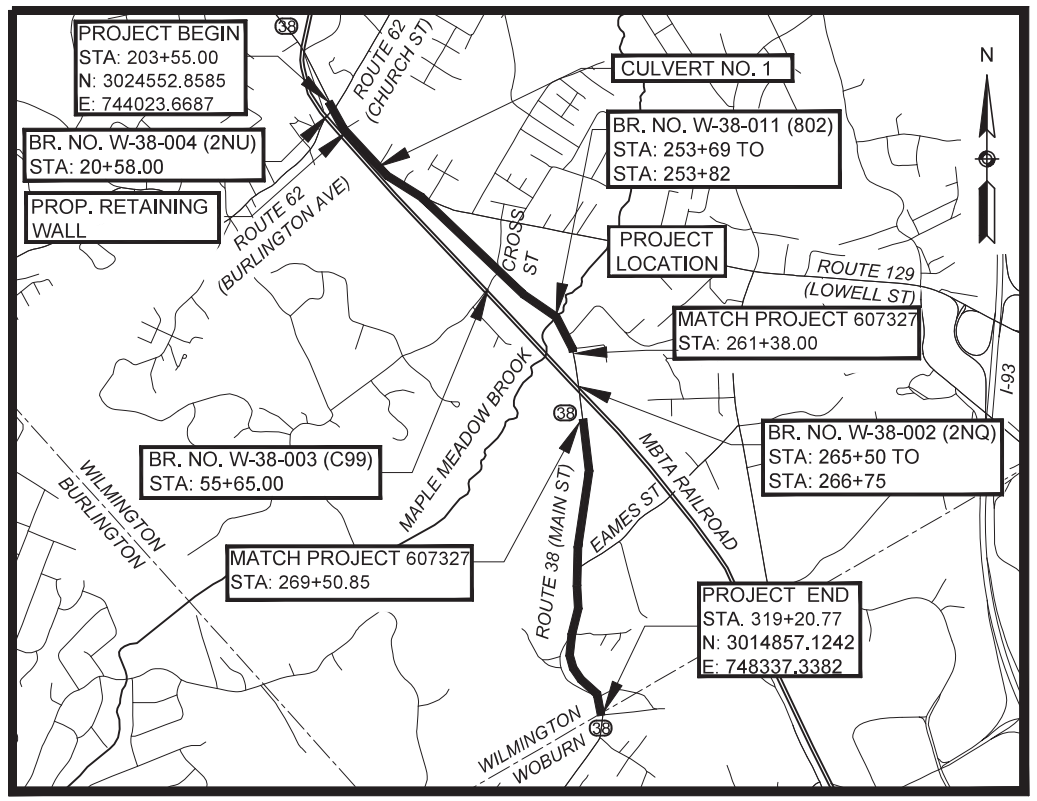

LENGTH OF PROJECT = 10850.00 FEET = 2.055 MILES

DESIGN DESIGNATION - (ROUTE 38/MAIN STREET)

DESIGN SPEED
40 MPH - PROJECT BEGIN TO STA. 236+60
45 MPH - STA. 236+60 TO 300+00
30 MPH - STA. 300+00 TO PROJECT END

	800 FEET NORTH OF LOWELL STREET	700 FEET SOUTH OF CROSS STREET	450 FEET SOUTH OF EAMES STREET
ADT (2016)	21,383	12,490	14,954
ADT (2036)	26091	15240	18247
K	7.5	9.1	9.0
D	72.9%	78	67.9%
T (PEAK HOUR)	6.0%	9.2%	4.1%
T (AVERAGE DAY)	6.2	10.1%	8.0%
DHV	1957	1387	1642
DDHV	1427	1090	1115
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL	URBAN PRINCIPAL ARTERIAL	URBAN PRINCIPAL ARTERIAL

PLANS ARE FOR PERMIT SUBMISSION ONLY AND NOT FOR CONSTRUCTION

DATE	DESCRIPTION	REV #
5/XX/2024	PS&E SUBMISSION	0
1/19/2024	100% SUBMISSION	0
1/15/2021	75% SUBMISSION	0
10/25/2017	25% SUBMISSION	0

massDOT Massachusetts Department of Transportation Highway Division

APPROVED

CHIEF ENGINEER DATE

PREPARED BY:

Green International Affiliates, Inc.
Civil and Structural Engineers

WQC/ACOE PLANS SHEET 1 OF 68

Proposal No. 608051 - 132406
608051_HD01(TITLE).DWG Plotted on 12-Mar-2025 2:26 PM
A008040 - 211

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GUARD POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
C	C	CABLE MANHOLE
D	D	DRAINAGE MANHOLE
E	E	ELECTRIC MANHOLE
G	G	GAS MANHOLE
M	M	MISC MANHOLE
S	S	SEWER MANHOLE
T	T	TELEPHONE MANHOLE
W	W	WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UPL	UPL	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
100 99		CONTOURS (ON-THE-GROUND SURVEY DATA)
100 99		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
x	x	CHAIN LINK OR METAL FENCE
		WOOD FENCE
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 YEAR FLOOD PLAIN
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT BUFFER
		50 FT NO BUILD
		15 FT NO DISTURB
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT
		CONC RETAINING WALL
		SEDIMENT CONTROL BARRIER
		COIR LOG
	x	FLOATING SILT FENCE
		STONE FOR PIPE ENDS
		MODIFIED ROCK FILL

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		VIDEO DETECTION CAMERA
		MICROWAVE DETECTOR
		PEDESTRIAN PUSH BUTTON, SIGN (DIRECTIONAL ARROW AS SHOWN) AND SADDLE
	*	EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED
		FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD, (TYPE AS NOTED OR AS SPECIFIED)
RRSG	RRSG	RAILROAD SIGNAL
OR		SIGNAL POST AND BASE (ALPHA-NUMERIC DESIGNATION NOTED)
	2V	MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		HIGH MAST POLE OR TOWER
		SIGN AND POST
		SIGN AND POST (2 POSTS)
	2V	MAST ARM WITH LUMINAIRE
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		CONTROL CABINET, POLE MOUNTED
		FLASHING BEACON CONTROL AND METER PEDESTAL
		LOAD CENTER ASSEMBLY
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT
		VIDEO VEHICLE DETECTION ZONE
		VIDEO BICYCLE DETECTION ZONE
		WIRE LOOP DETECTOR WITH BICYCLE DETECTION (6' x 23' TYP UNLESS OTHERWISE SPECIFIED)

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE
	CW	CROSSWALK
	SWL	6" SOLID WHITE LINE
	SYL	6" SOLID YELLOW LINE
	BWL	6" BROKEN WHITE LINE (10' LINE SEGMENT, 30' GAP)
	BYL	6" BROKEN YELLOW LINE (10' LINE SEGMENT, 30' GAP)
	DWL	6" DOTTED WHITE LINE (3' LINE SEGMENT, 9' GAP)
	DYL	6" DOTTED YELLOW LINE (3' LINE SEGMENT, 9' GAP)
	DWLEx	6" DOTTED WHITE LINE EXTENSION (2' LINE SEGMENT, 6' GAP)
	DYLEx	6" DOTTED YELLOW LINE EXTENSION (2' LINE SEGMENT, 6' GAP)
	DBWL	6" DOUBLE WHITE LINE
	DBYL	6" DOUBLE YELLOW LINE
	RWT	RECESSED ALL-WEATHER THERMOPLASTIC

ABBREVIATIONS

GENERAL

AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX.	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CB	CATCH BASIN
CB W/F&C	CATCH BASIN WITH FRAME AND COVER
CBCI	CATCH BASIN WITH CURB INLET
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CIP	CAST IRON PIPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
CTE	CONNECT TO EXISTING
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ECC	ECCENTRIC
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
JCT	JUNCTION
L	LENGTH OF CURVE
LB	LEACH BASIN
LP	LIGHT POLE
LSA	LANDSCAPED AREA
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NG	NATIONAL GRID
NIC	NOT IN CONTRACT
NO.	NUMBER
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PCR	PEDESTRIAN CURB RAMP
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW
PT	POINT OF TANGENCY

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	391
PROJECT FILE NO.		608051	

LEGEND & ABBREVIATIONS

ABBREVIATIONS (cont.)

GENERAL

PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PVMT	PAVEMENT
PWW	PAVED WATER WAY
R	RADIUS OF CURVATURE
R&D	REMOVE AND DISPOSE
R&R UP	REMOVE AND REPLACE UTILITY POLE
R&R	REMOVE AND RESET
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDWY	ROADWAY
REM	REMOVE
RET	RETAIN
RET WALL	RETAINING WALL
RMD	REMODEL
ROW	RIGHT OF WAY
RR	RAILROAD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SMH	SEWER MANHOLE
ST	STREET
STA	STATION
SSD	STOPPING SIGHT DISTANCE
SHLO	STATE HIGHWAY LAYOUT LINE
SW	SIDEWALK
T	TANGENT DISTANCE OF CURVE/TRUCK %
TAN	TANGENT
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TYP	TYPICAL
UP	UTILITY POLE
VAR	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
VP	VENT PIPE
VZ	VERIZON
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
X-SECT	CROSS SECTION

TRAFFIC SIGNAL

CAB.	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY DON'T WALK
FDW	FLASHING DON'T WALK
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR AMBER
FYL	FLASHING AMBER LEFT ARROW
FYR	FLASHING AMBER RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILE, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALK
Y	STEADY CIRCULAR AMBER
YL	STEADY AMBER LEFT ARROW

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Proposal No. 608051 - 132406
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GENERAL NOTES

1. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES AND PROCEDURES; AND FOR SAFETY PRECAUTIONS AND PROGRAMS REQUIRED FOR THE WORK UNDER THIS CONTRACT. THE CONTRACTOR SHALL COMPLY WITH OSHA REQUIREMENTS.
2. ALL TREE REMOVALS AND TREE TRIMMING SHALL BE APPROVED BY THE RESIDENT ENGINEER. ANY TREES IMPACTED BY PROPOSED WORK, THAT ARE NOT MARKED TO BE REMOVED ON THE PLAN SHALL BE EVALUATED BY A MASSACHUSETTS CERTIFIED ARBORIST. ALL TREE TRIMMING SHALL BE OVERSEEN BY A MASSACHUSETTS CERTIFIED ARBORIST.
3. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT NO EXPENSE TO THE OWNER.
4. MINIMUM CLEAR PATH ON THE SIDEWALK SHALL BE 3'-0" EXCLUDING THE SURFACE OF THE CURB. THE CONTRACTOR SHALL MAINTAIN AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE AROUND ALL EXISTING UTILITY POLES AND RELOCATED MAILBOXES.
5. CURB RAMPS SHALL CONFORM TO THE LATEST ADA/AAB STANDARDS.
6. TRANSITION CURB AT PROJECT LIMITS TO MATCH EXISTING ELEVATIONS (PAVEMENT OR EXISTING CURB). WITHIN ABUTTING PROPERTIES, UNLESS NOTED OTHERWISE, WHEN RETAINING THESE ITEMS IS NOT PRACTICAL IN THE OPINION OF THE ENGINEER, THE CONTRACTOR SHALL REMOVE, STOCKPILE, PROTECT AND RESET THE ITEMS. THE CONTRACTOR SHALL REPLACE ITEMS DAMAGED DURING REMOVAL, STOCKPILING, OR RESETTING DUE TO NEGLIGENCE, CARELESSNESS, OR MISHANDLING WITH EQUIVALENT NEW ITEMS AT NO COST TO THE OWNER.
7. ALL TREES CALLED OUT TO BE RETAINED ON THE CONSTRUCTION PLANS SHALL HAVE TREE PROTECTION - INDIVIDUAL AND TREE PROTECTION - TEMPORARY FENCE.
8. THE CONCRETE SLAB OF BRIDGE NO. W-38-011 (802) SHALL BE RETAINED DURING THE CONSTRUCTION OF THE PROJECT. THE DEPTH OF THE PROPOSED ROADWAY SUBBASE SHALL VARY IN DEPTH ACROSS THE BRIDGE.
9. ROCKS AND BOULDERS IDENTIFIED R&R ON THE PLANS SHALL BE REMOVED DURING CONSTRUCTION AND RESET AS DIRECTED PER THE ENGINEER.
10. MILLED LONGITUDINAL RUMBLE STRIP SHALL BE INSTALLED ACCORDING TO ENGINEERING DIRECTIVE E20-007.
11. THE CONTRACTOR SHALL FIELD VERIFY ALL MAILBOXES ARE INSTALLED PER MASSDOT STANDARD DETAIL E 504.1.0, AND MEETS ADA REQUIREMENTS.

SURVEY NOTES

1. THE EXISTING CONDITIONS SHOWN ON THIS BASE MAP ARE THE RESULT OF AN ON THE GROUND INSTRUMENT SURVEY PERFORMED BETWEEN OCTOBER 11, 2016 AND DECEMBER 7, 2016 BY GREEN INTERNATIONAL AFFILIATES, INC. (GREEN). SEE FIELD NOTES IN MASSDOT DISTRICT 4 FIELD BOOK 41142.
2. HORIZONTAL AND VERTICAL CONTROL WAS ESTABLISHED BY GREEN ON OCTOBER 28, 2016 WITH STATIC GPS VECTORS CALCULATED BY NATIONAL GEODETIC SURVEY'S OPUS SERVICE, IN MASSDOT DISTRICT 4 FIELD BOOK 41142, PAGE 84. HORIZONTAL DATUM IS BASED ON THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, NAD83 (2011) EPOCH 2010.0000, VERTICAL DATUM IS NAVD 88 (COMPUTED USING GEOID12B) USING THE FOLLOWING CONTROL POINTS:

POINT	GRID NORTHING	GRID EASTING	ELEVATION	COMBINED GROUND TO GRID SCALE FACTOR
2-MDHL	3024249.8723	744113.8185	108.896	0.99998182
28-MMAG	3014918.9153	748357.2529	91.352	0.99998006

THE UNIT OF MEASUREMENTS IS US FEET. THE PROJECT COMBINED SCALE FACTOR IS 0.99998094.

3. THE RIGHT OF WAY LINES SHOWN ON THIS BASE MAP ARE THE DIRECT RESULT OF AN INSTRUMENT SURVEY PERFORMED ON THE GROUND BY GREEN, WITH A TRAVERSE CLOSURE OF 1 IN 92,559 AND FROM PLANS AND DEEDS OF RECORD. PRIVATE PROPERTY LINES HAVE NOT BEEN SURVEYED, THEY ARE COMPILED FROM GIS & RECORD PLAN INFORMATION AND SHOULD BE CONSIDERED APPROXIMATE. THE SAID PARCELS SHOWN HEREON ARE SUBJECT TO RIGHTS AND EASEMENTS AS CONTAINED IN THE VARIOUS DEEDS OF RECORD DESCRIBING SAID PREMISES. THE LOCATIONS AND EXTENT OF SAID RIGHTS AND EASEMENTS ARE NOT SUBJECT TO THE SURVEY.
4. WETLANDS WERE DELINEATED AND FIELD LOCATED BY GREEN IN NOVEMBER, 2016.

EROSION AND SEDIMENT CONTROL NOTES

1. ALL EROSION CONTROL MEASURES MUST BE INSTALLED PRIOR TO THE START OF ANY LAND DISTURBANCE / EARTHWORK ACTIVITIES.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR, REPLACEMENT AND MAINTENANCE OF ALL SEDIMENTATION / EROSION CONTROL MEASURES UNTIL ALL DISTURBED AREAS ARE STABILIZED.

UTILITY NOTES

1. ALL UNDERGROUND UTILITIES AS SHOWN WERE COMPILED USING FIELD SURVEY INFORMATION AND AVAILABLE RECORD INFORMATION.
2. RECORD UTILITY INFORMATION FROM THE VARIOUS UTILITY COMPANIES AND PUBLIC AGENCIES ARE APPROXIMATE ONLY AND ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD. IN ADDITION, ANY UTILITIES NORMALLY LOCATED IN THE STREETS AND NOT SHOWN ON THESE PLANS SHALL BE ANTICIPATED BY THE CONTRACTOR IN ALL HIS OPERATIONS.
3. SUBSURFACE UTILITY LOCATIONS HAVE BEEN PLOTTED TO MEET UTILITY QUALITY LEVEL "C" AS DESCRIBED IN ASCE STANDARD 38-02 AND SUMMARIZED BELOW. THE UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS BASED ON ABOVE-GROUND FIELD OBSERVATION AND EXISTING RECORD INFORMATION RECEIVED FROM UTILITY STAKE-HOLDERS.

   SUMMARY OF UTILITY MAPPING QUALITY LEVELS:

   THE FOLLOWING IS A SUMMARY OF THE SURVEY MAPPING LEVELS FOR UTILITIES AS DESCRIBED IN ASCE STANDARD 38-02, "STANDARD GUIDELINE FOR THE DEPICTION OF EXISTING SUBSURFACE UTILITY DATA". THESE GUIDELINES ARE MORE FULLY DESCRIBED IN THE ASCE STANDARD.

   - UTILITY QUALITY LEVEL A:
     PRECISE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES OBTAINED BY THE ACTUAL EXPOSURE (OR VERIFICATION OF PREVIOUSLY EXPOSED AND SURVEYED UTILITIES) AND SUBSEQUENT MEASUREMENT OF SUBSURFACE UTILITIES, USUALLY AT A SPECIFIC POINT. MINIMALLY INTRUSIVE EXCAVATION EQUIPMENT IS TYPICALLY USED TO MINIMIZE THE POTENTIAL FOR UTILITY DAMAGE. A PRECISE HORIZONTAL AND VERTICAL LOCATION, AS WELL AS OTHER UTILITY ATTRIBUTES, IS SHOWN ON PLAN DOCUMENTS. ACCURACY IS TYPICALLY SET TO 15-MM VERTICAL AND TO APPLICABLE HORIZONTAL SURVEY AND MAPPING ACCURACY AS DEFINED OR EXPECTED BY THE PROJECT OWNER.
   - UTILITY QUALITY LEVEL B:
     INFORMATION OBTAINED THROUGH THE APPLICATION OF APPROPRIATE SURFACE GEOPHYSICAL METHODS TO DETERMINE THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF SUBSURFACE UTILITIES. QUALITY LEVEL B DATA SHOULD BE REPRODUCIBLE BY SURFACE GEOPHYSICS AT ANY POINT OF THEIR DEPICTION. THIS INFORMATION IS SURVEYED TO APPLICABLE TOLERANCES DEFINED BY THE PROJECT AND REDUCED ONTO PLAN DOCUMENTS.
   - UTILITY QUALITY LEVEL C:
     INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE ABOVE-GROUND UTILITY FEATURES AND BY USING PROFESSIONAL JUDGMENT IN CORRELATING THIS INFORMATION TO QUALITY LEVEL D INFORMATION.
   - UTILITY QUALITY LEVEL D:
     INFORMATION DERIVED FROM EXISTING RECORDS OR ORAL RECOLLECTIONS.
4. ALL UTILITY COMPANIES, PUBLIC AND PRIVATE MUST BE NOTIFIED, INCLUDING THOSE IN CONTROL OF UTILITIES NOT SHOWN ON THIS PLAN, (SEE CHAPTER 370, ACTS OF 1963, MASSACHUSETTS) PRIOR TO EXCAVATING, BLASTING, INSTALLING, BACKFILLING, GRADING, PAVEMENT RESTORING OR REPAVING.
5. THE LOCATION OF EXISTING PIPES OR OTHER UNDERGROUND STRUCTURES ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL UNDERGROUND PIPES OR STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL CALL "DIG SAFE" (1-888-344-7233) 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS) PRIOR TO ANY EXCAVATION TO OBTAIN ACCURATE UTILITY LOCATIONS. MUNICIPALITIES, THE STATE AND THE MBTA ARE NOT MEMBERS OF DIG-SAFE AND SHALL BE CONTACTED INDIVIDUALLY BY THE CONTRACTOR.
6. THE EXISTING INVERTS ARE SHOWN FOR BIDDING PURPOSES ONLY. ACTUAL INVERT ELEVATIONS SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR PRIOR TO ORDERING STRUCTURES.
7. THE CONTRACTOR SHALL INVESTIGATE ALL UNKNOWN MANHOLES TO DETERMINE OWNERSHIP AND CONTACT THE APPROPRIATE UTILITY AGENCIES TO COORDINATE WORK. THE ENGINEER SHALL BE NOTIFIED OF ANY MANHOLES DETERMINED TO BE PART OF SEWER, DRAIN OR WATER SYSTEMS.
8. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
9. THE CONTRACTOR SHALL EXERCISE EXTREME CARE WHEN EXCAVATING NEAR AND BACKFILLING IN THE VICINITY OF EXISTING UTILITIES. CONTRACTOR SHALL USE HAND EXCAVATION WHERE APPROPRIATE TO PROTECT EXISTING UTILITIES.
10. UNLESS OTHERWISE NOTED OR APPROVED BY THE ENGINEER, THE CONTRACTOR SHALL MAINTAIN ALL EXISTING UTILITIES IN SERVICE AT ALL TIMES. IF THE CONTRACTOR DAMAGES UTILITY SYSTEMS, THEY SHALL IMMEDIATELY NOTIFY THE RESPECTIVE UTILITY COMPANY AND SHALL REPAIR/REPLACE THE AFFECTED SYSTEM AT HIS OWN EXPENSE.
11. THE CONTRACTOR SHALL COORDINATE WITH PRIVATE UTILITY COMPANIES AND MAKE ARRANGEMENTS FOR ADJUSTMENTS, ALTERATIONS, AND REPLACEMENT OF PRIVATE UTILITIES WHICH ARE TO BE DONE BY THE UTILITY COMPANY.
12. THE CONTRACTOR SHALL ALTER THE MASONRY OF THE TOP SECTION OF ALL EXISTING DRAINAGE AND SEWER STRUCTURES AS NECESSARY FOR CHANGES IN GRADE, AND RESET ALL WATER, SEWER, DRAINAGE SURFACE CASTINGS, TRAFFIC SIGNALS, PUBLIC ELECTRICAL ITEMS, AND PRIVATE LIGHTING (ETC.) WITHIN THE LIMITS OF CONSTRUCTION TO THE PROPOSED FINISH SURFACE GRADE. REQUIRED NEW MASONRY SHALL BE CLAY BRICK CONFORMING TO M4.05.2. IF AN EXISTING UTILITY STRUCTURE WITHIN IN THE PROJECT LIMITS IS WITHIN A PROPOSED ACCESSIBLE SURFACE, THE STRUCTURE SHALL BE CAREFULLY ADJUSTED SUCH THAT THE TOPMOST SURFACES OR THE STRUCTURE COVER SHALL BE FLUSH WITH THE SURFACE.
13. THE CONTRACTOR SHALL CONSIDER THE INDIVIDUAL SERVICE LINES TO EACH BUILDING FROM ALL UTILITIES, WHETHER MARKED OUT OR NOT, WHEN PROCEEDING WITH EXCAVATION.
14. SURPLUS MATERIALS OBTAINED FROM ANY TYPE OF EXCAVATION, AND ALL EXISTING AND OTHER MATERIALS NOT REQUIRED TO BE REMOVED AND STACKED OR NEEDED FOR USE ON THE PROJECT, AS DETERMINED BY THE ENGINEER, SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND DISPOSED OF SUBJECT TO THE REGULATIONS AND REQUIREMENTS OF LOCAL AUTHORITIES GOVERNING THE DISPOSAL OF SUCH MATERIALS, AT NO ADDITIONAL COMPENSATION.
15. THE CONTRACTOR SHALL SUPPORT AND PROTECT EXISTING UTILITIES IN AND AROUND EXCAVATIONS, AND, IN PARTICULAR, WHEN CROSSING UNDER OR OVER ANY DUCT OR PIPE. ALL PROTECTIVE MEASURES AND SUPPORTS SHALL BE CONSIDERED INCIDENTAL WORK AND SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE ITEM BEING INSTALLED.
16. A MINIMUM 24-INCHES OF SEPARATION IS REQUIRED BETWEEN THE HIGH PRESSURE GAS MAIN AND DRAINAGE LINE AND ALSO BETWEEN THE HIGH PRESSURE GAS MAIN AND WATER MAIN.
17. PROPOSED WATER MAIN SHALL BE INSTALLED WITH VERTICAL BENDS TO CROSS UNDER EXISTING WATER MAIN TO AVOID CONFLICTS AND CONNECTION FOR THE HYDRANTS.
18. GUTTER INLETS AND CATCH BASINS WITH FRAME AND COVER ARE PROPOSED DUE TO CONFLICTS WITH EXISTING UTILITIES. IN LOCATIONS WHERE THE CONTRACTOR HAS DETERMINED NO SUCH CONFLICTS EXIST, THE CONTRACTOR SHALL USE MASSDOT STANDARD CATCH BASINS.
19. THE CONTRACTOR SHALL PROTECT PRIVATE IRRIGATION SYSTEM TO EACH PRIVATE PROPERTY, WHETHER MARKED OUT OR NOT, WHEN PROCEEDING WITH EXCAVATION AND GRADING. REPAIR TO DAMAGED IRRIGATION SYSTEM SHALL BE INCIDENTAL TO THE WORK PERFORMED AND INCLUDED IN THE UNIT PRICE BID FOR THE ITEM BEING INSTALLED.

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	–	3	391
PROJECT FILE NO.	608051		

GENERAL NOTES

608051_H003(GENERAL NOTES).DWG Plotted on 12-Mar-2025 2:27 PM

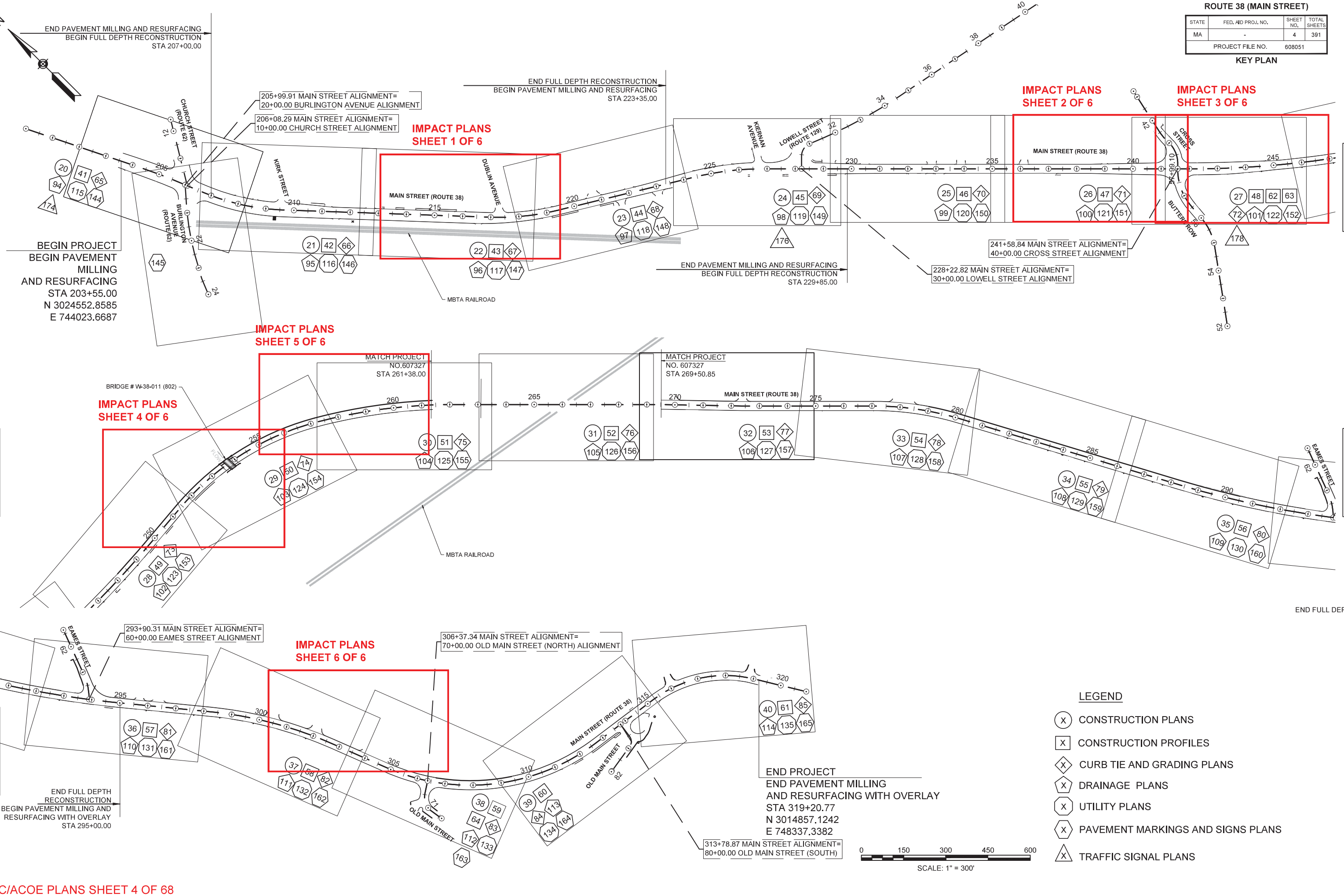
Proposal No. 608051 - 132406

A00840-313

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	391
PROJECT FILE NO.	608051		

KEY PLAN

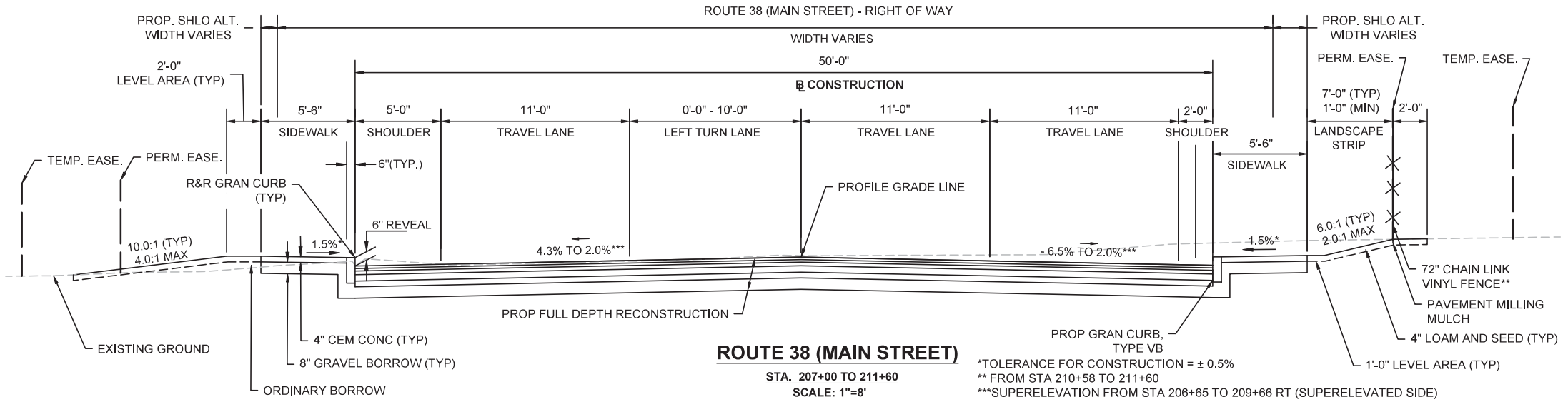


LEGEND

- (X) CONSTRUCTION PLANS
- [X] CONSTRUCTION PROFILES
- ◇X CURB TIE AND GRADING PLANS
- ⬡X DRAINAGE PLANS
- ⬡X UTILITY PLANS
- ⬡X PAVEMENT MARKINGS AND SIGNS PLANS
- △X TRAFFIC SIGNAL PLANS

WQC/ACOE PLANS SHEET 4 OF 68

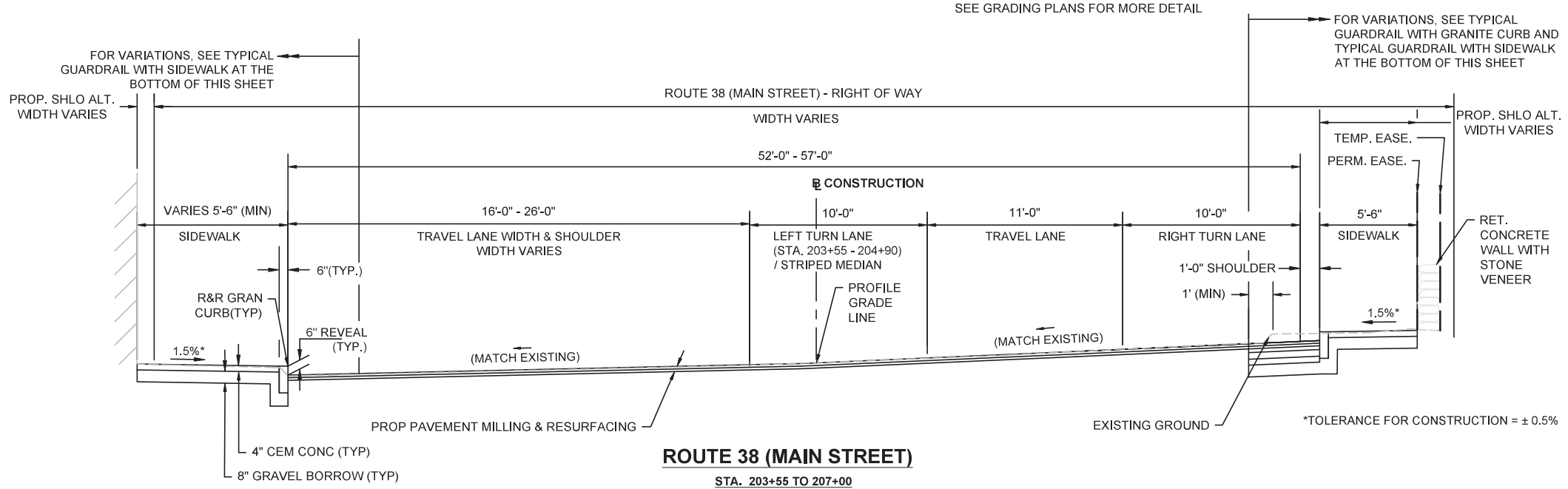
A0008040 - 314
Proposal No. 608051 - 132406
608051_HD04(KEY PLAN).DWG
Plotted on 12-Mar-2025 2:27 PM



ROUTE 38 (MAIN STREET)

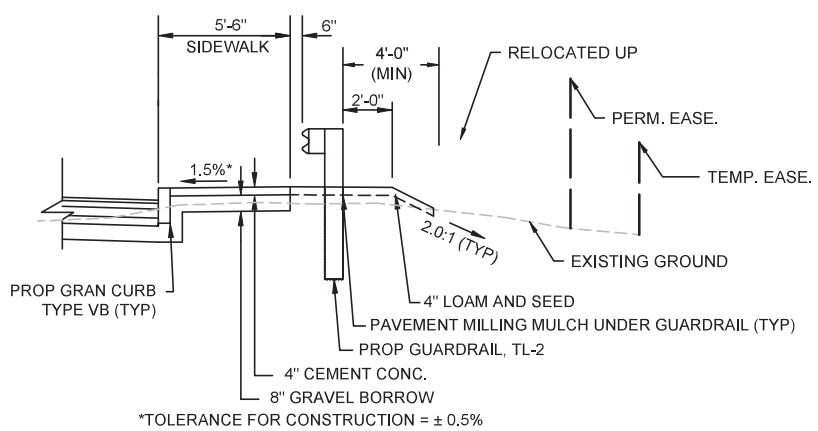
STA. 207+00 TO 211+60
SCALE: 1"=8'

*TOLERANCE FOR CONSTRUCTION = ± 0.5%
** FROM STA 210+58 TO 211+60
***SUPERELEVATION FROM STA 206+65 TO 209+66 RT (SUPERELEVATED SIDE)
SEE GRADING PLANS FOR MORE DETAIL



ROUTE 38 (MAIN STREET)

STA. 203+55 TO 207+00
SCALE: 1"=8'



TYPICAL GUARDRAIL WITH SIDEWALK

STA. 206+71 RT - 209+05 RT
STA. 216+75 RT - 218+34 RT
STA. 217+61 LT - 218+33 LT
STA. 216+75 RT - 218+34 RT
STA. 236+88 RT - 53+00 RT
STA. 40+29 LT - 41+30 LT
STA. 52+16 LT - 52+84 LT
STA. 252+13 RT - 252+89 RT
STA. 253+50 RT - 257+92 RT
STA. 260+14 LT - 260+73 LT
STA. 260+78 RT - 261+38 RT
STA. 274+93 RT - 276+14 RT
STA. 316+37 LT - 317+62 LT

SCALE: 1"=8'

4 0 4 8
SCALE IN FEET

PAVEMENT NOTES

PROPOSED FULL DEPTH RECONSTRUCTION

SURFACE: 1.75" SUPERPAVE SURFACE COURSE 12.5 POLYMER (SSC-12.5-P) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 POLYMER (SIC-12.5-P) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER

INTERMEDIATE COURSE: 2.5" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC-19.0) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER

BASE COURSE: 4.5" SUPERPAVE BASE COURSE 37.5 (SBC-37.5) PLACED IN ONE COURSE

SUBBASE: 4" DENSE GRADED CRUSHED STONE FOR SUBBASE (COMPACTED) OVER 8" GRAVEL BORROW (TYPE B)(COMPACTED)

PROPOSED BRIDGE PAVEMENT

SURFACE: 1.75" SUPERPAVE SURFACE COURSE 12.5 POLYMER (SSC-B-12.5-P) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 POLYMER (SIC-12.5-P)

SUBBASE: OVER 8" GRAVEL BORROW (TYPE B)(COMPACTED)(DEPTH VARIES)

PROPOSED PAVEMENT MILLING & RESURFACING

SURFACE: 1.75" SUPERPAVE SURFACE COURSE 12.5 POLYMER (SSC-12.5-P) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 POLYMER (SIC-12.5-P) OVER

ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER MILLED SURFACE.

MILLING: 3.5" PAVEMENT STANDARD MILLING

PROPOSED MILLING & STRUCTURAL OVERLAY

SURFACE: 1.75" SUPERPAVE SURFACE COURSE 12.5 POLYMER (SSC-12.5-P) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 POLYMER (SIC-12.5-P) OVER

ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER MILLED SURFACE.

MILLING: 3" PAVEMENT STANDARD MILLING

PROPOSED FULL DEPTH RECONSTRUCTION LESS THAN 4 FEET WIDE

SURFACE: 1.75" SUPERPAVE SURFACE COURSE 12.5 POLYMER (SSC-12.5-P) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 POLYMER (SIC-12.5-P) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER

BASE COURSE: 6" HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE OVER

SUBBASE: 8" GRAVEL BORROW (TYPE B)

PROPOSED TEMPORARY TRENCH PATCHES

SURFACE: 1.75" SUPERPAVE SURFACE COURSE 12.5 (SSC-12.5)

INTERMEDIATE COURSE: 1.75" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5)

SUBBASE: SUITABLE BACKFILL COMPACTED

PROPOSED CEMENT CONCRETE WALK/ WHEELCHAIR RAMP

SURFACE: 4" CEMENT CONCRETE (AIR ENTRAINED 4000 PSI, 3/4", 610)

FOUNDATION: 8" GRAVEL BORROW (TYPE B)

PROPOSED HMA DRIVEWAY

SURFACE: 4" SUPERPAVE (1.5" SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5) OVER 2.5" SUPER PAVE SURFACE COURSE - 12.5 (SSC-12.5))

SUBBASE: 8" GRAVEL BORROW (TYPE B)

PROPOSED HMA WALK SURFACE

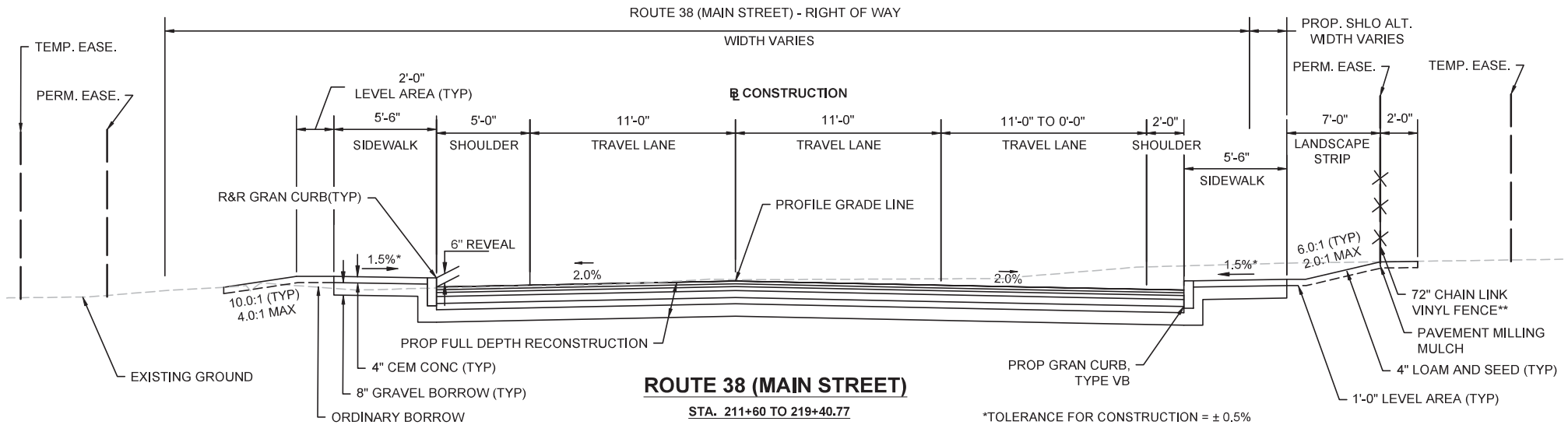
SURFACE: 3" SUPERPAVE (1.25" SUPERPAVE SURFACE COURSE - 9.5 (SSC-9.5) OVER 1.75" SUPER PAVE SURFACE COURSE - 12.5 (SSC-12.5))

SUBBASE: 8" GRAVEL BORROW (TYPE B)

NOTE:
1. TACK COAT SHALL BE APPLIED BETWEEN PAVEMENT LAYERS AT A RATE PER THE LATEST MASSDOT STANDARD SPECIFICATION SUBSECTION 450.
2. TEMPORARY TRENCH PATCHES ARE PAID UNDER ITEM 472 TEMPORARY ASPHALT PATCHING.

Plotted on 12-Mar-2025 2:28 PM
608051_HD05(TYPICAL SECTIONS).DWG
Proposal No. 608051 - 132406
A00840 315
WQC/ACOE PLANS SHEET 5 OF 68

Plotted on 12-Mar-2025 2:28 PM
608051_HD05(TYPICAL SECTIONS).DWG
Proposal No. 608051 - 132406
A00840-316



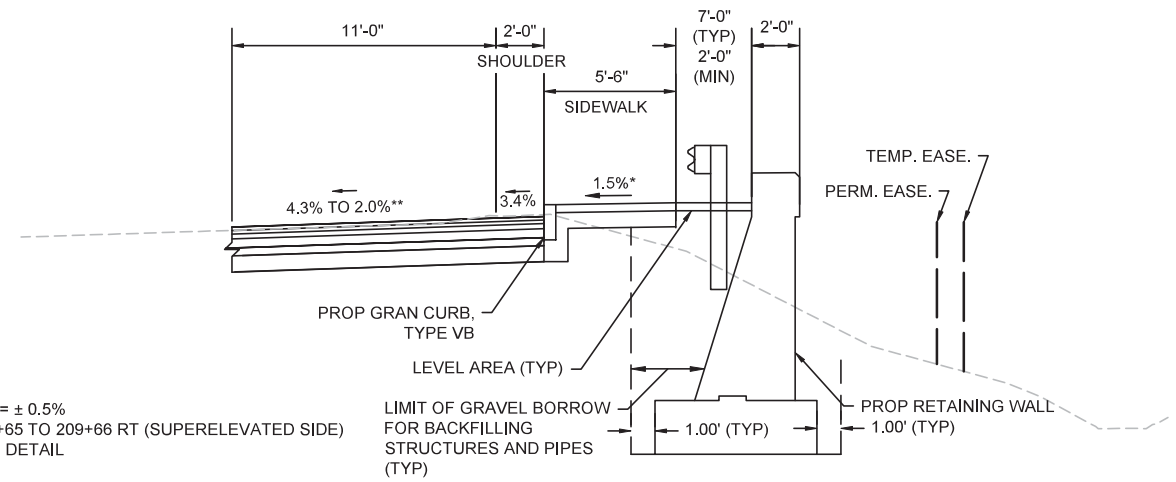
ROUTE 38 (MAIN STREET)

STA. 211+60 TO 219+40.77

SCALE: 1"=8'

4 0 4 8
SCALE IN FEET

*TOLERANCE FOR CONSTRUCTION = ± 0.5%
**FROM STA. 211+60 TO 218+35

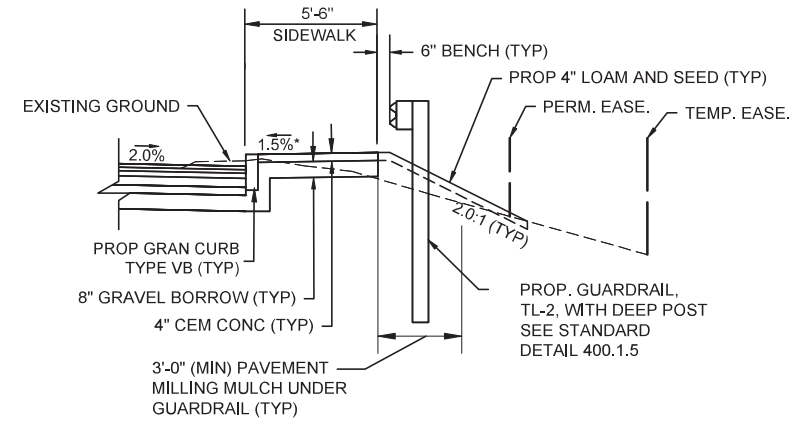


*TOLERANCE FOR CONSTRUCTION = ± 0.5%
**SUPERELEVATION FROM STA 206+65 TO 209+66 RT (SUPERELEVATED SIDE)
SEE GRADING PLANS FOR MORE DETAIL

ROUTE 38 (MAIN STREET)

STA. 207+22 TO 209+00

SCALE: 1"=8'



TYPICAL GUARDRAIL WITH DEEP POST AND SIDEWALK

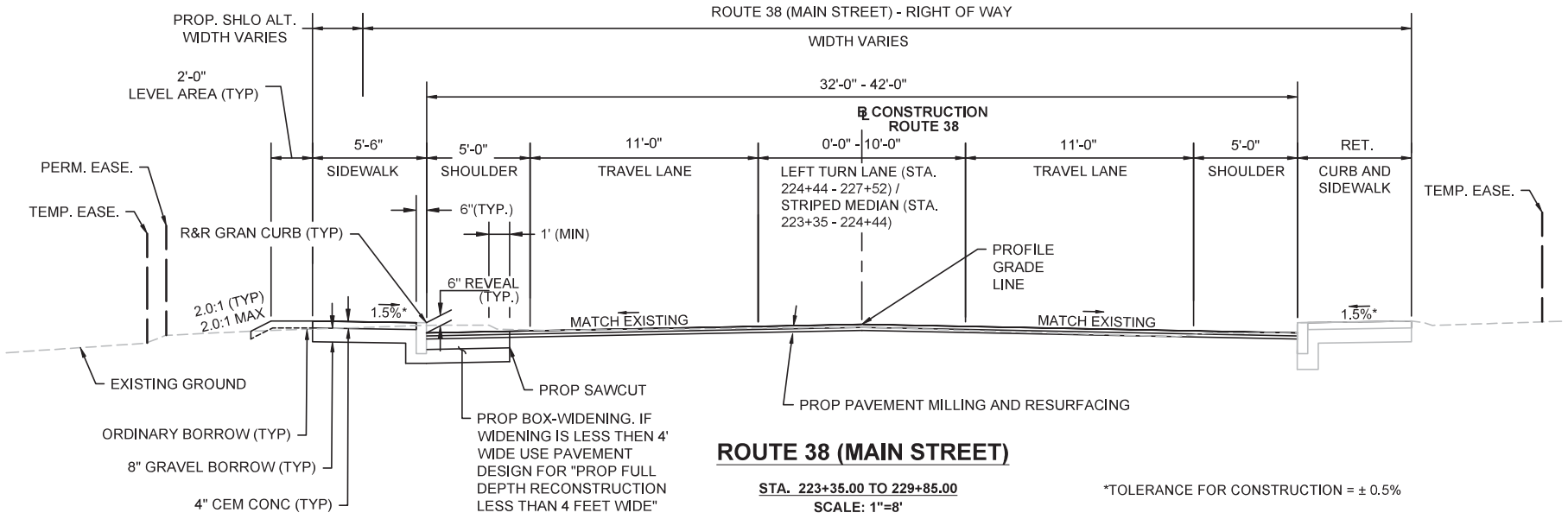
STA. 217+77 TO 217+96 LT & RT
STA. 237+00 TO 240+75 RT
STA. 253+30 TO 257+92 RT
STA. 260+78 TO 261+38 RT

SCALE: 1"=8'

WQC/ACOE PLANS SHEET 6 OF 68

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	391
PROJECT FILE NO.	608051		

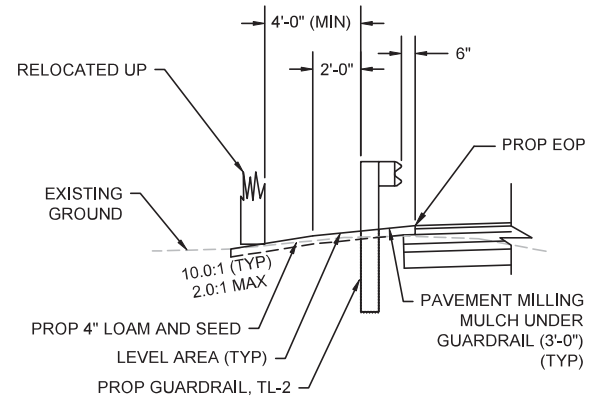
TYPICAL SECTIONS - 3



ROUTE 38 (MAIN STREET)

STA. 223+35.00 TO 229+85.00
SCALE: 1"=8'

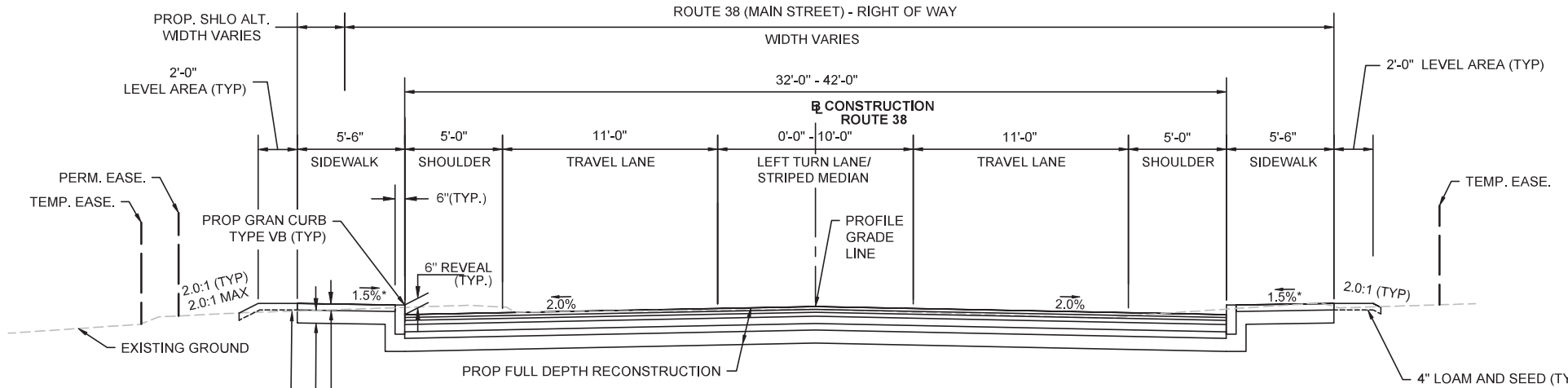
*TOLERANCE FOR CONSTRUCTION = ± 0.5%



TYPICAL GUARDRAIL AT EOP

STA 248+24 TO 255+50 LT
SCALE: 1"=8'

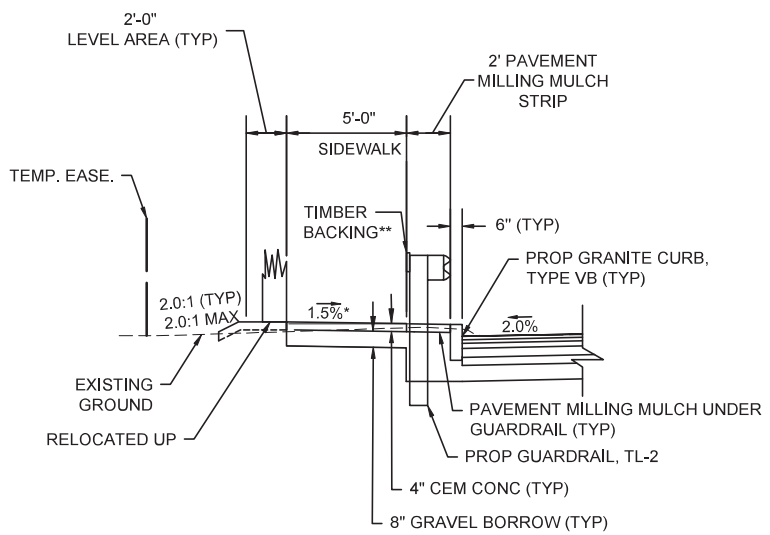
4 0 4 8
SCALE IN FEET



ROUTE 38 (MAIN STREET)

STA. 222+20.00 TO 223+35.00
STA. 229+85.00 TO 230+32.00
STA. 238+50.00 TO 245+00.00
SCALE: 1"=8'

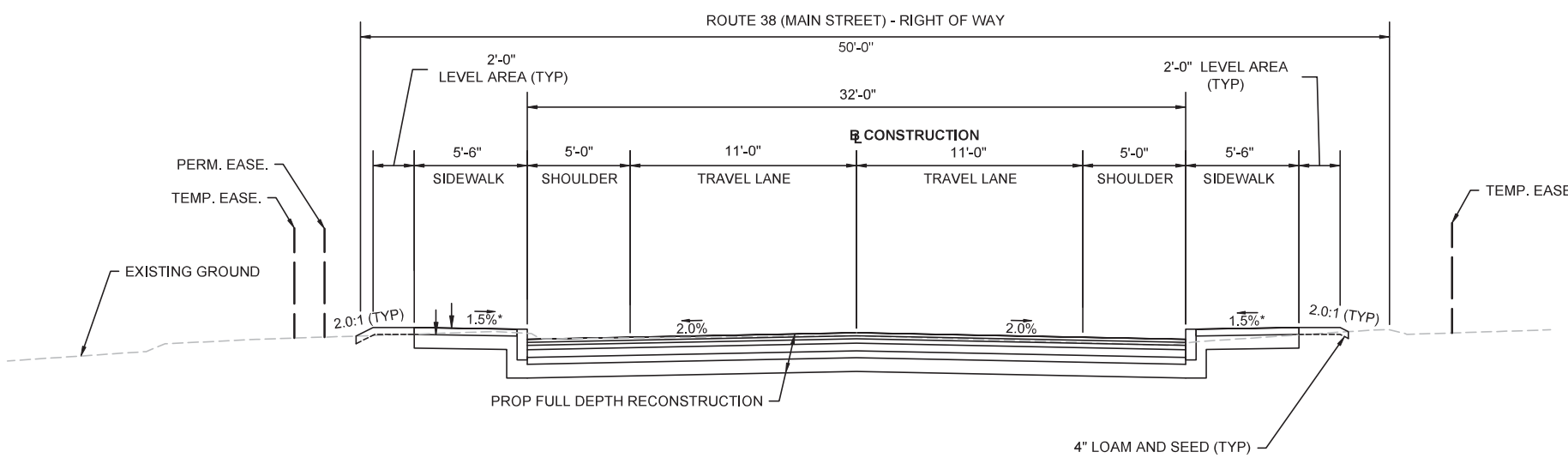
*TOLERANCE FOR CONSTRUCTION = ± 0.5%



**SEE MASSDOT CONSTRUCTION STANDARD DETAILS 400.5.1

TYPICAL GUARDRAIL AT FACE OF CURB

STA. 236+36 TO 240+81 LT
SCALE: 1"=8'



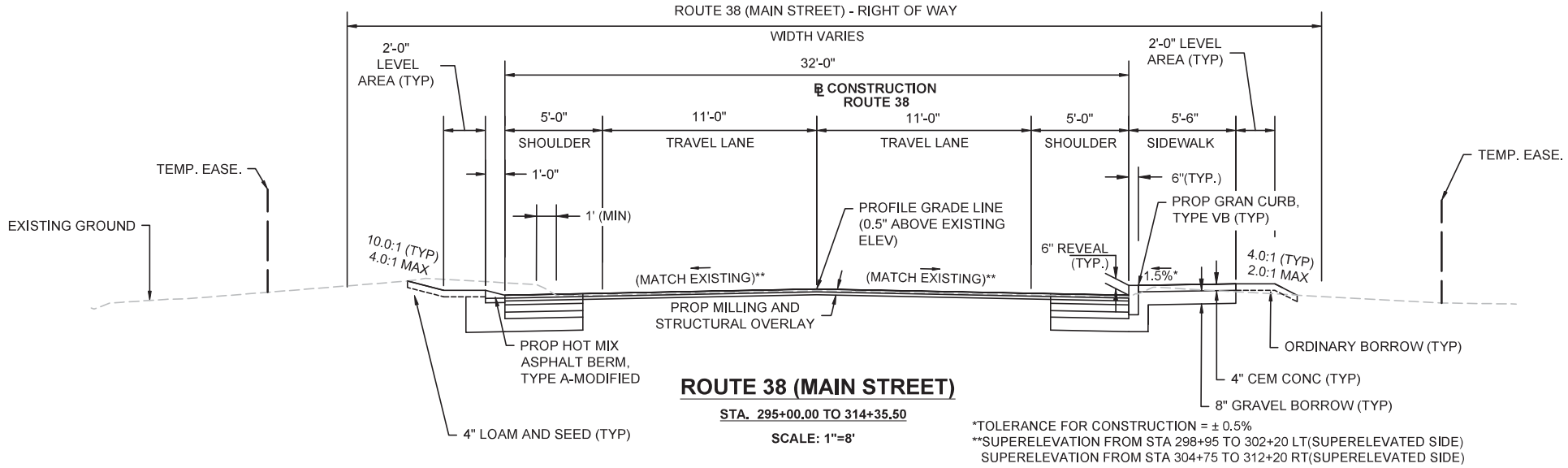
ROUTE 38 (MAIN STREET)

STA. 219+40.77 TO 222+20.00
STA. 230+32.00 TO 238+50.00
STA. 245+00.00 TO 248+18.00
SCALE: 1"=8'

*TOLERANCE FOR CONSTRUCTION = ± 0.5%

Proposal No. 608051 - 132406
608051_HD05(TYPICAL SECTIONS).DWG Plotted on 12-Mar-2025 2:28 PM
A00840_317
WQC/ACOE PLANS SHEET 7 OF 68

Plotted on 12-Mar-2025 2:28 PM
608051_HD05(TYPICAL SECTIONS).DWG
Proposal No. 608051 - 132406
A00840 - 318

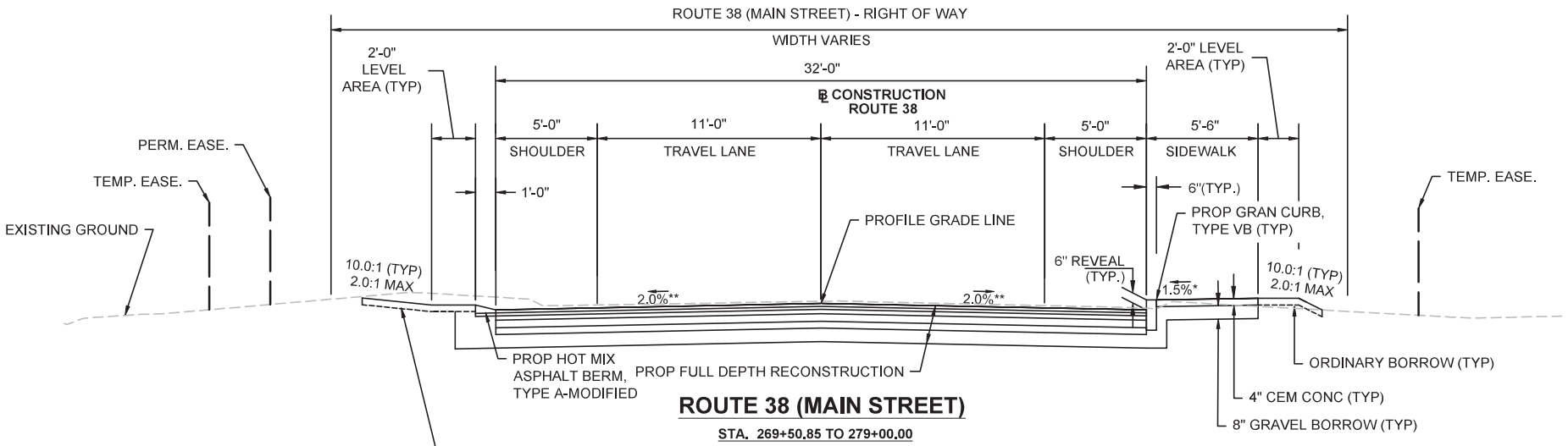


ROUTE 38 (MAIN STREET)

STA. 295+00.00 TO 314+35.50

SCALE: 1"=8'

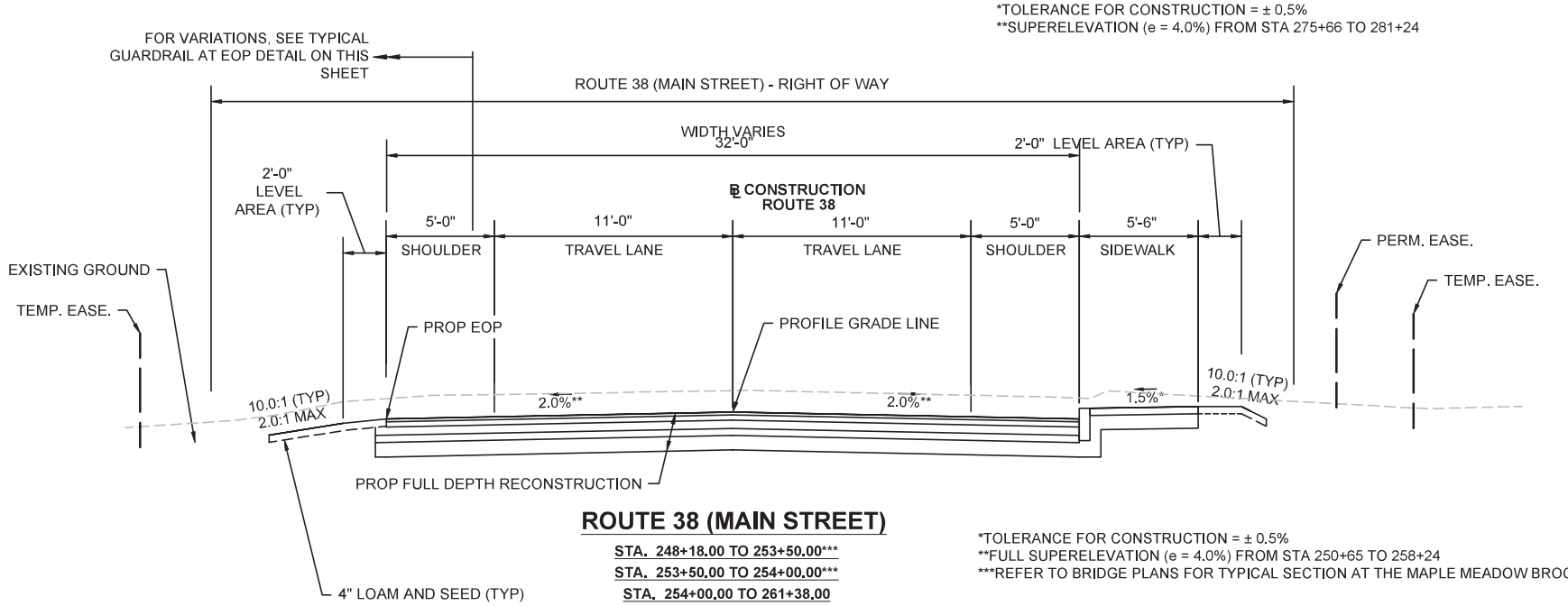
*TOLERANCE FOR CONSTRUCTION = ± 0.5%
**SUPERELEVATION FROM STA 298+95 TO 302+20 LT(SUPERELEVATED SIDE)
SUPERELEVATION FROM STA 304+75 TO 312+20 RT(SUPERELEVATED SIDE)



ROUTE 38 (MAIN STREET)

STA. 269+50.85 TO 279+00.00
STA. 290+50.00 TO 295+00.00
SCALE: 1"=8'

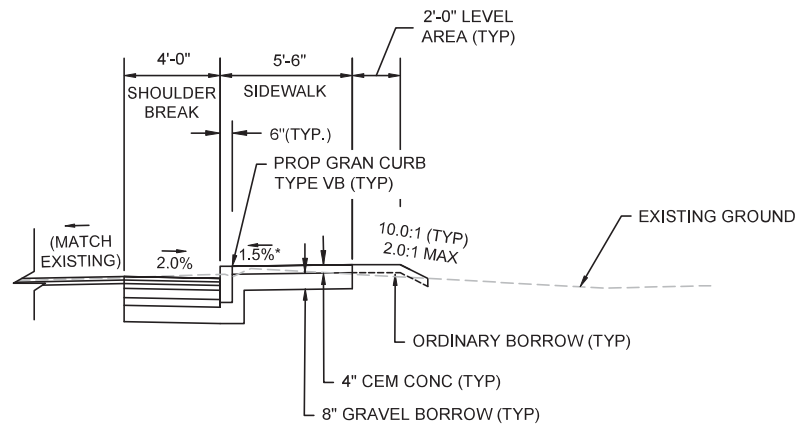
*TOLERANCE FOR CONSTRUCTION = ± 0.5%
**SUPERELEVATION (e = 4.0%) FROM STA 275+66 TO 281+24



ROUTE 38 (MAIN STREET)

STA. 248+18.00 TO 253+50.00***
STA. 253+50.00 TO 254+00.00***
STA. 254+00.00 TO 261+38.00
STA. 279+00.00 TO 290+50.00
SCALE: 1"=8'

*TOLERANCE FOR CONSTRUCTION = ± 0.5%
**FULL SUPERELEVATION (e = 4.0%) FROM STA 250+65 TO 258+24
***REFER TO BRIDGE PLANS FOR TYPICAL SECTION AT THE MAPLE MEADOW BROOK BRIDGE



TYPICAL SHOULDER BREAK IN SUPERELEVATED SECTION

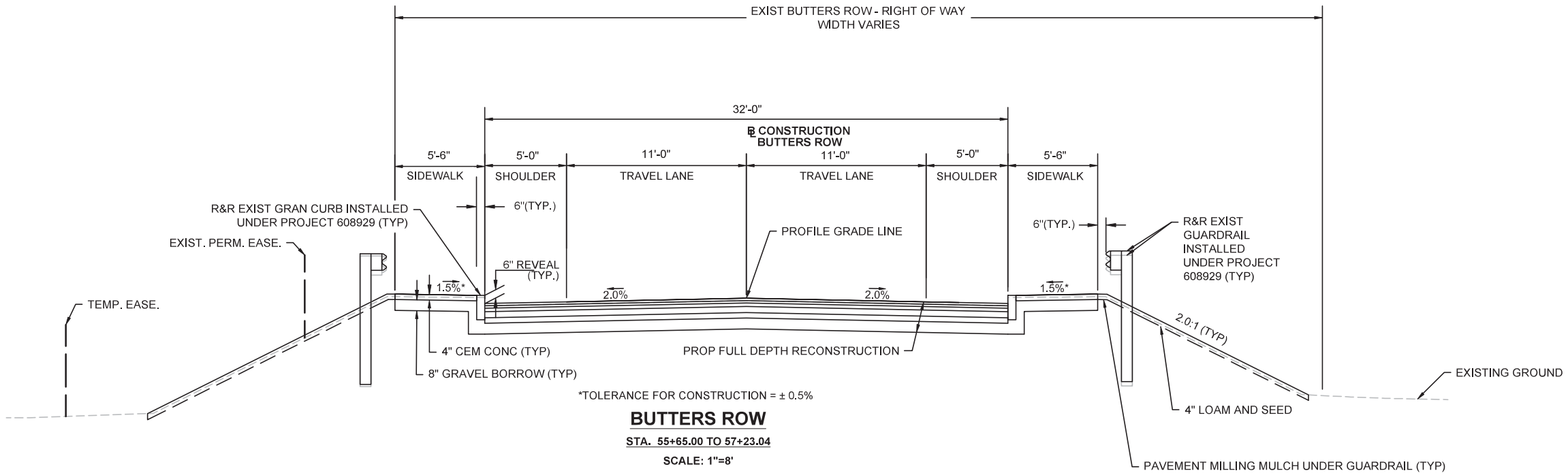
STA 298+95 TO 302+20 LT (NO SIDEWALK)
STA 302+75 TO 312+20 RT
STA 313+90 TO 318+70 LT
SCALE: 1"=8'

4 0 4 8
SCALE IN FEET

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	391
PROJECT FILE NO.	608051		

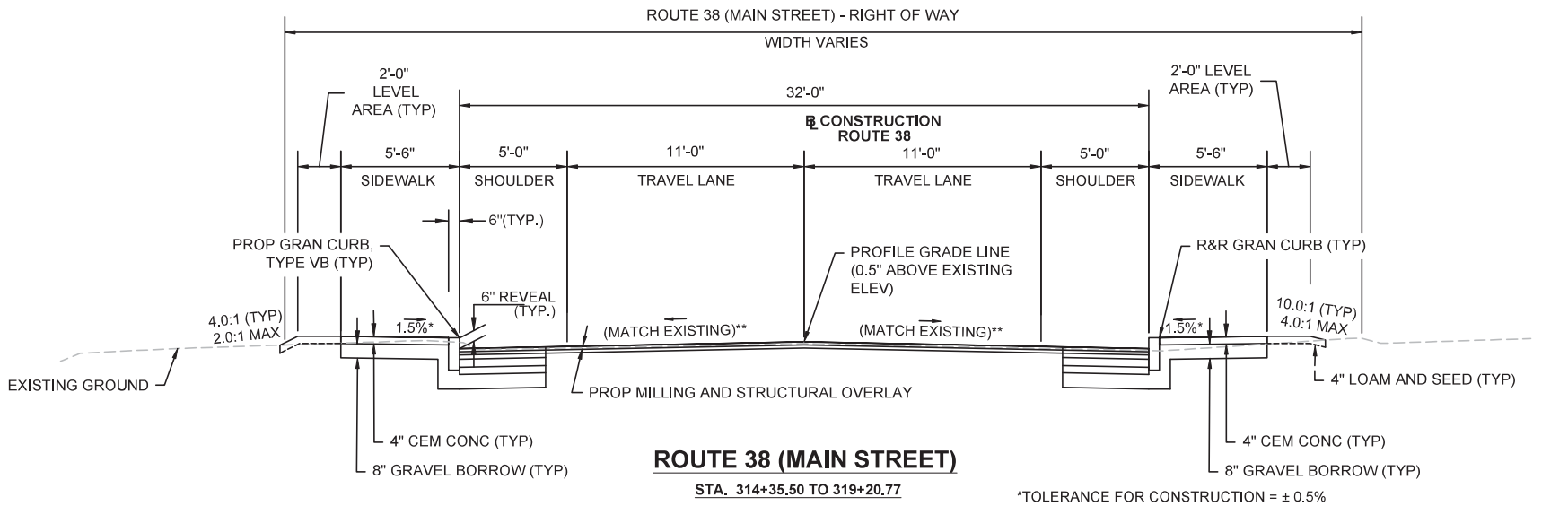
TYPICAL SECTIONS - 5



BUTTERS ROW

STA. 55+65.00 TO 57+23.04

SCALE: 1"=8'



ROUTE 38 (MAIN STREET)

STA. 314+35.50 TO 319+20.77

SCALE: 1"=8'

*TOLERANCE FOR CONSTRUCTION = ± 0.5%
**SUPERELEVATION FROM STA 313+90 TO 318+70 LT(SUPERELEVATED SIDE)

4 0 4 8
SCALE IN FEET

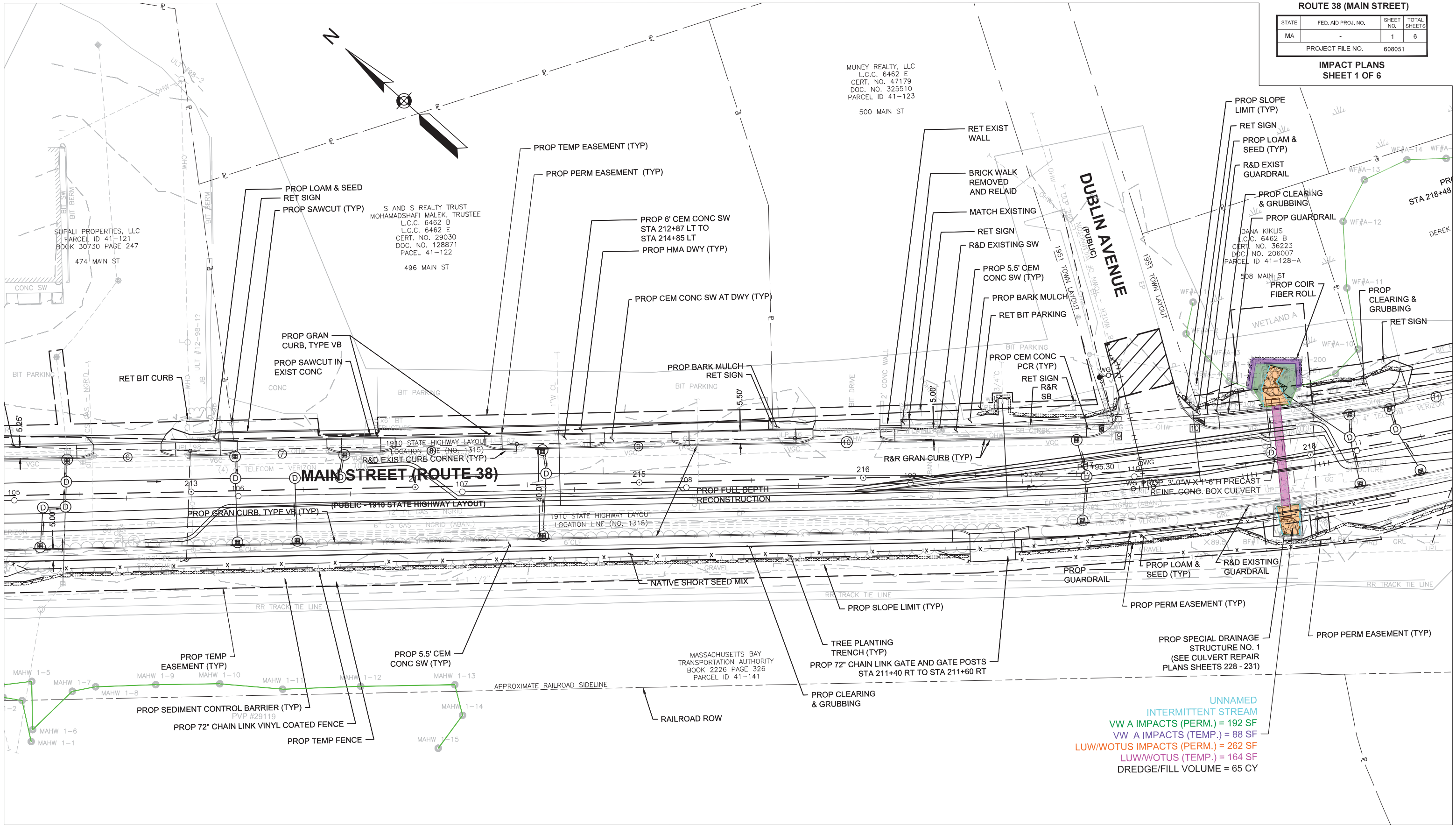
Plotted on 12-Mar-2025 2:28 PM
608051_HD05(TYPICAL SECTIONS).DWG
Proposal No. 608051 - 132406
A00840 - 319
WQC/ACOE PLANS SHEET 9 OF 68

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	6
PROJECT FILE NO.	608051		

IMPACT PLANS
SHEET 1 OF 6

608051_EV(IMPACT-PLANS).DWG Plotted on 4-Apr-2025 1:24 PM



PERMANENT VW IMPACT AREA = 3,292 SF ±

PERMANENT LUW/WOTUS IMPACT AREA = 2,378 SF ±

TOTAL PERMANENT IMPACT AREA = 5,670 SF ±

TEMPORARY VW IMPACT AREA = 2,842 SF ±

TEMPORARY LUW/WOTUS IMPACT AREA = 710 SF ±

TOTAL TEMPORARY IMPACT AREA = 3,552 SF ±

VEGETATED WETLAND (VW)

BANK/OHW (PERENNIAL STREAM)

BANK/OHW (INTERMITTENT STREAM)

TOTAL DREDGE/FILL WITHIN LUW/WOTUS VOLUME = 715 CY

WQC/ACOE PLANS SHEET 10 OF 68

0 20 50 100

SCALE: 1" = 40'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	6
PROJECT FILE NO.	608051		

IMPACT PLANS
SHEET 2 OF 6

Plotted on 4-Apr-2025 1:28 PM
608051_EV(IMPACT-PLANS).DWG

Proposal No. 608051 - 132406

A00840 - 321

PROP 1.5' MILLING MULCH STRIP (TYP)
PROP GUARDRAIL
PROP SAWCUT (TYP)
PROP CEM CONC SW AT DWY (TYP)
PROP HMA BERM, TYPE A-MODIFIED
SEE DETAIL ON SHEET 222
RET GUARDRAIL
EXISTING PHRAGMITES PROVIDE INVASIVE SPECIES MANAGEMENT PLAN FOR PLANTS AND DISTURBED SOIL WHERE THEY ARE WITHIN THE LIMIT OF WORK
R&D SIGN
R&D EXIST BIT BERM (TYP)
PROP GRAN CURB TYPE VB (TYP)
R&D STUMP
RET SIDEWALK (TYP)
ONE CROSS LLC
BOOK 35186 PAGE 80
PARCEL ID 40-11
CROSS ST
PROP TEMP EASEMENT (TYP)
PROP SLOPE LIMIT (TYP)
R&S SIGN
PROP SEDIMENT CONTROL BARRIER (TYP)
R&D EXISTING GUARDRAIL
PROP LOAM & SEED (TYP)
VERIZON NEW ENGLAND INC.
PARCEL ID 40-12
BOOK 1212 PAGE 352
MAIN ST
PROP. COIR FIBER ROLL (TYP.)
PROP HMA DWY (TYP)
VW D
VW IMPACTS (PERM.) = 270 SF
VW IMPACTS (TEMP.) = 655 SF
PROP PERM EASEMENT (TYP)
PROP TEMP EASEMENT (TYP)
R&D EXISTING GUARDRAIL
PROP 5' CEM CONC SW (TYP)
PROP PERM EASEMENT (TYP)
2023 TOWN ALTERATION SECTION 3
(DEED BK 37867 PG 1)
(PLAN BK 251 PG 51)
PROP SAWCUT & MATCH EXISTING
TAKING ON BEHALF OF THE TOWN
PROP GUARDRAIL - CURVED
PROP CLEARING & GRUBBING
LIMIT OF WORK
END PAVEMENT
FINE MILLING
AND RESURFACING
STA. 41+95.00
END FULL DEPTH RECONSTRUCTION
MATCH EXISTING GRADE & ELEVATIO
STA. 40+70.00
RET BERM
PROP TEMP EASEMENT (TYP)
TOWN OF WILMINGTON
PARCEL ID 40-13-A
BOOK 35162 PAGE 138
CROSS ST
CROSS STREET
(2023 TOWN ALTERATION - VARIABLE WIDTH)
1600 TOWN LAYOUT
MAIN STREET (ROUTE 38)
(PUBLIC - 1910 STATE HIGHWAY LAYOUT)
R&D EXIST HEADWALL
SEE NOTE 1
PROP GUARDRAIL
PROP FULL DEPTH RECONSTRUCTION
PROP GRAN CURB, TYPE VB (TYP)
PROP CLEARING AND GRUBBING
R&D EXIST BIT BERM (TYP)
LOCATION LINE OF 1910 STATE HIGHWAY LAYOUT (SHLO 1315)
GRAN CURB PROPOSED UNDER PROJECT 608929
PC +06125
PROP CONC HEADWALL
PROP STONE FOR PIPE END
PROP PERM EASEMENT (TYP)
R&D EXISTING GUARDRAIL
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP GUARDRAIL
PROP 5.5' CEM CONC SW (TYP)
PROP CLEARING & GRUBBING
PROP SLOPE LIMIT (TYP)
PROP. COIR FIBER ROLL (TYP.)
PROP LOAM & SEED (TYP)
VW C
VW IMPACTS (PERM.) = 2,315 SF
VW IMPACTS (TEMP.) = 1,443 SF
PROP TEMP EASEMENT (TYP)
BUTTERS ROW
2023 TOWN ALTERATION, SECTION 2
(DEED BK 37867 PG 1)
(PLAN BK 251 PG 51)
SUBJECT TO VERIZON EASEMENT
BOOK 36483 PAGE 73
(NOT PLOTTABLE)
WETLAND
CONC RET WALL
STONE RET WALL
WF#C-1 START
WF#C-2
WF#C-3
WF#C-25
WF#C-26
WF#C-27
SMH
RIM=97.24
INV.(A)=87.25
INV.(B)=87.30
SUMP=87.27
SMH
RIM=95.60
BOLTED SHUT, INACCESSIBLE
RIM=95.53

PERMANENT VW IMPACT AREA
TEMPORARY VW IMPACT AREA
TEMPORARY LUW/WOTUS IMPACT AREA
VEGETATED WETLAND (VW)
BANK/OHW (PERENNIAL STREAM)
BANK/OHW (INTERMITTENT STREAM)

0 20 50 100
SCALE: 1" = 40'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	6
PROJECT FILE NO.		608051	

IMPACT PLANS
SHEET 3 OF 6

Plotted on 4-Apr-2025 1:32 PM
608051_EV(IMPACT-PLANS).DWG

Proposal No. 608051 - 132406

A00840 - 322

MAIN STREET (ROUTE 38)
(PUBLIC - 1910 STATE HIGHWAY LAYOUT)
LOCATION LINE OF 1910 STATE HIGHWAY LAYOUT (SHID NO. 1315)
1910 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1315)
1911 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1352)
PROP CLEARING AND GRUBBING
SEE NOTE 1
PROP GRAN CURB, TYPE VB (TYP)
R&D (TYP)
R&D EXIST BIT BERM (TYP)
R&D EXISTING GUARDRAIL
PROP CEM CONC PCR (TYP)
PROP UP (BO)
PROP COIR FIBER ROLL (TYP)
PROP GUARDRAIL
PROP MAST ARM (TYP)
PROP GUARDRAIL - CURVED
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP TEMP EASEMENT (TYP)
PROP 6.0' CEM CONC SW (TYP)
PROP BUTTERS ROW CONST BL
R&R CURB AND GUARDRAIL INSTALLED UNDER PROJECT 608929
PROP LOAM & SEED (TYP)
PROP SLOPE LIMIT (TYP)
PROP TEMP EASEMENT (TYP)
GRAN CURB PROPOSED UNDER PROJECT 608929
PROP GRAN CURB TYPE VB (TYP) (2023 TOWN ALTERATION - SECTION 2 (DEED BK 37867 PG 1) (PLAN BK 251 PG 51))
BUTTERS ROW
(2023 TOWN ALTERATION - VARIABLE WIDTH)
1894 TOWN LAYOUT
PROP HMA DWY (TYP)
PROP CEM CONC SW AT DWY (TYP)
R&R CURB AND GUARDRAIL INSTALLED UNDER PROJECT 608929
MATCH EXISTING
PROP LOAM & SEED (TYP)
BUTTERS ROW - 1951 COUNTY LAYOUT - 40' WIDE
PROP SLOPE LIMIT (TYP)
PROP SAWCUT & MATCH EXISTING
END FULL DEPTH RECONSTRUCTION
MATCH EXISTING GRADE & ELEVATION
STA. 55+90.00
LIMIT OF WORK
END PAVEMENT FINE MILLING AND RESURFACING
STA. 55+65.00
RETAIN EXISTING ROADWAY AND SIDEWALK CONSTRUCTED UNDER PROJECT 608929
2023 STATE HIGHWAY ALTERATION NO. 89-18 (DEED BK 37867 PG 1) (PLAN BK 251 PG 51)
(SEE PLAN BOOK 98 PLAN 150) 20' WATER EASEMENT
PROP TEMP EASEMENT (TYP)
MATCH EXISTING
EXISTING LANDSCAPING INSTALLED UNDER PROJECT 608929
PROP LOAM & SEED (TYP)
PROP SLOPE LIMIT (TYP)
PROP HMA DWY (TYP)
PROP SAWCUT (TYP)
PROP CEM CONC SW AT DWY (TYP)
PROP ROUTE 38 CONST BL
N44°52'23"W (BACK)
N44°55'34"E (AHEAD)
R&R MAILBOXES ON UP
BRICK WALK REMOVED AND RELAID
3" REVEAL
PROP FULL DEPTH RECONSTRUCTION
R&R MB
RET BOUND
PROP 6.0' CEM CONC SW (TYP)
JOHN C. OLSON
PARCEL ID 39-14
BOOK 23310 PAGE 186
673 MAIN ST
MIDDLESEX COUNTY EASEMENT FOR HIGHWAY PURPOSES
(BOOK 1178 PAGE 237)
JARID POLLEY AND MARY POLLEY
BOOK 37173 PAGE 123
PARCEL ID 39-15
669 MAIN ST
ANDREA J. DELUCA
PARCEL ID 39-16
BOOK 18231 PAGE 111
665 MAIN ST
635 MAIN STREET OWNER LLC
AKA 635 MAIN STREET OWNER, LLC
BOOK 34786 PAGE 182
PARCEL ID 40-1
635 MAIN ST
VW C
VW IMPACTS (PERM.) = 2,315 SF
VW IMPACTS (TEMP.) = 1,443 SF
WETLAND C
PC +06+25
END OF 1910 LAYOUT
BEGINNING OF 1911 LAYOUT
NON TANGENT AT PC
END OF 1910 LAYOUT
BEGINNING OF 1911 LAYOUT
AT PC
420'
500'
32.0'
22.0'

PERMANENT VW IMPACT AREA
TEMPORARY VW IMPACT AREA
TEMPORARY LUW/WOTUS IMPACT AREA
VEGETATED WETLAND (VW)
BANK/OHW (PERENNIAL STREAM)
BANK/OHW (INTERMITTENT STREAM)

0 20 50 100
SCALE: 1" = 40'

TRAFFIC SIGNAL CONDUIT
N/A

WATER SUPPLY ALTERATIONS
SEE SHEET 124

DRAINAGE DETAILS
SEE SHEET 103

MAPLE MEADOW BROOK
VW E IMPACTS (PERM.) = 486 SF
VW E IMPACTS (TEMP.) = 346 SF
LUW/WOTUS (PERM.) = 2,118 SF
LUW/WOTUS (TEMP.) = 515 SF
VW G IMPACTS (TEMP.) = 221 SF
DREDGE/FILL VOLUME = 650 CY

TOWN OF WILMINGTON
PARCEL ID 39-5
BOOK 26062 PAGE 215

9 CROSS ST

MAPLE MEADOW BROOK
VW E IMPACTS (PERM.) = 29 SF
VW E IMPACTS (TEMP.) = 89 SF
LUW/WOTUS (TEMP.) = 31 SF

N/F
TOWN OF WILMINGTON
PARCEL ID 39-5
BOOK 26062 PAGE 215

9 CROSS ST

MAPLE MEADOW BROOK

FLOW

OHW EL. 77.78' (NAVD88)

254+00

PROP. CHANNEL ARMORING
PROP. FLOATING SILT FENCE (TYP)
PROP COFFERDAM (TYP)
BRIDGE NO. W-38-011 (802)
PROP COMPOST AND SEASONALLY FLOODED SEED MIX OVER STONE (TYP)
PROP. STONE FOR PIPE ENDS (TYP.)
PROP PERM EASEMENT (TYP)
PROP COIR FIBER ROLL
R&D EXIST GUARDRAIL
PROP GUARDRAIL
PROP GRAN CURB, TYPE VB (TYP)
PROP HMA DWY (TYP)
(RET)
PROP SAWCUT (TYP)
PROP CEM CONC SW AT DWY (TYP)
PROP TEMP EASEMENT (TYP)
R&D EXISTING GUARDRAIL
PROP PERMANENT IMPACT ATTENUATOR, NON-REDIRECTIVE, TL-3

PROP SLOPE LIMIT (TYP)
PROP CLEARING & GRUBBING
PROP LOAM & NATIVE SEED (TYP)
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP PERM EASEMENT (TYP)
PROP EOP (TYP)
PROP ROUTE 38 CONST BL
PROP 5.5' CEM CONC SW (TYP)
PROP CLEARING & GRUBBING
PROP TEMP PEDESTRIAN BRIDGE AND WALKWAY
PROP LOAM & NATIVE SEED (STA 253+91 - 257+38)
PROP NATURAL STREAMBED MATERIAL OVER M2.02.2 (TYP) SEE DRAINAGE AND UTILITY DETAIL SHEETS
PROP LOAM & NATIVE SEED
PROP JUTE MESH (STA 253+54 RT - 253+73 RT)

TEXTRON SYSTEMS CORPORATION
PARCEL ID 48-73-A
BOOK 24103 PAGE 25
BOOK 35305 PAGE 130
BOOK 35305 PAGE 132

201 LOWELL ST

SUBJECT TO RECIPROCAL EASEMENTS
BOOK 37155 PAGE 258
(NOT PLOTTABLE)

MAIN STREET (ROUTE 38)
(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

PC +35.53
PCC +18.67

J-HAUL REAL ESTATE COMPANY
PARCEL ID 39-11-A
BOOK 5015 PAGE 103

687 MAIN ST

100-FOOT WETLAND BUFFER ZONE

100-YEAR FLOODPLAIN UPSTREAM EL. 82.9'

REM TREE

COMPENSATORY FLOOD STORAGE AREA
SEE SHEET: 219

100-YEAR FLOOR ZONE (TYP)

TOWN OF WILMINGTON
BOOK 2299 PAGE 288
PARCEL ID 39-9
MAIN ST

LIMIT OF REPLICATION AREA

PROP WETLAND REPLICATION AREA: SEE SHEET: ###

PROP WETLAND REPLICATION AREA - 3,510 SF (SEE SHEET 212)

ACCESS EASEMENT
BOOK 5666 PAGE 82
BOOK 35733 PAGE 145
BOOK 37850 PAGE 55

WETLAND E

100-FOOT WETLAND BUFFER ZONE

PROP HMA DWY (TYP)

RET SIGN

PROP SAWCUT (TYP)

100-FOOT RIVERFRONT AREA

PROP FULL DEPTH RECONSTRUCTION

PERMANENT VW IMPACT AREA
TEMPORARY VW IMPACT AREA
TEMPORARY LUW/WOTUS IMPACT AREA
PERMANENT LUW/WOTUS IMPACT AREA

VEGETATED WETLAND (VW)
BANK/OHW (PERENNIAL STREAM)
BANK/OHW (INTERMITTENT STREAM)

0 20 50 100
SCALE: 1" = 40'

WQC/ACOE PLANS SHEET 13 OF 68

FOR PROFILE:
SEE SHEET NO. 50

Plotted on 4-Apr-2025 1:35 PM
608051_EV(IMPACT-PLANS).DWG
Proposal No. 608051 - 132406
A00840 - 323

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	6
PROJECT FILE NO.	608051		

IMPACT PLANS
SHEET 5 OF 6

Plotted on 4-Apr-2025 1:45 PM
608051_EV(IMPACT-PLANS).DWG

Proposal No. 608051 - 132406

A00840 - 324

LIMIT OF REPLICATION AREA

PROP WETLAND REPLICATION AREA: SEE SHEET: ###

PROP HMA DWY (TYP)

PROP LOAM & SEED (TYP)

PROP GUARDRAIL

REM TREE

COMPENSATORY FLOOD STORAGE AREA SEE SHEET: 219

R&D EXISTING GUARDRAIL

PROP GUARDRAIL

100-YEAR FLOOD ZONE (TYP)

PROP LOAM & SEED (TYP)

PROP COMPENSATORY FLOOD STORAGE AREA - 4,261 SF (SEE SHEET 213)

MAIN STREET (ROUTE 38)
(PUBLIC 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1352)

PCC +18.67

+45.48 PCC

N/F TOWN OF WILMINGTON BOOK 2299 PAGE 288 PARCEL ID 39-9 MAIN ST

DSM NEORESINS INC. PARCEL ID 39-8 L.C.C. 23868 C CERT. NO. 359.32 DOC NO. 202386 730 MAIN ST

ACCESS EASEMENT BOOK 8866 PAGE 82 BOOK 37133 PAGE 145 BOOK 37880 PAGE 353

WETLAND I

WETLAND E

WETLAND J

EDGE OF WETLAND

PERMANENT EASEMENT PARCEL 25-PUE-1 SHLO 8859

TEMPORARY EASEMENT PARCEL 25-TE-6 SHLO 8859

ECT TO RECIPROCAL EASEMENTS BOOK 37155 PAGE 258 (NOT PLOTTABLE)

ALL BE RESTORED K IS COMPLETE

E (TYP)

NATIVE SEED

257+38)

100-YEAR FLOOR ZONE (TYP)

TOWN OF WILMINGTON BOOK 2299 PAGE 288 PARCEL ID 39-9 MAIN ST

PERMANENT VW IMPACT AREA

TEMPORARY VW IMPACT AREA

TEMPORARY LUW/WOTUS IMPACT AREA

VEGETATED WETLAND (VW)

BANK/OHW (PERENNIAL STREAM)

BANK/OHW (INTERMITTENT STREAM)

WQC/ACOE PLANS SHEET 14 OF 68

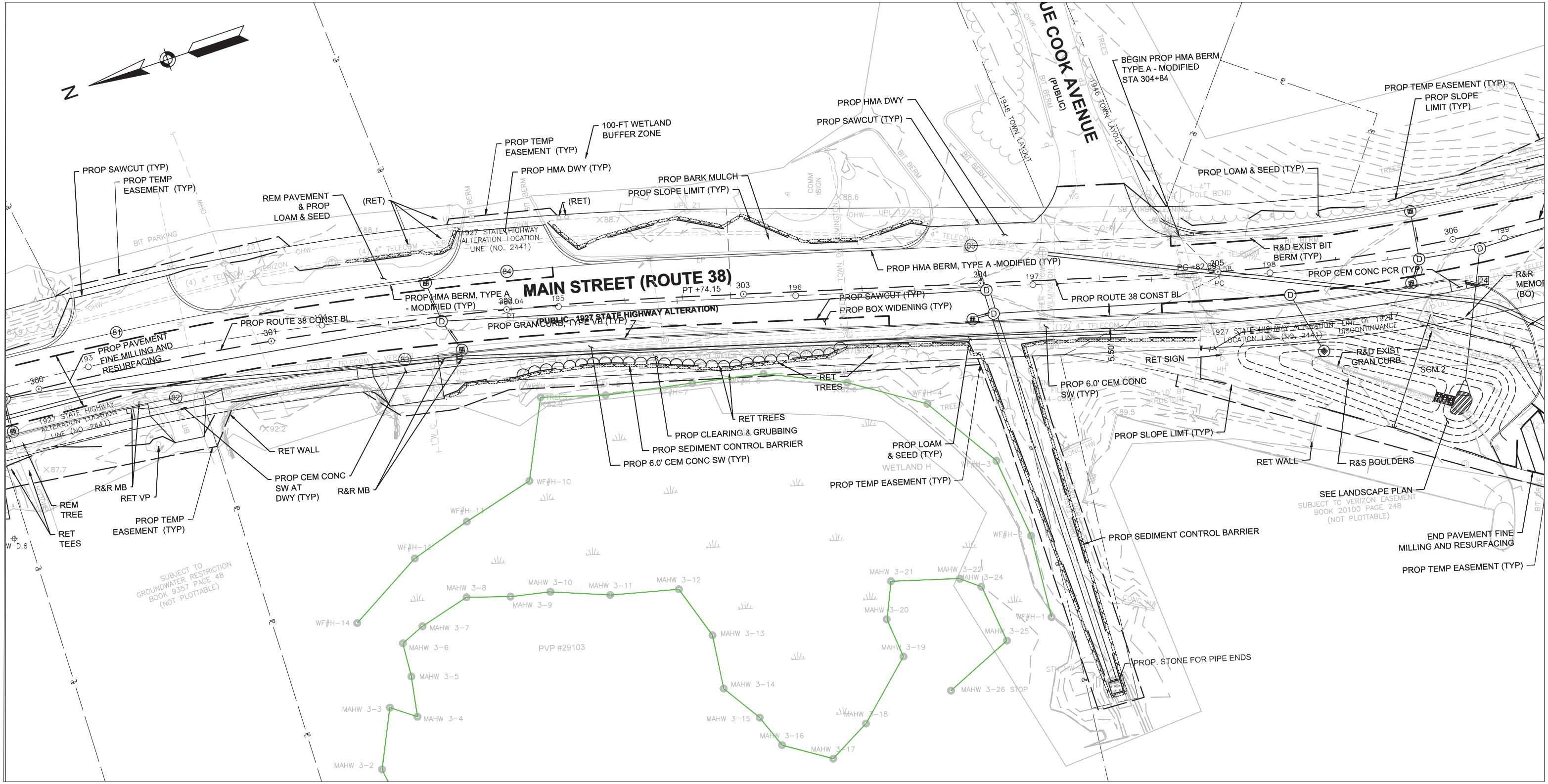
0 20 50 100

SCALE: 1" = 40'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	6
PROJECT FILE NO.		608051	

IMPACT PLANS
SHEET 6 OF 6



PERMANENT VW IMPACT AREA
TEMPORARY VW IMPACT AREA
TEMPORARY LUW/WOTUS IMPACT AREA
VEGETATED WETLAND (VW)
BANK/OHW (PERENNIAL STREAM)
BANK/OHW (INTERMITTENT STREAM)

WQC/ACOE PLANS SHEET 15 OF 68

0 20 50 100
SCALE: 1" = 40'

A00840 - 325

Proposal No. 608051 - 132406

608051_EVIMPACT-PLANS).DWG Plotted on 4-Apr-2025 1:49 PM

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

SEE SHEET 109

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	94	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 1

BEGIN PROJECT
STA. 203+55.00
MEET EXISTING
N3024552.8585
E744023.6687

N

CHURCH STREET
(1901 COUNTY LAYOUT - 60' WIDE)

LOCATION LINE OF 1901 COUNTY LAYOUT

LOUIS VALENTI
PARCEL ID 42-20
BOOK 15294 PAGE 161
424 MAIN ST

MACMULLIN FAMILY
REALTY TRUST III
PARCEL ID 42-21
BOOK 27960 PAGE 33
428-438 MAIN ST

414-418 MAIN STREET
REALTY TRUST
PARCEL ID 42-19
BOOK 21033 PAGE 248
414-418 MAIN ST

1 CHURCH
REALTY TRUST
PARCEL ID 41-110
BOOK 24436 PAGE 46
1 CHURCH ST

STEDMAN 442, LLC
PARCEL ID 41-111
BOOK 22652 PAGE 51
442 MAIN ST

C & B
REALTY TRUST
PARCEL ID 41-112
BOOK 10882 PAGE 295
446 MAIN ST

456 MAIN STREET
REALTY TRUST
PARCEL ID 41-113
BOOK 23689 PAGE 31
456 MAIN ST

1923 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 2122)

1997 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 7255)

4 LF - 12" DRAINAGE PIPE - OPTION @ 1.7%

PROP. GI (0-01)

CTE

PROP ROUTE 38 BASELINE

ROUTE 38 (MAIN STREET)
(PUBLIC - 1923 STATE HIGHWAY LAYOUT-1997 ALTERATION)

BURLINGTON AVENUE
(PUBLIC - 1997 ALTERATION)

MASS BAY TRANSPORTATION AUTHORITY
BOOK 10373 PAGE 276
PARCEL ID 42-22
375 MAIN ST

PARTEL MANAGEMENT, LLC
PARCEL ID 42-22-F
BOOK 31258 PAGE 98
433 MAIN ST

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 42-22
375 MAIN ST

TOWN OF READING
PARCEL ID 41-142
BOOK 1675 PAGE 178
435 MAIN ST

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 41-141

RAILROAD SIDELINE

CONTINUED ON SHEET NO. 95

LEGEND - UTILITIES

- EXIST OVERHEAD WIRE
- PROP OVERHEAD WIRE
- EXIST GAS-OIL-STEAM
- EXIST COMMUNICATION/CATV
- PROP COMMUNICATION/CATV
- EXIST SEWER
- PROP SEWER
- EXIST DRAINAGE
- PROP DRAINAGE
- EXIST POTABLE WATER
- PROP POTABLE WATER

0 20 50 100
SCALE: 1" = 40'

A000840 326

Proposal No. 608051 - 132406

608051_UT03\DRAINAGE-PLANS\.DWG Plotted on 13-Mar-2025 8:52 AM

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

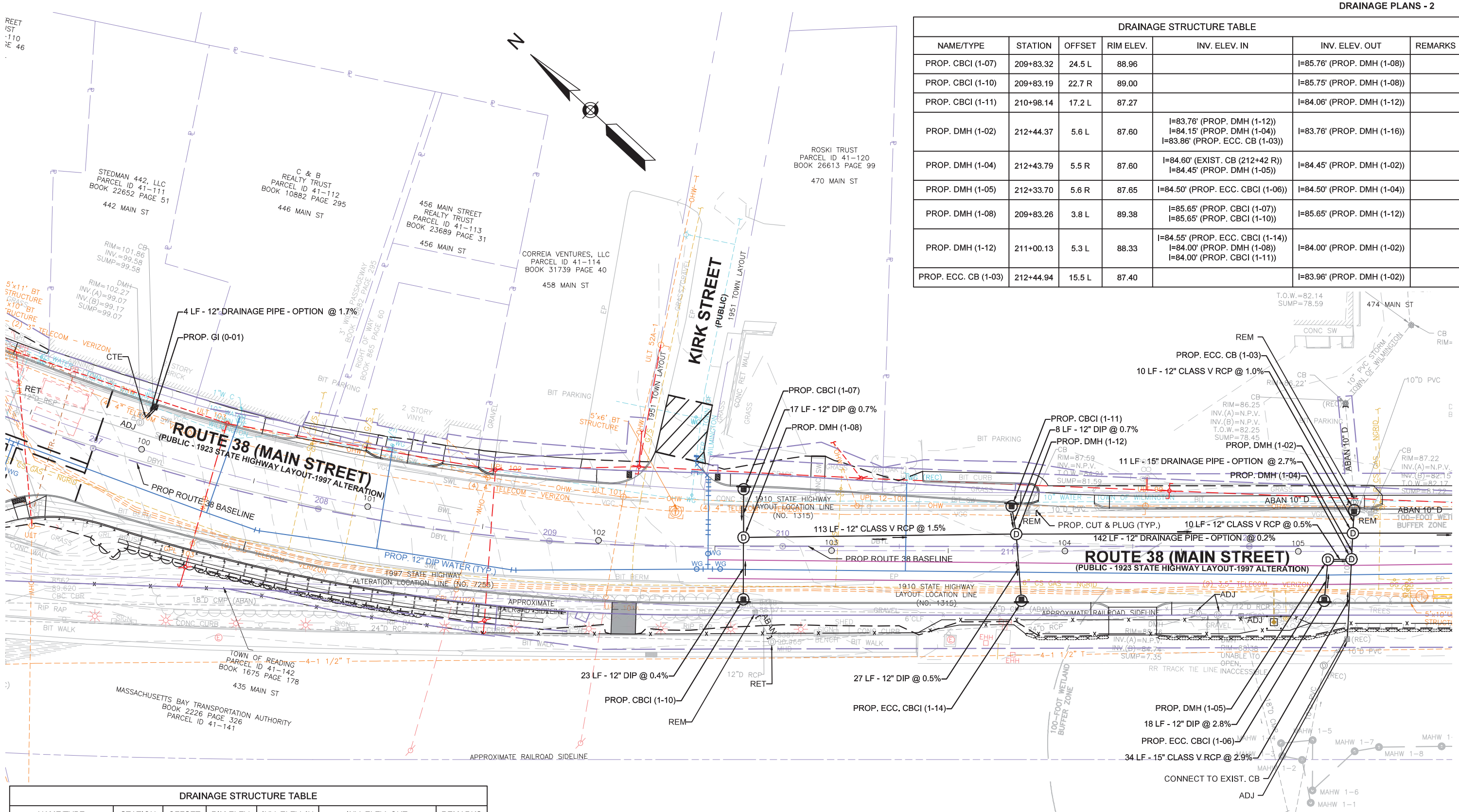
SEE SHEET 110

DRAINAGE PLANS
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	95	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 2

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CBCI (1-07)	209+83.32	24.5 L	88.96		I=85.76' (PROP. DMH (1-08))	
PROP. CBCI (1-10)	209+83.19	22.7 R	89.00		I=85.75' (PROP. DMH (1-08))	
PROP. CBCI (1-11)	210+98.14	17.2 L	87.27		I=84.06' (PROP. DMH (1-12))	
PROP. DMH (1-02)	212+44.37	5.6 L	87.60	I=83.76' (PROP. DMH (1-12)) I=84.15' (PROP. DMH (1-04)) I=83.86' (PROP. ECC. CB (1-03))	I=83.76' (PROP. DMH (1-16))	
PROP. DMH (1-04)	212+43.79	5.5 R	87.60	I=84.60' (EXIST. CB (212+42 R)) I=84.45' (PROP. DMH (1-05))	I=84.45' (PROP. DMH (1-02))	
PROP. DMH (1-05)	212+33.70	5.6 R	87.65	I=84.50' (PROP. ECC. CBCI (1-06))	I=84.50' (PROP. DMH (1-04))	
PROP. DMH (1-08)	209+83.26	3.8 L	89.38	I=85.65' (PROP. CBCI (1-07)) I=85.65' (PROP. CBCI (1-10))	I=85.65' (PROP. DMH (1-12))	
PROP. DMH (1-12)	211+00.13	5.3 L	88.33	I=84.55' (PROP. ECC. CBCI (1-14)) I=84.00' (PROP. DMH (1-08)) I=84.00' (PROP. CBCI (1-11))	I=84.00' (PROP. DMH (1-02))	
PROP. ECC. CB (1-03)	212+44.94	15.5 L	87.40		I=83.96' (PROP. DMH (1-02))	



DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. ECC. CBCI (1-06)	212+32.11	24.0 R	87.29		I=85.01' (PROP. DMH (1-05))	FLAT TOP
PROP. ECC. CBCI (1-14)	211+02.37	24.0 R	87.94		I=84.70' (PROP. DMH (1-12))	
PROP. GI (0-01)	207+20.18	25.0 L	101.77		I=99.27' ()	

0 20 50 100

SCALE: 1" = 40'

WQC/ACOE PLANS SHEET 17 OF 68

A00840 327

Plotted on 13-Mar-2025 8:52 AM

608051_UT03\DRAINAGE-PLANS\.DWG

Proposal No. 608051 - 132406

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

SEE SHEET 111

DRAINAGE PLANS
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	96	391
PROJECT FILE NO.	608051		

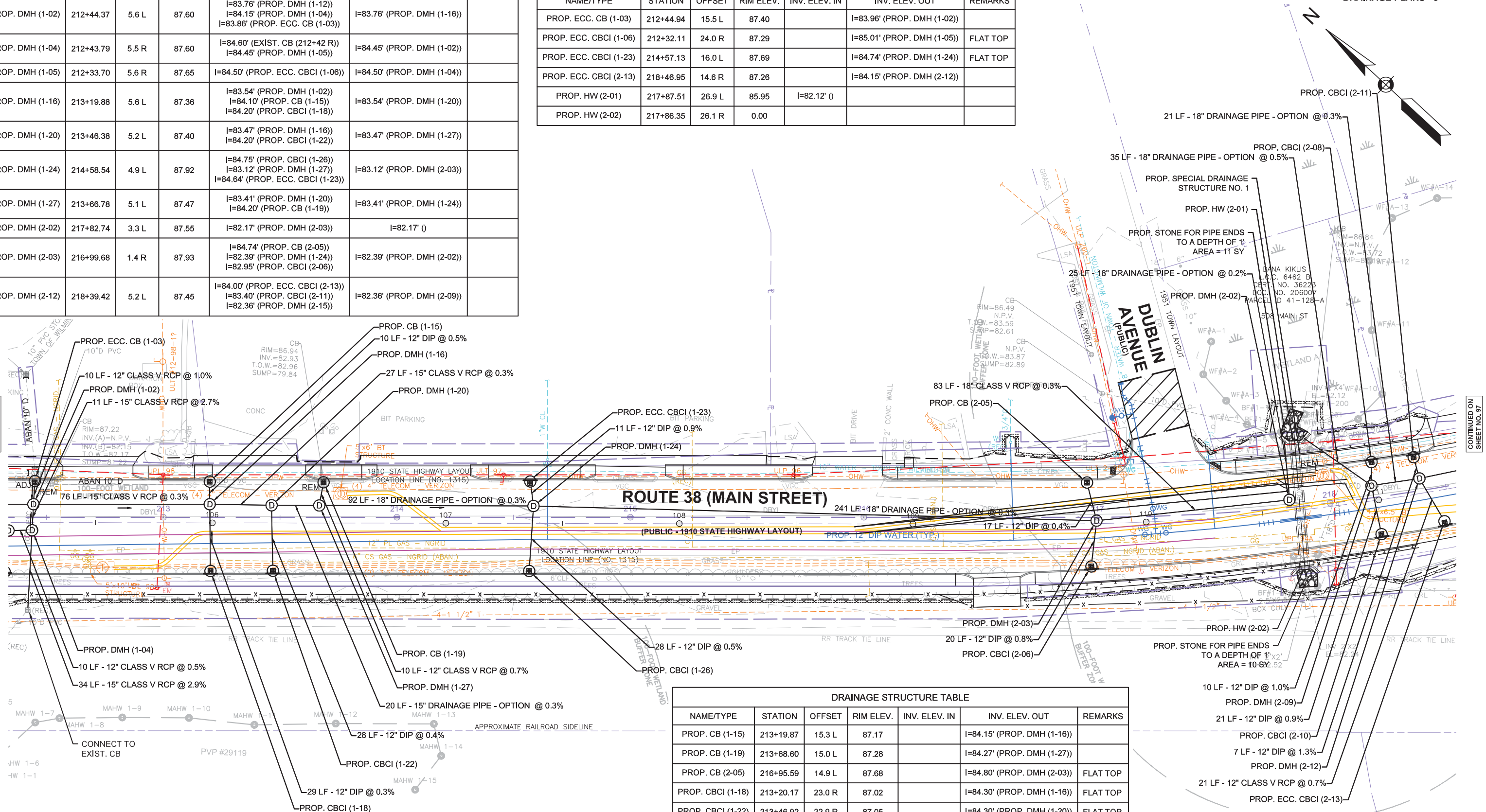
DRAINAGE PLANS - 3

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (1-02)	212+44.37	5.6 L	87.60	I=83.76' (PROP. DMH (1-12)) I=84.15' (PROP. DMH (1-04)) I=83.86' (PROP. ECC. CB (1-03))	I=83.76' (PROP. DMH (1-16))	
PROP. DMH (1-04)	212+43.79	5.5 R	87.60	I=84.60' (EXIST. CB (212+42 R)) I=84.45' (PROP. DMH (1-05))	I=84.45' (PROP. DMH (1-02))	
PROP. DMH (1-05)	212+33.70	5.6 R	87.65	I=84.50' (PROP. ECC. CBCI (1-06))	I=84.50' (PROP. DMH (1-04))	
PROP. DMH (1-16)	213+19.88	5.6 L	87.36	I=83.54' (PROP. DMH (1-02)) I=84.10' (PROP. CB (1-15)) I=84.20' (PROP. CBCI (1-18))	I=83.54' (PROP. DMH (1-20))	
PROP. DMH (1-20)	213+46.38	5.2 L	87.40	I=83.47' (PROP. DMH (1-16)) I=84.20' (PROP. CBCI (1-22))	I=83.47' (PROP. DMH (1-27))	
PROP. DMH (1-24)	214+58.54	4.9 L	87.92	I=84.75' (PROP. CBCI (1-26)) I=83.12' (PROP. DMH (1-27)) I=84.64' (PROP. ECC. CBCI (1-23))	I=83.12' (PROP. DMH (2-03))	
PROP. DMH (1-27)	213+66.78	5.1 L	87.47	I=83.41' (PROP. DMH (1-20)) I=84.20' (PROP. CB (1-19))	I=83.41' (PROP. DMH (1-24))	
PROP. DMH (2-02)	217+82.74	3.3 L	87.55	I=82.17' (PROP. DMH (2-03))	I=82.17' ()	
PROP. DMH (2-03)	216+99.68	1.4 R	87.93	I=84.74' (PROP. CB (2-05)) I=82.39' (PROP. DMH (1-24)) I=82.95' (PROP. CBCI (2-06))	I=82.39' (PROP. DMH (2-02))	
PROP. DMH (2-12)	218+39.42	5.2 L	87.45	I=84.00' (PROP. ECC. CBCI (2-13)) I=83.40' (PROP. CBCI (2-11)) I=82.36' (PROP. DMH (2-15))	I=82.36' (PROP. DMH (2-09))	

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. ECC. CB (1-03)	212+44.94	15.5 L	87.40		I=83.96' (PROP. DMH (1-02))	
PROP. ECC. CBCI (1-06)	212+32.11	24.0 R	87.29		I=85.01' (PROP. DMH (1-05))	FLAT TOP
PROP. ECC. CBCI (1-23)	214+57.13	16.0 L	87.69		I=84.74' (PROP. DMH (1-24))	FLAT TOP
PROP. ECC. CBCI (2-13)	218+46.95	14.6 R	87.26		I=84.15' (PROP. DMH (2-12))	
PROP. HW (2-01)	217+87.51	26.9 L	85.95	I=82.12' ()		
PROP. HW (2-02)	217+86.35	26.1 R	0.00			



NOTES:
1. CONTRACTOR SHALL FIELD VERIFY GUARDRAIL POST SPACING CAN ACCOMMODATE PROPOSED AND EXISTING DRAINAGE.
2. EXCAVATE TO DEPTH OF RIPRAP AND MATCH EXISTING SURFACE. FINAL GRADE SHALL MATCH EXISTING GRADE.

0 20 50 100
SCALE: 1" = 40'

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB (1-15)	213+19.87	15.3 L	87.17		I=84.15' (PROP. DMH (1-16))	
PROP. CB (1-19)	213+68.60	15.0 L	87.28		I=84.27' (PROP. DMH (1-27))	
PROP. CB (2-05)	216+95.59	14.9 L	87.68		I=84.80' (PROP. DMH (2-03))	FLAT TOP
PROP. CBCI (1-18)	213+20.17	23.0 R	87.02		I=84.30' (PROP. DMH (1-16))	FLAT TOP
PROP. CBCI (1-22)	213+46.92	22.9 R	87.05		I=84.30' (PROP. DMH (1-20))	FLAT TOP
PROP. CBCI (1-26)	214+56.66	23.0 R	87.55		I=84.90' (PROP. DMH (1-24))	FLAT TOP
PROP. CBCI (2-06)	216+97.41	21.0 R	87.55		I=83.10' (PROP. DMH (2-03))	
PROP. CBCI (2-08)	218+19.93	15.2 L	87.22		I=84.10' (PROP. DMH (2-09))	
PROP. CBCI (2-10)	218+19.91	16.0 R	87.21		I=84.10' (PROP. DMH (2-09))	
PROP. CBCI (2-11)	218+38.37	14.6 L	86.61		I=83.50' (PROP. DMH (2-12))	

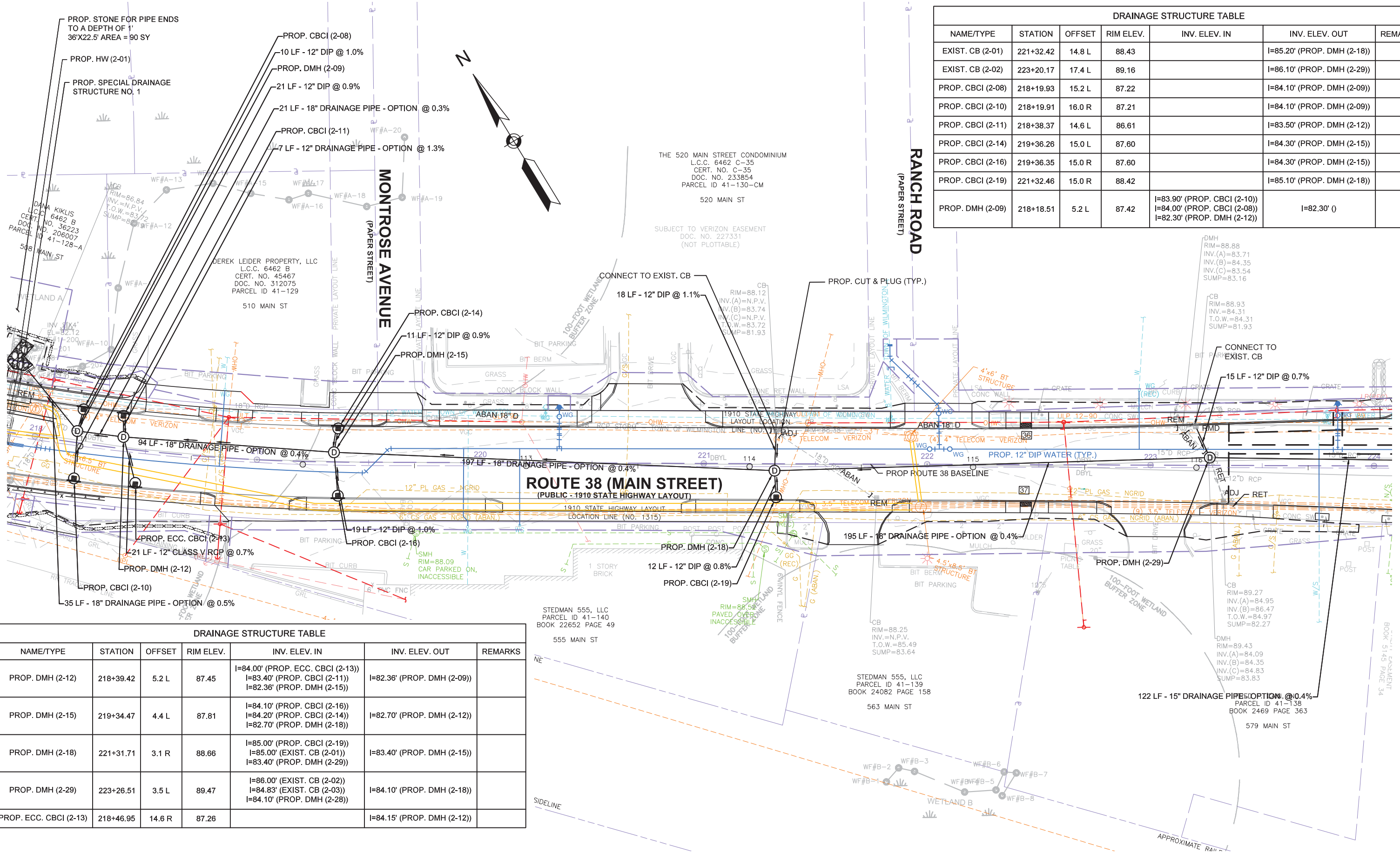
Plotted on 13-Mar-2025 8:53 AM
608051_UT03\DRAINAGE-PLANS\.DWG
Proposal No. 608051 - 132406

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS	UTILITY PLAN
SEE SHEET 33	NONE	SEE SHEET 133	SEE BELOW	SEE SHEET 112

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	97	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 4



DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
EXIST. CB (2-01)	221+32.42	14.8 L	88.43		I=85.20' (PROP. DMH (2-18))	
EXIST. CB (2-02)	223+20.17	17.4 L	89.16		I=86.10' (PROP. DMH (2-29))	
PROP. CBCI (2-08)	218+19.93	15.2 L	87.22		I=84.10' (PROP. DMH (2-09))	
PROP. CBCI (2-10)	218+19.91	16.0 R	87.21		I=84.10' (PROP. DMH (2-09))	
PROP. CBCI (2-11)	218+38.37	14.6 L	86.61		I=83.50' (PROP. DMH (2-12))	
PROP. CBCI (2-14)	219+36.26	15.0 L	87.60		I=84.30' (PROP. DMH (2-15))	
PROP. CBCI (2-16)	219+36.35	15.0 R	87.60		I=84.30' (PROP. DMH (2-15))	
PROP. CBCI (2-19)	221+32.46	15.0 R	88.42		I=85.10' (PROP. DMH (2-18))	
PROP. DMH (2-09)	218+18.51	5.2 L	87.42	I=83.90' (PROP. CBCI (2-10)) I=84.00' (PROP. CBCI (2-08)) I=82.30' (PROP. DMH (2-12))	I=82.30' ()	

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (2-12)	218+39.42	5.2 L	87.45	I=84.00' (PROP. ECC. CBCI (2-13)) I=83.40' (PROP. CBCI (2-11)) I=82.36' (PROP. DMH (2-15))	I=82.36' (PROP. DMH (2-09))	
PROP. DMH (2-15)	219+34.47	4.4 L	87.81	I=84.10' (PROP. CBCI (2-16)) I=84.20' (PROP. CBCI (2-14)) I=82.70' (PROP. DMH (2-18))	I=82.70' (PROP. DMH (2-12))	
PROP. DMH (2-18)	221+31.71	3.1 R	88.66	I=85.00' (PROP. CBCI (2-19)) I=85.00' (EXIST. CB (2-01)) I=83.40' (PROP. DMH (2-29))	I=83.40' (PROP. DMH (2-15))	
PROP. DMH (2-29)	223+26.51	3.5 L	89.47	I=86.00' (EXIST. CB (2-02)) I=84.83' (EXIST. CB (2-03)) I=84.10' (PROP. DMH (2-28))	I=84.10' (PROP. DMH (2-18))	
PROP. ECC. CBCI (2-13)	218+46.95	14.6 R	87.26		I=84.15' (PROP. DMH (2-12))	

NOTES:
1. CONTRACTOR SHALL FIELD VERIFY GUARDRAIL POST SPACING CAN ACCOMMODATE PROPOSED AND EXISTING DRAINAGE.
2. EXCAVATE TO DEPTH OF RIPRAP AND MATCH EXISTING SURFACE. FINAL GRADE SHALL MATCH EXISTING GRADE.

0 20 50 100
SCALE: 1" = 40'

A000840 329
Proposal No. 608051 - 132406
608051_UT03\DRAINAGE-PLANS1.DWG Plotted on 13-Mar-2025 8:54 AM

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

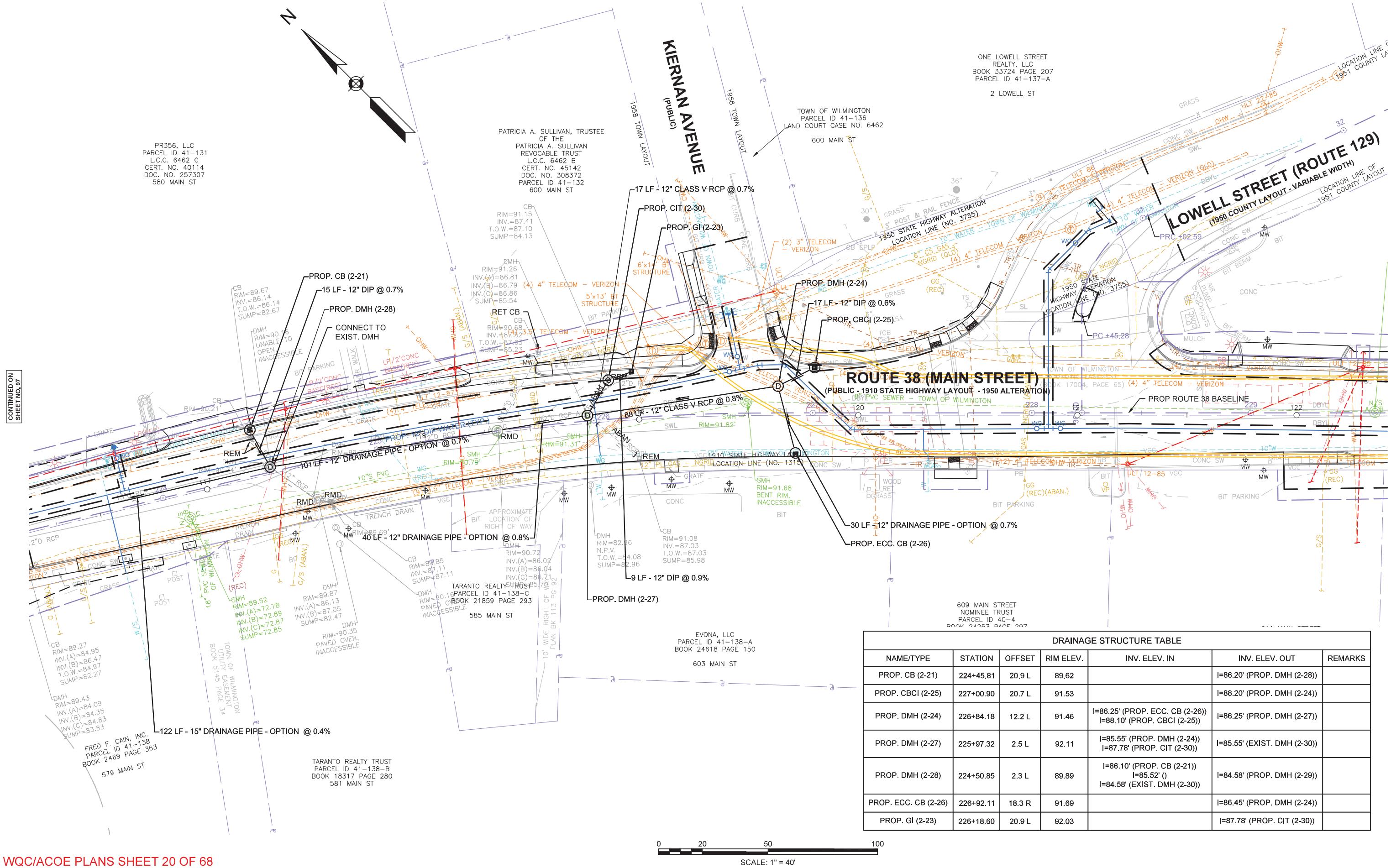
UTILITY PLAN

SEE SHEET 113

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	98	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 5


N
KIERNAN AVENUE
(PUBLIC)
1958 TOWN LAYOUT
1958 TOWN LAYOUT
PR356, LLC
PARCEL ID 41-131
L.C.C. 6462 C
CERT. NO. 40114
DOC. NO. 257307
580 MAIN ST
PATRICIA A. SULLIVAN, TRUSTEE
OF THE
PATRICIA A. SULLIVAN
REVOCABLE TRUST
L.C.C. 6462 B
CERT. NO. 45142
DOC. NO. 308372
PARCEL ID 41-132
600 MAIN ST
TOWN OF WILMINGTON
PARCEL ID 41-136
LAND COURT CASE NO. 6462
600 MAIN ST
ONE LOWELL STREET
REALTY, LLC
BOOK 33724 PAGE 207
PARCEL ID 41-137-A
2 LOWELL ST
LOWELL STREET (ROUTE 129)
(1950 COUNTY LAYOUT - VARIABLE WIDTH)
LOCATION LINE OF
1951 COUNTY LAYOUT
ROUTE 38 (MAIN STREET)
(PUBLIC - 1910 STATE HIGHWAY LAYOUT - 1950 ALTERATION)
PROP ROUTE 38 BASELINE
1950 STATE HIGHWAY ALTERATION
LOCATION LINE (NO. 3755)
1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)
PC +02.59
PC +45.28
17 LF - 12" CLASS V RCP @ 0.7%
PROP. CIT (2-30)
PROP. GI (2-23)
PROP. CB (2-21)
15 LF - 12" DIP @ 0.7%
PROP. DMH (2-28)
CONNECT TO
EXIST. DMH
RET CB
PROP. DMH (2-24)
17 LF - 12" DIP @ 0.6%
PROP. CBCI (2-25)
88 LF - 12" CLASS V RCP @ 0.8%
101 LF - 12" DRAINAGE PIPE - OPTION @ 0.7%
40 LF - 12" DRAINAGE PIPE - OPTION @ 0.8%
30 LF - 12" DRAINAGE PIPE - OPTION @ 0.7%
PROP. ECC. CB (2-26)
9 LF - 12" DIP @ 0.9%
PROP. DMH (2-27)
122 LF - 15" DRAINAGE PIPE - OPTION @ 0.4%
TARANTO REALTY TRUST
PARCEL ID 41-138-C
BOOK 21859 PAGE 293
585 MAIN ST
TARANTO REALTY TRUST
PARCEL ID 41-138-B
BOOK 18317 PAGE 280
581 MAIN ST
FRED F. CAIN, INC.
PARCEL ID 41-138
BOOK 2469 PAGE 363
579 MAIN ST
EVONA, LLC
PARCEL ID 41-138-A
BOOK 24618 PAGE 150
603 MAIN ST
609 MAIN STREET
NOMINEE TRUST
PARCEL ID 40-4
BOOK 24263 PAGE 297
TOWN OF WILMINGTON
UTILITY EASEMENT
BOOK 5145 PAGE 34
10' WIDE RIGHT OF WAY
PLAN BK 113 PG 92
APPROXIMATE
LOCATION OF
RIGHT OF WAY
TRENCH DRAIN
PAVED OVER,
INACCESSIBLE
DMH
RIM=90.35
PAVED OVER,
INACCESSIBLE
DMH
RIM=90.16
PAVED OVER,
INACCESSIBLE
DMH
RIM=90.18
UNABLE TO
OPEN,
INACCESSIBLE
SMH
RIM=89.52
INV.(A)=72.78
INV.(B)=72.89
INV.(C)=72.87
SUMP=72.85
SMH
RIM=91.82'
SMH
RIM=91.31'
SMH
RIM=90.75'
SMH
RIM=91.68
BENT RIM,
INACCESSIBLE
DMH
RIM=91.26
INV.(A)=86.81
INV.(B)=86.79
INV.(C)=86.66
SUMP=85.54
DMH
RIM=82.96
N.P.V.
T.O.W.=84.08
SUMP=82.96
CB
RIM=91.15
INV.=87.41
T.O.W.=87.10
SUMP=84.13
CB
RIM=91.08
INV.=87.03
T.O.W.=87.03
SUMP=85.98
CB
RIM=89.67
INV.=86.14
T.O.W.=86.14
SUMP=82.67
CB
RIM=90.68
INV.=87.32
T.O.W.=87.65
SUMP=85.23
CB
RIM=90.21'
CB
RIM=89.27
INV.(A)=84.95
INV.(B)=86.47
T.O.W.=84.97
SUMP=82.27
DMH
RIM=89.43
INV.(A)=84.09
INV.(B)=84.35
INV.(C)=84.83
SUMP=83.83
CB
RIM=89.85
INV.=87.11
SUMP=87.11
DMH
RIM=89.87
INV.(A)=86.13
INV.(B)=87.05
SUMP=82.47
CB
RIM=89.69'
DMH
RIM=90.72
INV.(A)=88.02
INV.(B)=86.04
INV.(C)=86.21
SUMP=85.79
(2) 3" TELECOM – VERIZON
(4) 4" TELECOM – VERIZON
6"x11' BT STRUCTURE
5'x13' BT STRUCTURE
6" CS GAS
1950 STATE HIGHWAY ALTERATION
LOCATION LINE (NO. 3755)
1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)
12" PVC SEWER – TOWN OF WILMINGTON
(4) 4" TELECOM – VERIZON
(9) 4" TELECOM – VERIZON
(7) 4" TELECOM – VERIZON
(2) 4" TELECOM – VERIZON
(4) 4" TELECOM – VERIZON
(4) 4" TELECOM – VERIZON
(4

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

SEE SHEET 114

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	99	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 6

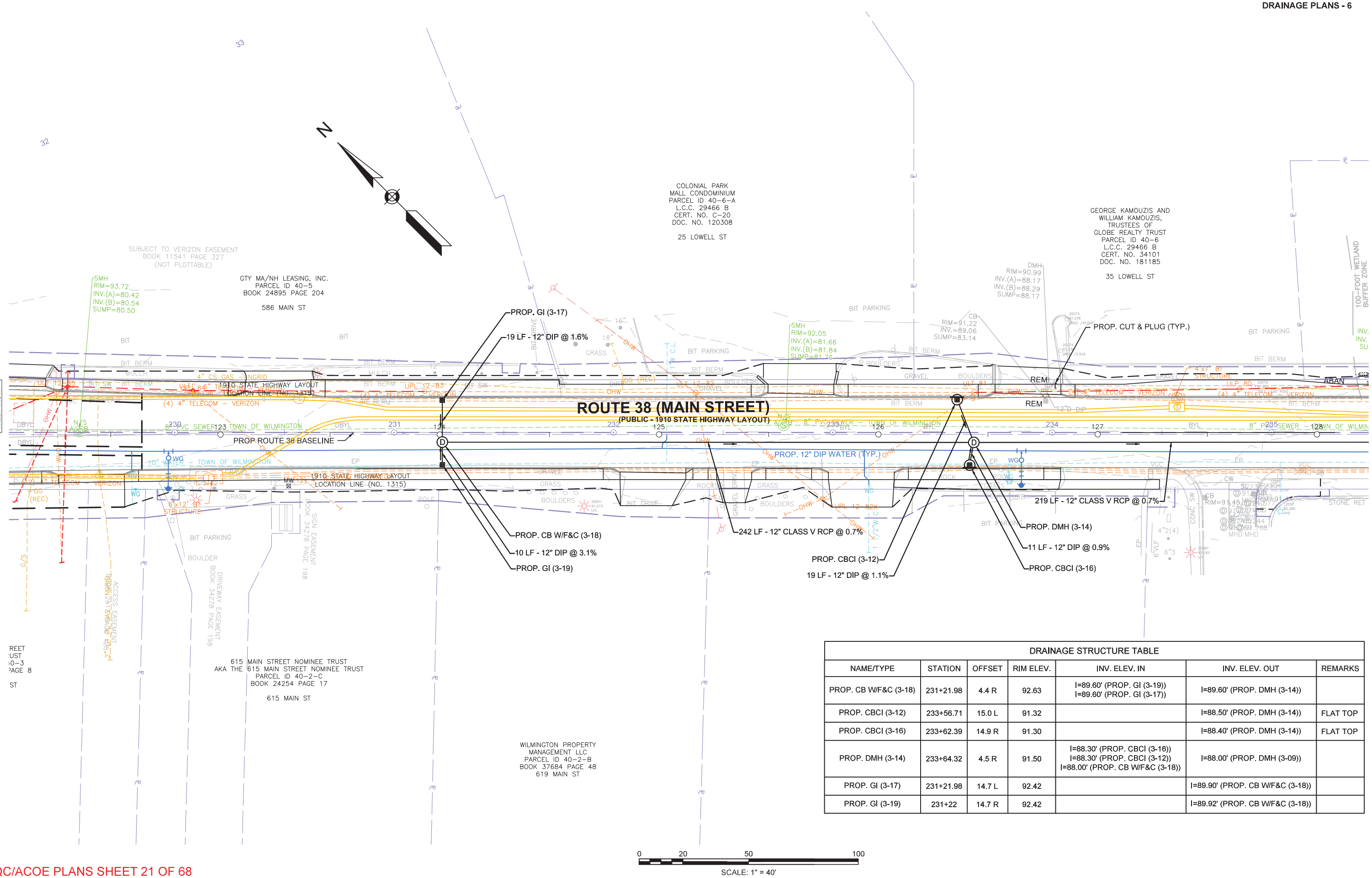
608051_UT03\DRAINAGE-PLANS\.DWG Plotted on 13-Mar-2025 8:54 AM

Proposal No. 608051 - 132406

CONTINUED ON SHEET NO. 98

A00840 - 331

CONTINUED ON SHEET NO.100



DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB W/F&C (3-18)	231+21.98	4.4 R	92.63	I=89.60' (PROP. GI (3-19)) I=89.60' (PROP. GI (3-17))	I=89.60' (PROP. DMH (3-14))	
PROP. CBCI (3-12)	233+56.71	15.0 L	91.32		I=88.50' (PROP. DMH (3-14))	FLAT TOP
PROP. CBCI (3-16)	233+62.39	14.9 R	91.30		I=88.40' (PROP. DMH (3-14))	FLAT TOP
PROP. DMH (3-14)	233+64.32	4.5 R	91.50	I=88.30' (PROP. CBCI (3-16)) I=88.30' (PROP. CBCI (3-12)) I=88.00' (PROP. CB W/F&C (3-18))	I=88.00' (PROP. DMH (3-09))	
PROP. GI (3-17)	231+21.98	14.7 L	92.42		I=89.90' (PROP. CB W/F&C (3-18))	
PROP. GI (3-19)	231+22	14.7 R	92.42		I=89.92' (PROP. CB W/F&C (3-18))	

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

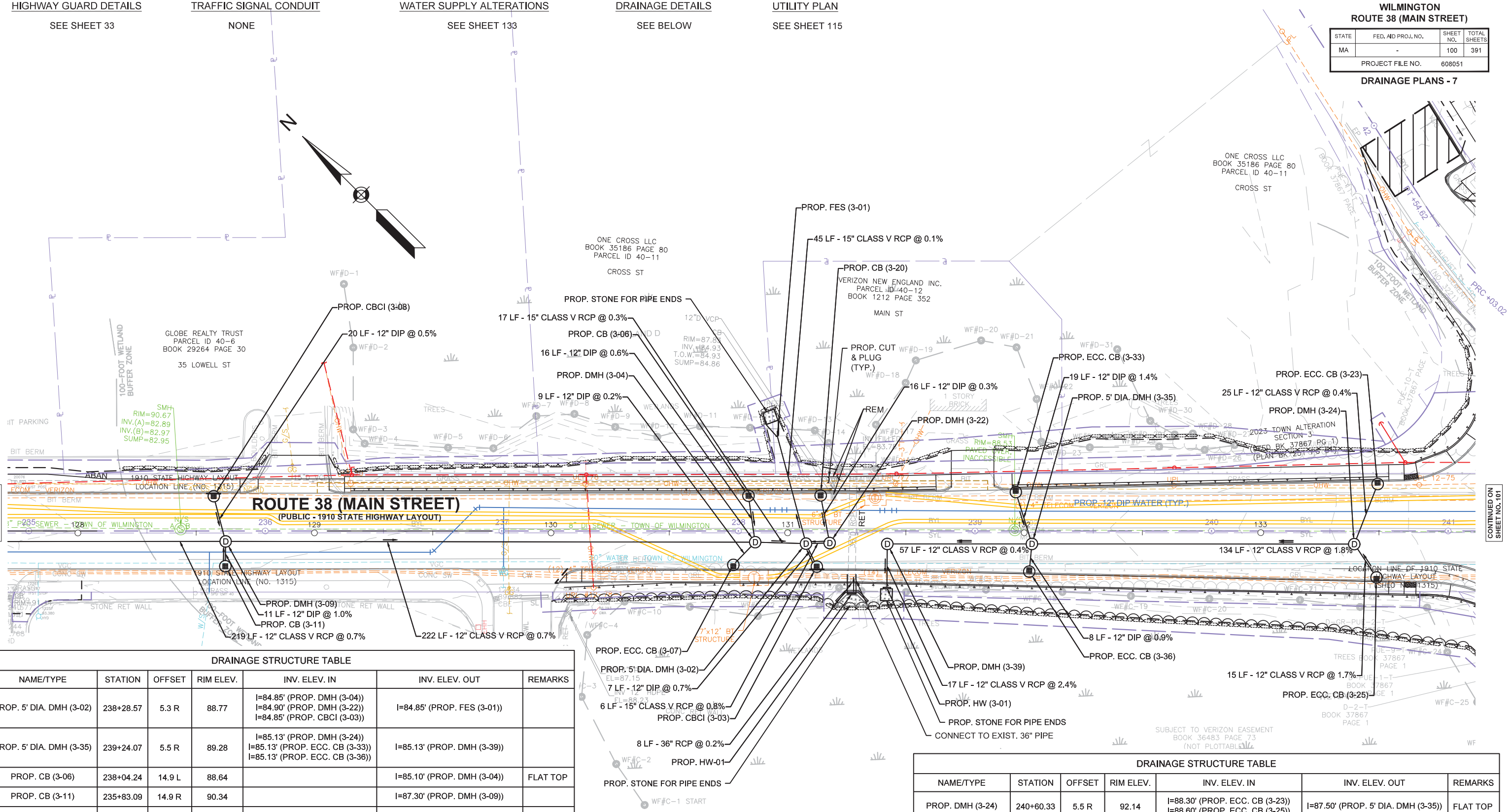
UTILITY PLAN

SEE SHEET 115

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	100	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 7



DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. 5' DIA. DMH (3-02)	238+28.57	5.3 R	88.77	I=84.85' (PROP. DMH (3-04)) I=84.90' (PROP. DMH (3-22)) I=84.85' (PROP. CBCI (3-03))	I=84.85' (PROP. FES (3-01))	
PROP. 5' DIA. DMH (3-35)	239+24.07	5.5 R	89.28	I=85.13' (PROP. DMH (3-24)) I=85.13' (PROP. ECC. CB (3-33)) I=85.13' (PROP. ECC. CB (3-36))	I=85.13' (PROP. DMH (3-39))	
PROP. CB (3-06)	238+04.24	14.9 L	88.64		I=85.10' (PROP. DMH (3-04))	FLAT TOP
PROP. CB (3-11)	235+83.09	14.9 R	90.34		I=87.30' (PROP. DMH (3-09))	
PROP. CB (3-20)	238+34.75	15.0 L	88.57		I=85.00' (PROP. DMH (3-22))	FLAT TOP
PROP. CBCI (3-03)	238+33.11	15.1 R	88.32		I=84.90' (PROP. 5' DIA. DMH (3-02))	
PROP. CBCI (3-08)	235+78.19	14.7 L	90.37		I=87.50' (PROP. DMH (3-09))	FLAT TOP
PROP. DMH (3-04)	238+07.09	4.7 R	88.83	I=85.00' (PROP. DMH (3-09)) I=84.90' (PROP. ECC. CB (3-07)) I=85.00' (PROP. CB (3-06))	I=84.90' (PROP. 5' DIA. DMH (3-02))	
PROP. DMH (3-09)	235+83.23	4.4 R	90.55	I=86.55' (PROP. DMH (3-14)) I=87.40' (PROP. CBCI (3-08)) I=87.20' (PROP. CB (3-11))	I=86.55' (PROP. DMH (3-04))	
PROP. DMH (3-22)	238+38.58	5.1 R	88.78	I=84.96' (PROP. CB (3-20))	I=84.95' (PROP. 5' DIA. DMH (3-02))	

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (3-24)	240+60.33	5.5 R	92.14	I=88.30' (PROP. ECC. CB (3-23)) I=88.60' (PROP. ECC. CB (3-25))	I=87.50' (PROP. 5' DIA. DMH (3-35))	FLAT TOP
PROP. ECC. CB (3-07)	237+97.82	14.3 R	88.64		I=84.92' (PROP. DMH (3-04))	FLAT TOP
PROP. ECC. CB (3-23)	240+70.21	19.9 L	91.98		I=88.40' (PROP. DMH (3-24))	FLAT TOP
PROP. ECC. CB (3-25)	240+69.72	19.6 R	92.42		I=88.85' (PROP. DMH (3-24))	
PROP. ECC. CB (3-33)	239+17.25	16.4 L	88.99		I=85.40' (PROP. 5' DIA. DMH (3-35))	FLAT TOP
PROP. ECC. CB (3-36)	239+22.92	17.2 R	88.77		I=85.20' (PROP. 5' DIA. DMH (3-35))	FLAT TOP
PROP. FES (3-01)	238+16.47	40.2 L	86.25	I=84.80' (PROP. 5' DIA. DMH (3-02))		
PROP. HW-01	238+47.90	26.6 R	85.65		I=84.00' ()	
PROP. HW (3-01)	238+62.78	24.1 R	86.17	I=84.50' (PROP. DMH (3-39))		

NOTES:
1. CONTRACTOR SHALL FIELD VERIFY GUARDRAIL POST SPACING CAN ACCOMMODATE PROPOSED AND EXISTING DRAINAGE.

0 20 50 100
SCALE: 1" = 40'

WQC/ACOE PLANS SHEET 22 OF 68

A00840_332

Proposal No. 608051 - 132406

608051_UT03\DRAINAGE-PLANS).DWG Plotted on 13-Mar-2025 8:55 AM

HIGHWAY GUARD DETAILS
SEE SHEET 20

TRAFFIC SIGNAL CONDUIT
SEE SHEET 178

WATER SUPPLY ALTERATIONS
SEE SHEET 120

DRAINAGE DETAILS
SEE BELOW

UTILITY PLAN
SEE SHEET 116

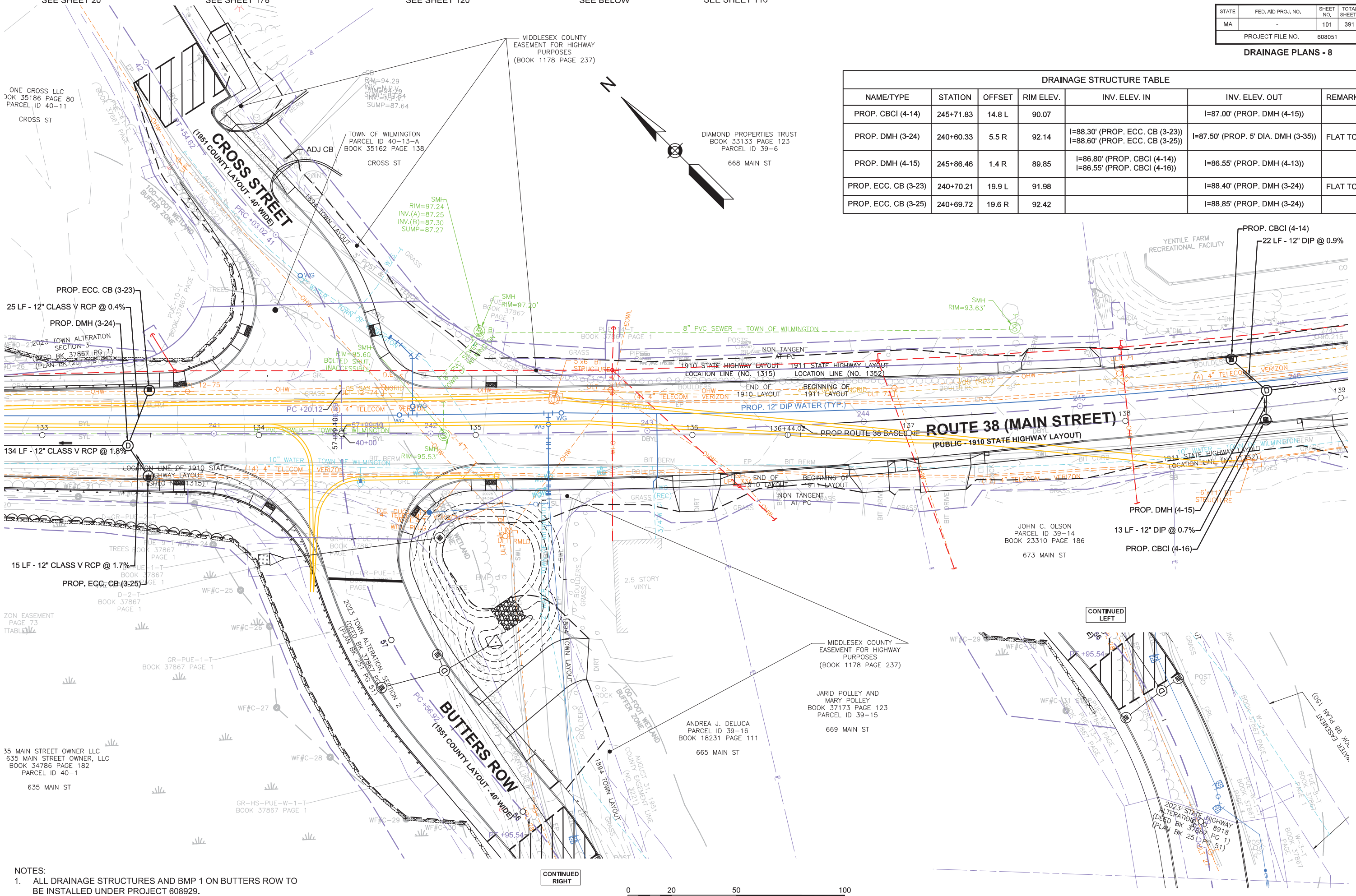
WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	101	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 8

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CBCI (4-14)	245+71.83	14.8 L	90.07		I=87.00' (PROP. DMH (4-15))	
PROP. DMH (3-24)	240+60.33	5.5 R	92.14	I=88.30' (PROP. ECC. CB (3-23)) I=88.60' (PROP. ECC. CB (3-25))	I=87.50' (PROP. 5' DIA. DMH (3-35))	FLAT TOP
PROP. DMH (4-15)	245+86.46	1.4 R	89.85	I=86.80' (PROP. CBCI (4-14)) I=86.55' (PROP. CBCI (4-16))	I=86.55' (PROP. DMH (4-13))	
PROP. ECC. CB (3-23)	240+70.21	19.9 L	91.98		I=88.40' (PROP. DMH (3-24))	FLAT TOP
PROP. ECC. CB (3-25)	240+69.72	19.6 R	92.42		I=88.85' (PROP. DMH (3-24))	



NOTES:
1. ALL DRAINAGE STRUCTURES AND BMP 1 ON BUTTERS ROW TO BE INSTALLED UNDER PROJECT 608929.

SCALE: 1" = 40'

WQC/ACOE PLANS SHEET 23 OF 68

A00840 - 333

Proposal No. 608051 - 132406

Plotted on 13-Mar-2025 8:55 AM

608051_UT03\DRAINAGE-PLANS\.DWG

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

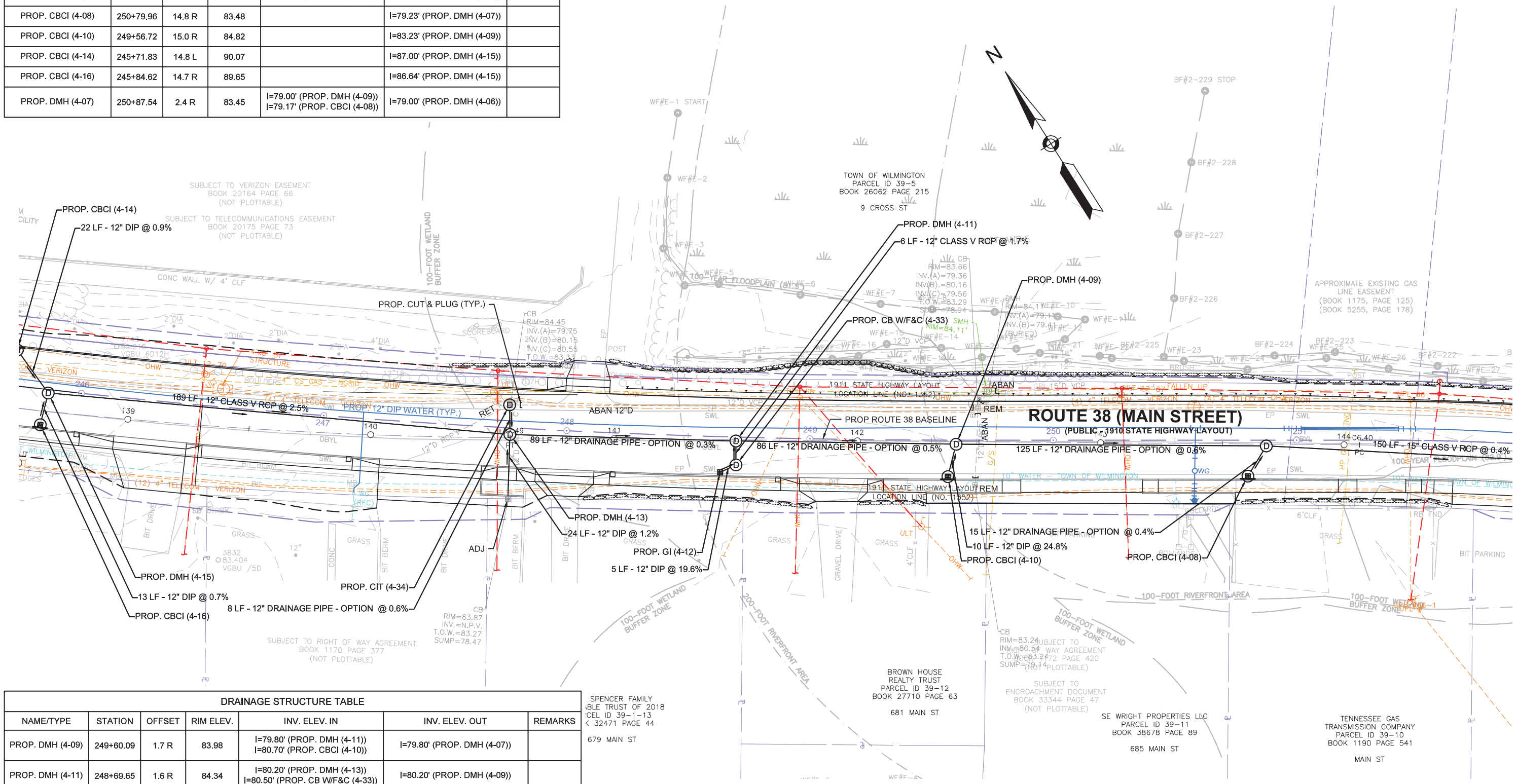
SEE SHEET 117

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	102	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 9

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
EXIST. CB (247+12 R)	247+77.40	29.2 R	84.49		I=81.30' (PROP. DMH (4-13))	
PROP. CB W/F&C (4-33)	248+69.94	11.5 R	84.14	I=80.60' (PROP. GI (4-12))	I=80.60' (PROP. DMH (4-11))	
PROP. CBCI (4-08)	250+79.96	14.8 R	83.48		I=79.23' (PROP. DMH (4-07))	
PROP. CBCI (4-10)	249+56.72	15.0 R	84.82		I=83.23' (PROP. DMH (4-09))	
PROP. CBCI (4-14)	245+71.83	14.8 L	90.07		I=87.00' (PROP. DMH (4-15))	
PROP. CBCI (4-16)	245+84.62	14.7 R	89.65		I=86.64' (PROP. DMH (4-15))	
PROP. DMH (4-07)	250+87.54	2.4 R	83.45	I=79.00' (PROP. DMH (4-09)) I=79.17' (PROP. CBCI (4-08))	I=79.00' (PROP. DMH (4-06))	



DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (4-09)	249+60.09	1.7 R	83.98	I=79.80' (PROP. DMH (4-11)) I=80.70' (PROP. CBCI (4-10))	I=79.80' (PROP. DMH (4-07))	
PROP. DMH (4-11)	248+69.65	1.6 R	84.34	I=80.20' (PROP. DMH (4-13)) I=80.50' (PROP. CB W/F&C (4-33))	I=80.20' (PROP. DMH (4-09))	
PROP. DMH (4-13)	247+76.84	2.7 R	85.05	I=81.90' (PROP. DMH (4-15)) I=81.00' (EXIST. CB (247+12 R)) I=80.50' (PROP. CIT (4-34))	I=80.50' (PROP. DMH (4-11))	
PROP. DMH (4-15)	245+86.46	1.4 R	89.85	I=86.80' (PROP. CBCI (4-14)) I=86.55' (PROP. CBCI (4-16))	I=86.55' (PROP. DMH (4-13))	
PROP. GI (4-12)	248+63.57	14.6 R	84.10		I=81.60' (PROP. CB W/F&C (4-33))	

NOTES:
1. A MINIMUM OF 24 INCHES OF SEPARATION IS REQUIRED BETWEEN THE HIGH PRESSURE GAS MAIN AND DRAINAGE LINE AND ALSO BETWEEN THE HIGH PRESSURE GAS MAIN AND WATER MAIN. SEE PROFILE ON SHEET 127 FOR CROSSING OF EXISTING AND PROPOSED UTILITIES.

A00840 - 334
CONTINUED ON SHEET NO. 101
CONTINUED ON SHEET NO. 103

Proposal No. 608051 - 132406
608051_UT03\DRAINAGE-PLANS\.DWG Plotted on 13-Mar-2025 8:56 AM

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

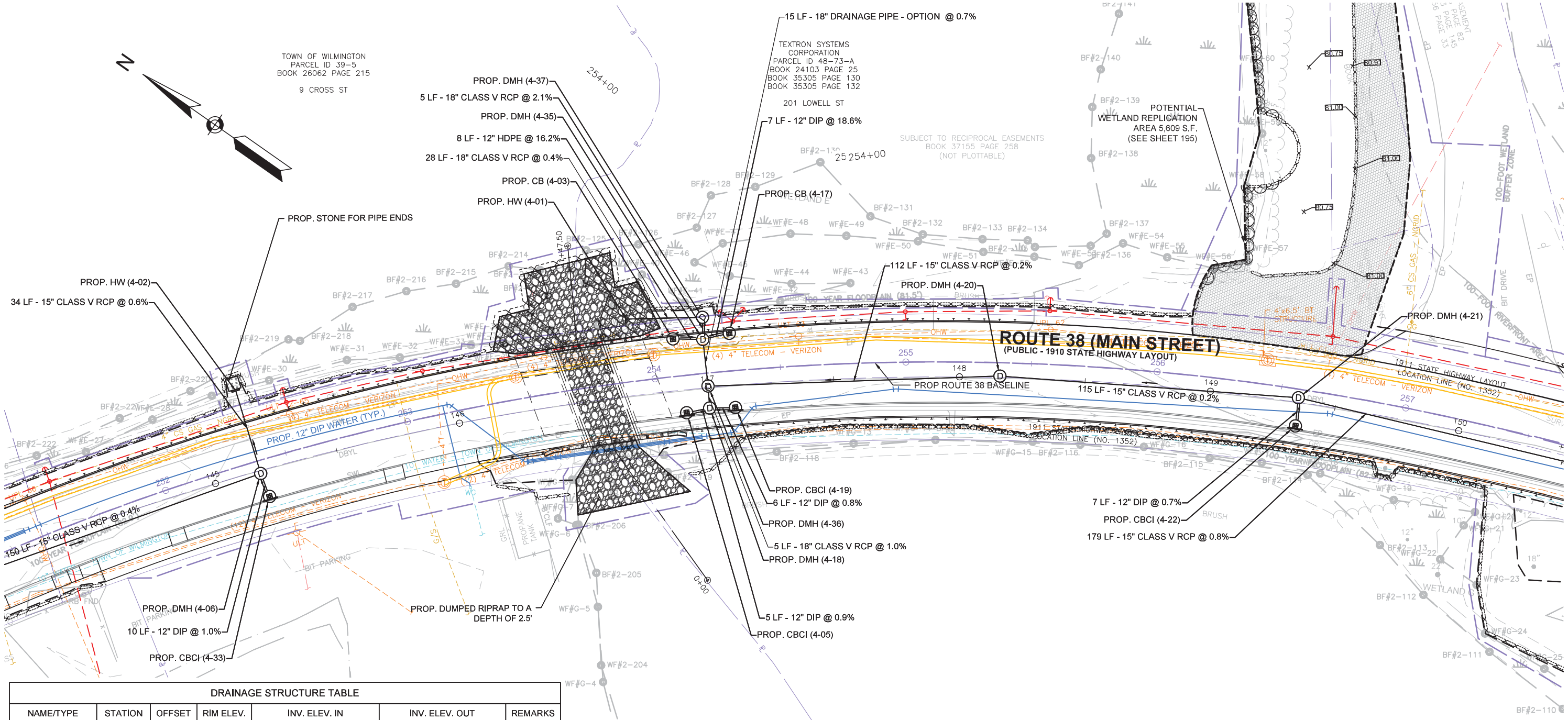
UTILITY PLAN

SEE SHEET 118

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	103	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 10



DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (4-20)	255+37.54	5.3 R	82.38	I=78.92' (PROP. DMH (4-21))	I=78.92' (PROP. DMH (4-36))	
PROP. DMH (4-21)	256+57.15	3.4 R	83.10	I=79.10' (PROP. CBCI (4-22)) I=79.26' (PROP. DMH (4-24))	I=79.10' (PROP. DMH (4-20))	
PROP. DMH (4-35)	254+20.43	13.5 L	82.69	I=78.20' (PROP. DMH (4-36)) I=78.10' (PROP. CB (4-03)) I=78.10' (PROP. CB (4-17))	I=78.20' (PROP. DMH (4-37))	
PROP. DMH (4-36)	254+20.67	5.2 R	83.28	I=78.40' (PROP. DMH (4-18)) I=78.67' (PROP. DMH (4-20))	I=78.30' (PROP. DMH (4-35))	
PROP. DMH (4-37)	254+21.11	22.3 L	82.40	I=78.10' (PROP. DMH (4-35))	I=79.44' (PROP. HW (4-01)) I=78.10' ()	
PROP. HW (4-01)	253+91.64	25.0 L	81.07	I=79.40' (PROP. DMH (4-37))		
PROP. HW (4-02)	252+38	29.3 L	80.14	I=78.20' (PROP. DMH (4-06))		

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB (4-03)	254+08.81	14.9 L	82.67		I=79.40' (PROP. DMH (4-35))	
PROP. CB (4-17)	254+30.98	15.0 L	82.65		I=79.40' (PROP. DMH (4-35))	
PROP. CBCI (4-05)	254+11.04	14.8 R	81.79		I=78.50' (PROP. DMH (4-18))	
PROP. CBCI (4-19)	254+30.81	14.7 R	81.78		I=78.58' (PROP. DMH (4-18))	
PROP. CBCI (4-22)	256+57.67	14.7 R	82.71		I=79.15' (PROP. DMH (4-21))	
PROP. CBCI (4-33)	252+38.95	14.9 R	82.37		I=79.30' (PROP. DMH (4-06))	
PROP. DMH (4-06)	252+38.17	5.1 R	82.72	I=78.40' (PROP. DMH (4-07)) I=79.20' (PROP. CBCI (4-33))	I=78.40' (PROP. HW (4-02))	
PROP. DMH (4-18)	254+20.47	13.9 R	81.81	I=78.53' (PROP. CBCI (4-19)) I=78.45' (PROP. CBCI (4-05))	I=78.45' (PROP. DMH (4-36))	

NOTES:
1. CONTRACTOR SHALL FIELD VERIFY GUARDRAIL POST SPACING CAN ACCOMMODATE PROPOSED AND EXISTING DRAINAGE.
2. EXCAVATE TO DEPTH OF RIPRAP AND MATCH EXISTING SURFACE. FINAL GRADE SHALL MATCH EXISTING GRADE.

0 20 50 100
SCALE: 1" = 40'

WQC/ACOE PLANS SHEET 25 OF 68

FOR UTILITY PLAN:
SEE SHEET NO. 109

Proposal No. 608051 - 132406
608051_UT03\DRAINAGE-PLANS).DWG
Plotted on 20-Mar-2025 6:10 PM

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

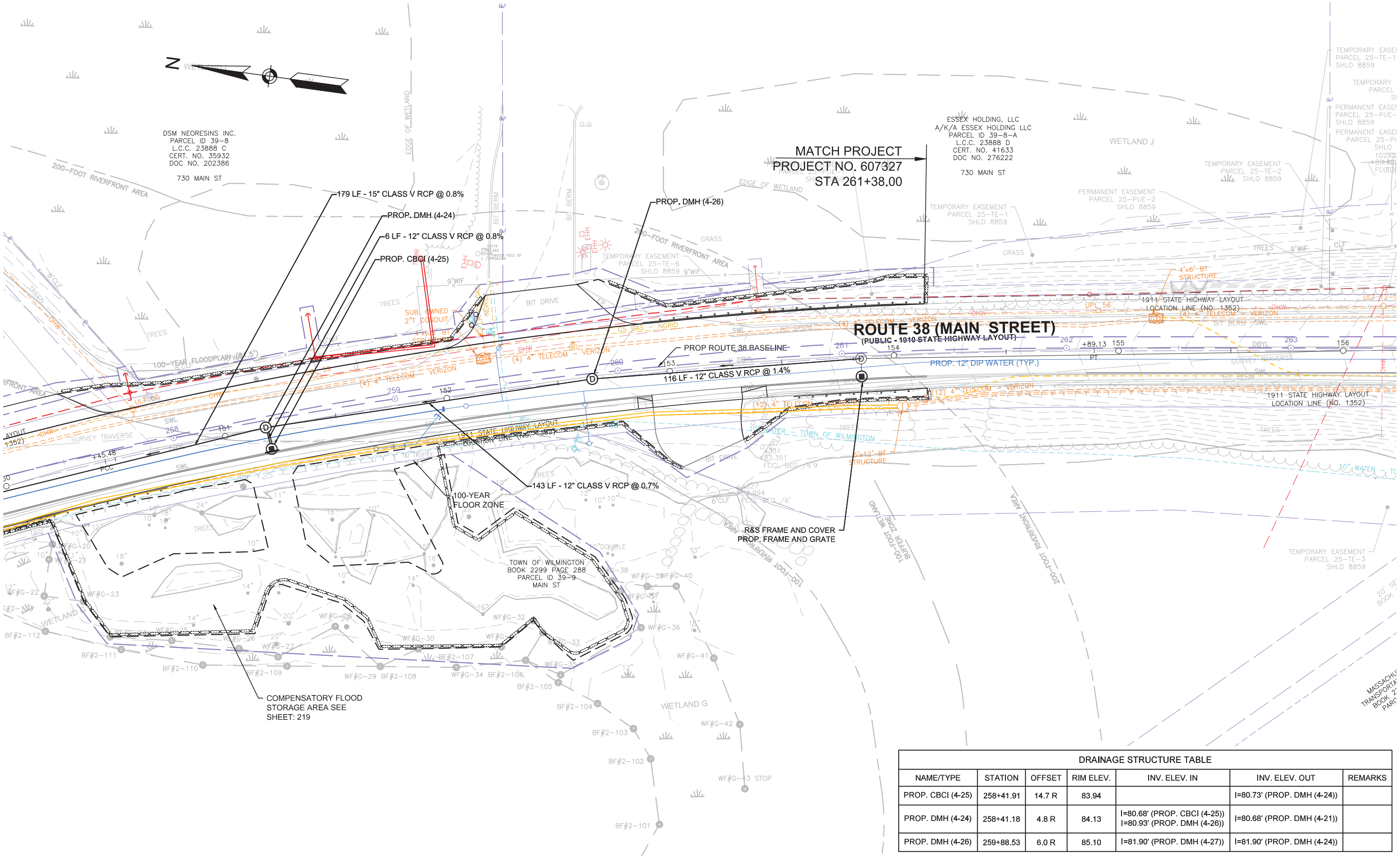
UTILITY PLAN

SEE SHEET 119

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	104	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 11



DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CBCI (4-25)	258+41.91	14.7 R	83.94		I=80.73' (PROP. DMH (4-24))	
PROP. DMH (4-24)	258+41.18	4.8 R	84.13	I=80.68' (PROP. CBCI (4-25)) I=80.93' (PROP. DMH (4-26))	I=80.68' (PROP. DMH (4-21))	
PROP. DMH (4-26)	259+88.53	6.0 R	85.10	I=81.90' (PROP. DMH (4-27))	I=81.90' (PROP. DMH (4-24))	

CONTINUED ON SHEET NO. 103

CONTINUED ON SHEET NO. 105

608051_UT03(DRAINAGE-PLANS).DWG Plotted on 13-Mar-2025 8:57 AM

Proposal No. 608051 - 132406

A00840 - 336

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

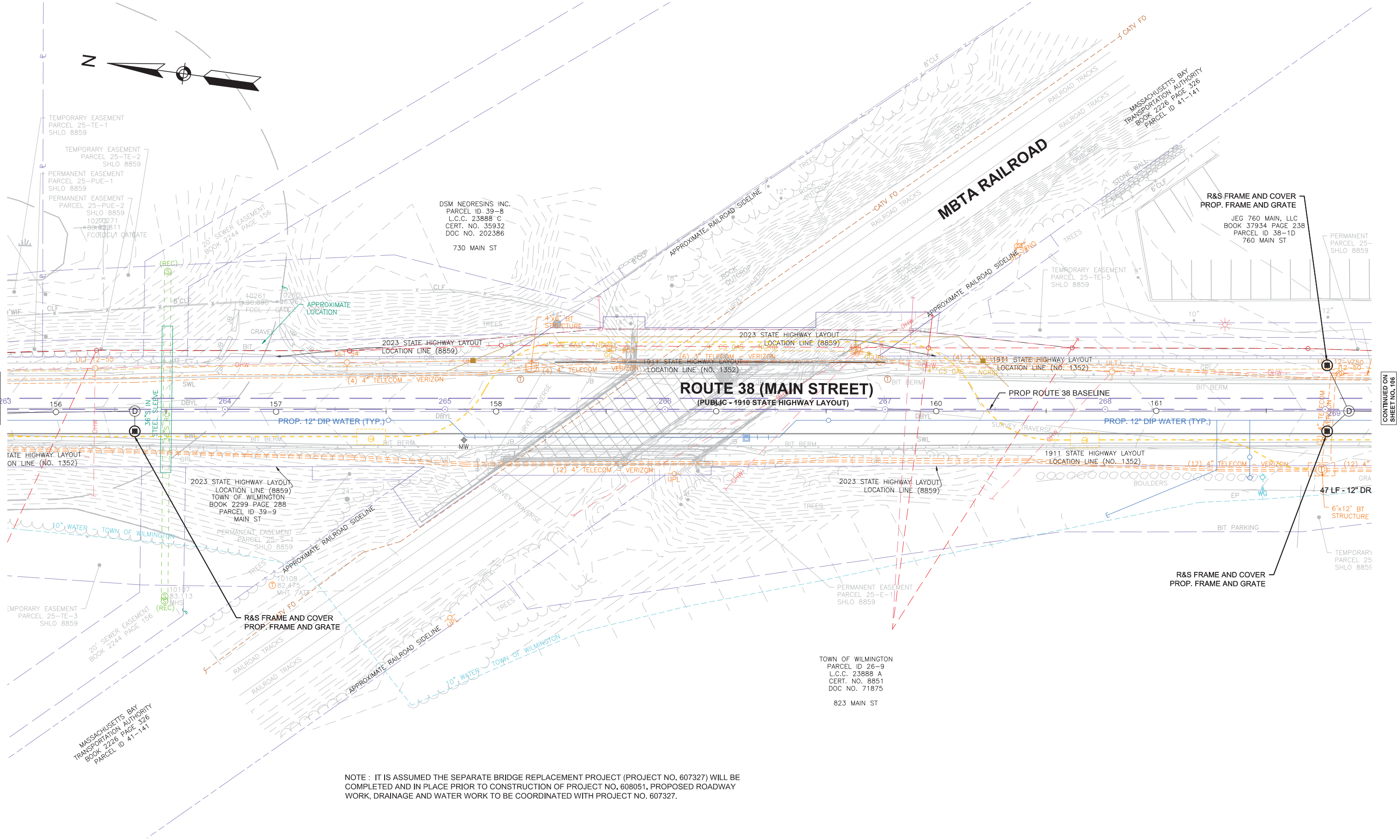
UTILITY PLAN

SEE SHEET 120

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	105	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 12



NOTE : IT IS ASSUMED THE SEPARATE BRIDGE REPLACEMENT PROJECT (PROJECT NO. 607327) WILL BE COMPLETED AND IN PLACE PRIOR TO CONSTRUCTION OF PROJECT NO. 608051. PROPOSED ROADWAY WORK, DRAINAGE AND WATER WORK TO BE COORDINATED WITH PROJECT NO. 607327.

0 20 50 100

SCALE: 1" = 40'

A0008A0 - 337

608051_UT03(DRAINAGE-PLANS).DWG Plotted on 13-Mar-2025 8:57 AM

Proposal No. 608051 - 132406

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

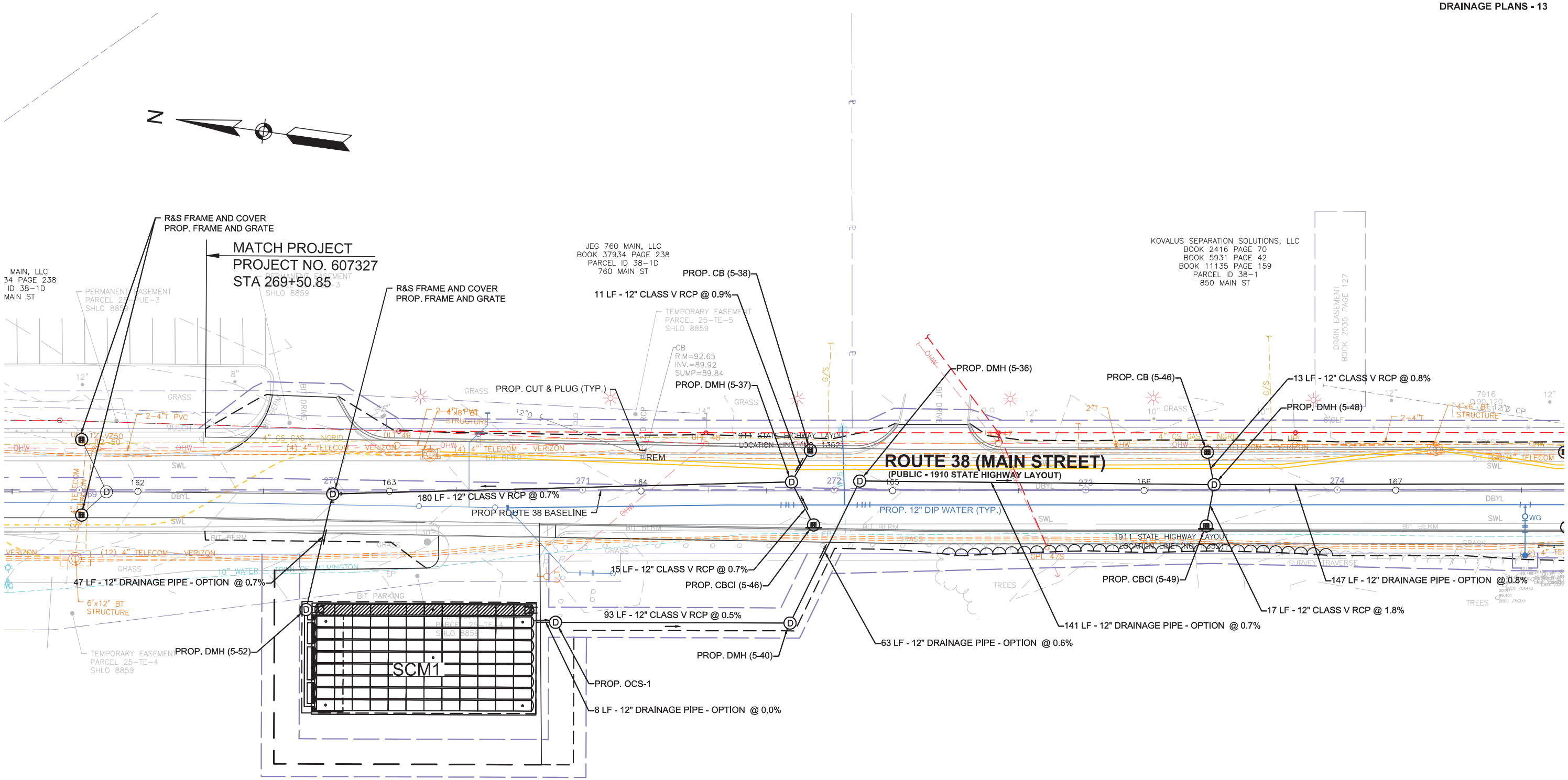
UTILITY PLAN

SEE SHEET 121

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	106	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 13



DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (5-40)	271+84.22	53.9 R	92.83	I=88.50' (PROP. OCS-1)	I=86.50' (PROP. DMH (5-36))	
PROP. DMH (5-48)	273+51.83	2.1 L	91.26	I=85.10' (PROP. DMH (5-36)) I=87.90' (PROP. CB (5-46)) I=87.20' (PROP. CBCI (5-49))	I=85.10' (PROP. DMH (5-31))	
PROP. OCS-1	270+90.97	55.2 R	92.62	I=88.10' (SCM1)	I=89.00' (PROP. DMH (5-40))	

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB (5-38)	271+91.05	14.9 L	91.89		I=88.70' (PROP. DMH (5-37))	FLAT TOP
PROP. CB (5-46)	273+49.14	15.0 L	91.02		I=88.00' (PROP. DMH (5-48))	
PROP. CBCI (5-46)	271+92.83	14.7 R	91.89		I=88.70' (PROP. DMH (5-37))	
PROP. CBCI (5-49)	273+48.72	14.4 R	91.03		I=87.50' (PROP. DMH (5-48))	
PROP. DMH (5-36)	272+10.91	3.1 L	92.01	I=86.10' (PROP. DMH (5-40))	I=86.10' (PROP. DMH (5-48))	
PROP. DMH (5-37)	271+83.81	2.2 L	92.20	I=88.60' (PROP. CB (5-38)) I=88.60' (PROP. CBCI (5-46))	I=88.60' (PROP. DMH (5-41))	

WQC/ACOE PLANS SHEET 28 OF 68

A00840 - 338

Proposal No. 608051 - 132406

608051_UT03\DRAINAGE-PLANS\.DWG Plotted on 13-Mar-2025 8:58 AM

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS	UTILITY PLAN
SEE SHEET 33	NONE	SEE SHEET 133	SEE BELOW	SEE SHEET 122

WILMINGTON
ROUTE 38 (MAIN STREET)

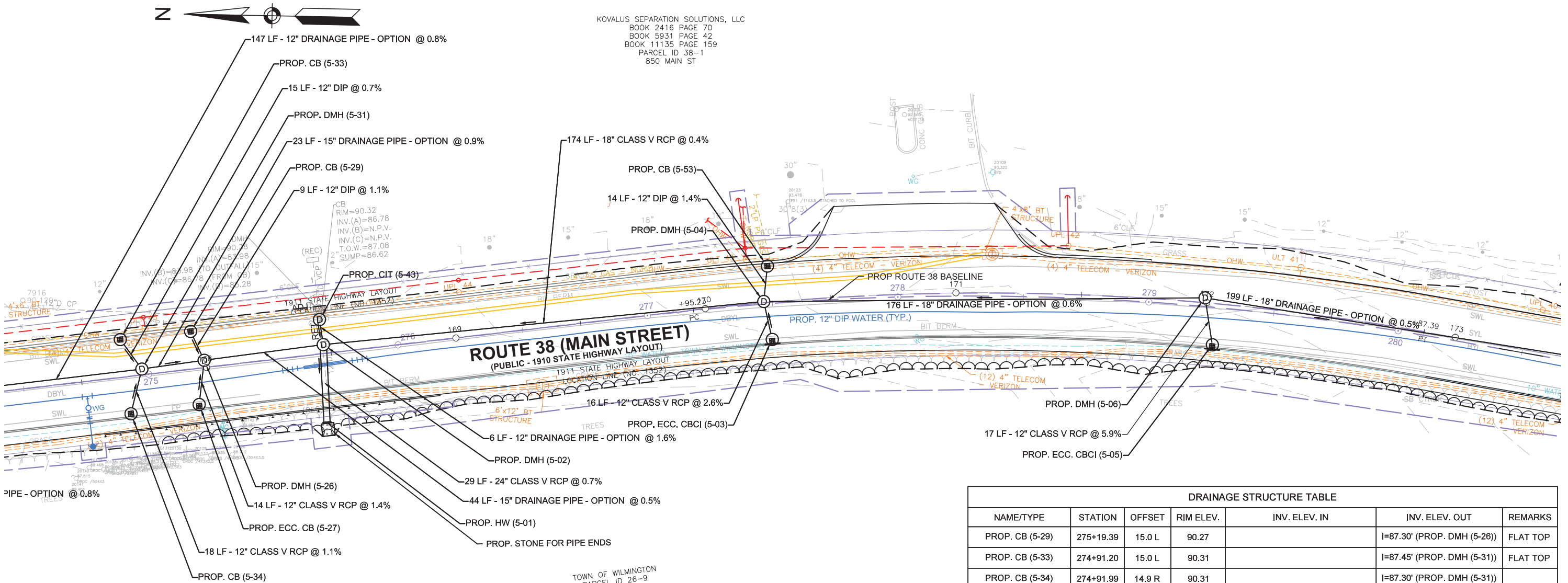
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	107	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 14

608051_UT03(DRAINAGE-PLANS).DWG Plotted on 13-Mar-2025 8:59 AM

Proposal No. 608051 - 132406

A00840 - 339



DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. ECC. CBCI (5-03)	277+49.63	14.4 R	92.00		I=88.90' (PROP. DMH (5-04))	
PROP. ECC. CBCI (5-05)	279+27.56	15.0 R	94.47		I=91.00' (PROP. DMH (5-06))	
PROP. HW (5-01)	275+69.12	27.4 R	86.05	I=83.40' (PROP. DMH (5-02))		

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB (5-29)	275+19.39	15.0 L	90.27		I=87.30' (PROP. DMH (5-26))	FLAT TOP
PROP. CB (5-33)	274+91.20	15.0 L	90.31		I=87.45' (PROP. DMH (5-31))	FLAT TOP
PROP. CB (5-34)	274+91.99	14.9 R	90.31		I=87.30' (PROP. DMH (5-31))	
PROP. CB (5-53)	277+49.89	15.0 L	93.00		I=89.00' (PROP. DMH (5-04))	
PROP. DMH (5-02)	275+71.25	3.6 L	90.62	I=83.60' (PROP. DMH (5-26)) I=86.70' (PROP. DMH (5-04)) I=86.70' (PROP. CIT (5-43))	I=83.60' (PROP. HW (5-01))	
PROP. DMH (5-04)	277+47.43	1.0 L	92.59	I=88.80' (PROP. CB (5-53)) I=88.50' (PROP. ECC. CBCI (5-03)) I=87.40' (PROP. DMH (5-06))	I=87.40' (PROP. DMH (5-02))	
PROP. DMH (5-06)	279+22.97	3.4 L	95.14	I=88.40' (PROP. DMH (5-10)) I=90.00' (PROP. ECC. CBCI (5-05))	I=88.40' (PROP. DMH (5-04))	
PROP. DMH (5-26)	275+23.41	2.9 L	90.52	I=83.80' (PROP. DMH (5-31)) I=87.20' (PROP. CB (5-29)) I=87.10' (PROP. ECC. CB (5-27))	I=83.80' (PROP. DMH (5-02))	
PROP. DMH (5-31)	274+98.37	2.4 L	90.54	I=84.00' (PROP. DMH (5-48)) I=87.10' (PROP. CB (5-34)) I=87.35' (PROP. CB (5-33))	I=84.00' (PROP. DMH (5-26))	
PROP. ECC. CB (5-27)	275+19.35	14.4 R	90.29		I=87.30' (PROP. DMH (5-26))	FLAT TOP

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS	UTILITY PLAN
SEE SHEET 33	NONE	SEE SHEET 133	SEE BELOW	SEE SHEET 123

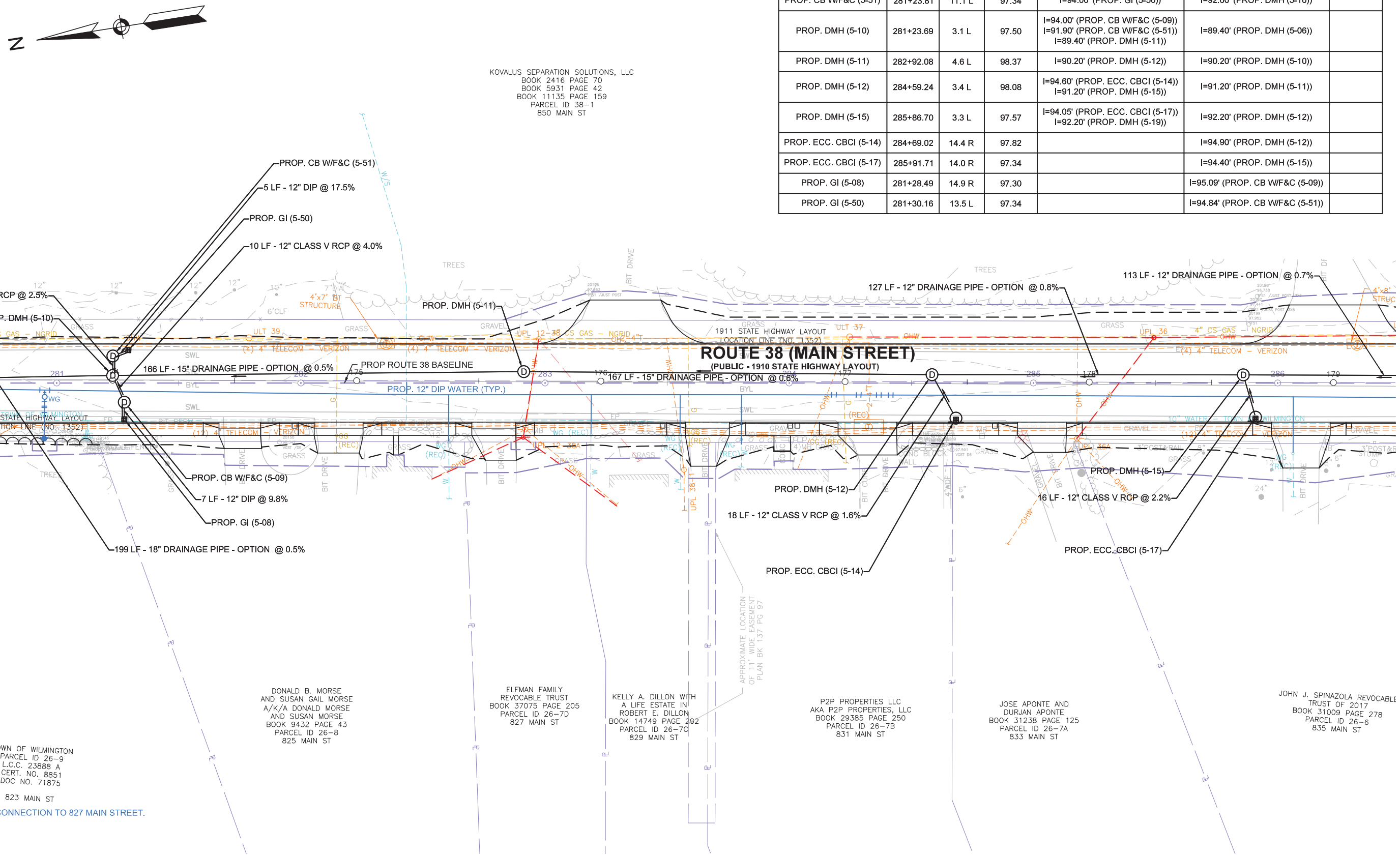
WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	108	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 15

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB W/F&C (5-09)	281+28.47	7.9 R	97.44	I=94.40' (PROP. GI (5-08))	I=94.40' (PROP. DMH (5-10))	
PROP. CB W/F&C (5-51)	281+23.81	11.1 L	97.34	I=94.00' (PROP. GI (5-50))	I=92.00' (PROP. DMH (5-10))	
PROP. DMH (5-10)	281+23.69	3.1 L	97.50	I=94.00' (PROP. CB W/F&C (5-09)) I=91.90' (PROP. CB W/F&C (5-51)) I=89.40' (PROP. DMH (5-11))	I=89.40' (PROP. DMH (5-06))	
PROP. DMH (5-11)	282+92.08	4.6 L	98.37	I=90.20' (PROP. DMH (5-12))	I=90.20' (PROP. DMH (5-10))	
PROP. DMH (5-12)	284+59.24	3.4 L	98.08	I=94.60' (PROP. ECC. CBCI (5-14)) I=91.20' (PROP. DMH (5-15))	I=91.20' (PROP. DMH (5-11))	
PROP. DMH (5-15)	285+86.70	3.3 L	97.57	I=94.05' (PROP. ECC. CBCI (5-17)) I=92.20' (PROP. DMH (5-19))	I=92.20' (PROP. DMH (5-12))	
PROP. ECC. CBCI (5-14)	284+69.02	14.4 R	97.82		I=94.90' (PROP. DMH (5-12))	
PROP. ECC. CBCI (5-17)	285+91.71	14.0 R	97.34		I=94.40' (PROP. DMH (5-15))	
PROP. GI (5-08)	281+28.49	14.9 R	97.30		I=95.09' (PROP. CB W/F&C (5-09))	
PROP. GI (5-50)	281+30.16	13.5 L	97.34		I=94.84' (PROP. CB W/F&C (5-51))	



NOTE: PRIVATE SERVICE CONNECTION TO 827 MAIN STREET.

CONTINUED ON SHEET NO. 107
CONTINUED ON SHEET NO. 109

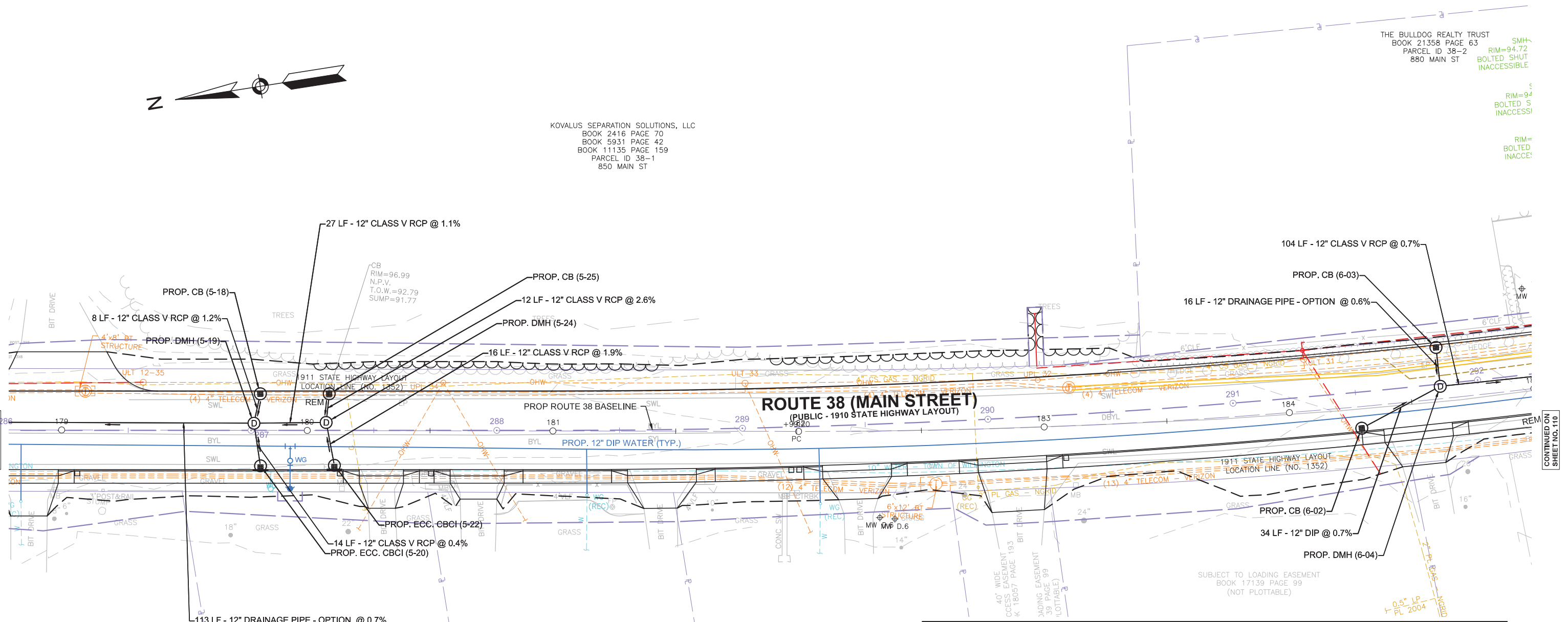
A00840 - 340
608051_UT03\DRAINAGE-PLANS\.DWG Plotted on 13-Mar-2025 8:59 AM
Proposal No. 608051 - 132406

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS	UTILITY PLAN
SEE SHEET 33	NONE	SEE SHEET 133	SEE BELOW	SEE SHEET 124

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	109	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 16



DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB (5-18)	287+04.52	14.9 L	97.00		I=93.85' (PROP. DMH (5-19))	
PROP. CB (5-25)	287+32.57	14.9 L	97.03		I=93.80' (PROP. DMH (5-24))	
PROP. CB (6-02)	291+52.01	14.7 R	95.36		I=92.25' (PROP. DMH (6-04))	
PROP. CB (6-03)	291+85.30	15.0 L	94.95		I=89.50' (PROP. DMH (6-04))	
PROP. DMH (5-19)	287+01.93	2.9 L	97.24	I=93.50' (PROP. ECC. CBCI (5-20)) I=93.75' (PROP. CB (5-18)) I=93.20' (PROP. DMH (5-24))	I=93.00' (PROP. DMH (5-15))	
PROP. DMH (5-24)	287+31.32	3.2 L	97.26	I=93.60' (PROP. ECC. CBCI (5-22)) I=93.50' (PROP. CB (5-25))	I=93.50' (PROP. DMH (5-19))	
PROP. DMH (6-04)	291+85.41	0.9 R	95.23	I=92.00' (PROP. CB (6-02)) I=89.40' (PROP. CB (6-03))	I=89.40' (PROP. DMH (6-07))	
PROP. ECC. CBCI (5-20)	287+04.58	14.5 R	97.01		I=93.56' (PROP. DMH (5-19))	
PROP. ECC. CBCI (5-22)	287+34.66	14.3 R	98.15		I=93.90' (PROP. DMH (5-24))	

SCALE: 1" = 40'

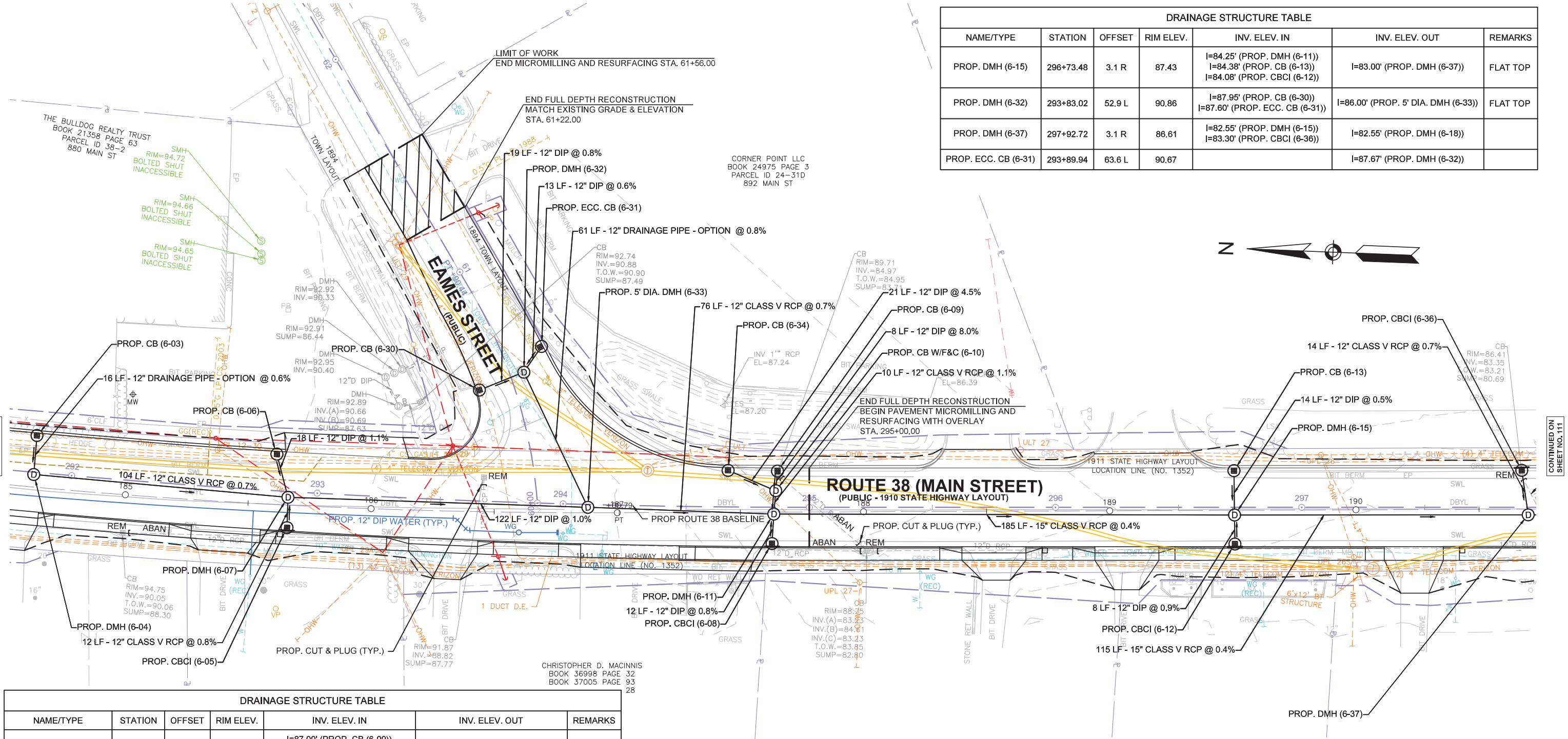
Plotted on 13-Mar-2025 9:00 AM
608051_UT03\DRAINAGE-PLANS\.DWG
Proposal No. 608051 - 132406
608051 - 341

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS	UTILITY PLAN
SEE SHEET 33	NONE	SEE SHEET 133	SEE BELOW	SEE SHEET 125

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	110	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 17



DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (6-15)	296+73.48	3.1 R	87.43	I=84.25' (PROP. DMH (6-11)) I=84.38' (PROP. CB (6-13)) I=84.08' (PROP. CBCI (6-12))	I=83.00' (PROP. DMH (6-37))	FLAT TOP
PROP. DMH (6-32)	293+83.02	52.9 L	90.86	I=87.95' (PROP. CB (6-30)) I=87.60' (PROP. ECC. CB (6-31))	I=86.00' (PROP. 5' DIA. DMH (6-33))	FLAT TOP
PROP. DMH (6-37)	297+92.72	3.1 R	86.61	I=82.55' (PROP. DMH (6-15)) I=83.30' (PROP. CBCI (6-36))	I=82.55' (PROP. DMH (6-18))	
PROP. ECC. CB (6-31)	293+89.94	63.6 L	90.67		I=87.67' (PROP. DMH (6-32))	

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB W/F&C (6-10)	294+87.10	6.7 L	90.00	I=87.00' (PROP. CB (6-09)) I=87.00' (PROP. CB (6-34))	I=87.00' (PROP. DMH (6-11))	
PROP. CBCI (6-05)	292+89.38	14.7 R	93.38		I=90.30' (PROP. DMH (6-07))	
PROP. CBCI (6-08)	294+85.67	14.8 R	89.86		I=86.75' (PROP. DMH (6-11))	
PROP. CBCI (6-12)	296+73.62	14.9 R	87.20		I=84.15' (PROP. DMH (6-15))	FLAT TOP
PROP. CBCI (6-36)	297+90.12	15.0 L	86.50		I=83.40' (PROP. DMH (6-37))	
PROP. DMH (6-04)	291+85.41	0.9 R	95.23	I=92.00' (PROP. CB (6-02)) I=89.40' (PROP. CB (6-03))	I=89.40' (PROP. DMH (6-07))	
PROP. DMH (6-07)	292+89.03	2.3 R	93.63	I=88.70' (PROP. DMH (6-04)) I=90.20' (PROP. CBCI (6-05)) I=87.70' (PROP. CB (6-06))	I=87.20' (PROP. 5' DIA. DMH (6-33))	
PROP. DMH (6-11)	294+86.36	2.8 R	90.09	I=85.00' (PROP. 5' DIA. DMH (6-33)) I=86.90' (PROP. CB W/F&C (6-10)) I=86.65' (PROP. CBCI (6-08))	I=85.00' (PROP. DMH (6-15))	

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. 5' DIA. DMH (6-33)	294+10.83	1.1 R	91.42	I=86.00' (PROP. DMH (6-07)) I=85.50' (PROP. DMH (6-32))	I=85.50' (PROP. DMH (6-11))	
PROP. CB (6-02)	291+52.01	14.7 R	95.36		I=92.25' (PROP. DMH (6-04))	
PROP. CB (6-03)	291+85.30	15.0 L	94.95		I=89.50' (PROP. DMH (6-04))	
PROP. CB (6-06)	292+83.44	14.9 L	93.48		I=87.90' (PROP. DMH (6-07))	
PROP. CB (6-09)	294+87.77	14.7 L	89.83		I=87.64' (PROP. CB W/F&C (6-10))	
PROP. CB (6-13)	296+73.21	14.9 L	87.44		I=84.45' (PROP. DMH (6-15))	FLAT TOP
PROP. CB (6-30)	293+64.96	45.0 L	91.14		I=88.10' (PROP. DMH (6-32))	
PROP. CB (6-34)	294+67.62	14.8 L	90.14		I=87.95' (PROP. CB W/F&C (6-10))	

A00840 342
Proposal No. 608051 - 132406
608051_UT03\DRAINAGE-PLANS\.DWG Plotted on 13-Mar-2025 9:00 AM

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

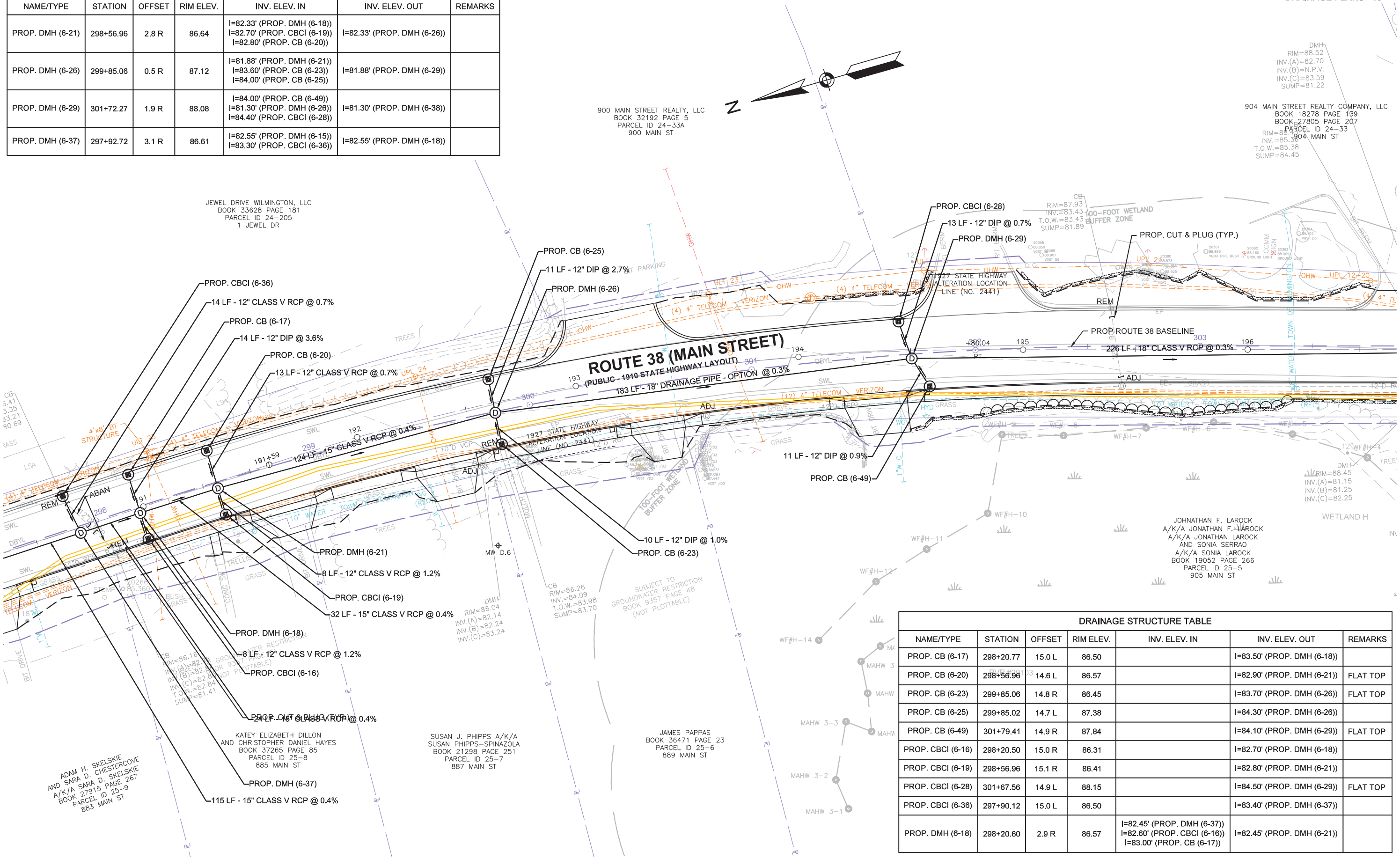
SEE SHEET 126

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	111	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 18

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (6-21)	298+56.96	2.8 R	86.64	I=82.33' (PROP. DMH (6-18)) I=82.70' (PROP. CBCI (6-19)) I=82.80' (PROP. CB (6-20))	I=82.33' (PROP. DMH (6-26))	
PROP. DMH (6-26)	299+85.06	0.5 R	87.12	I=81.88' (PROP. DMH (6-21)) I=83.60' (PROP. CB (6-23)) I=84.00' (PROP. CB (6-25))	I=81.88' (PROP. DMH (6-29))	
PROP. DMH (6-29)	301+72.27	1.9 R	88.08	I=84.00' (PROP. CB (6-49)) I=81.30' (PROP. DMH (6-26)) I=84.40' (PROP. CBCI (6-28))	I=81.30' (PROP. DMH (6-38))	
PROP. DMH (6-37)	297+92.72	3.1 R	86.61	I=82.55' (PROP. DMH (6-15)) I=83.30' (PROP. CBCI (6-36))	I=82.55' (PROP. DMH (6-18))	



DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CB (6-17)	298+20.77	15.0 L	86.50		I=83.50' (PROP. DMH (6-18))	
PROP. CB (6-20)	298+56.96	14.6 L	86.57		I=82.90' (PROP. DMH (6-21))	FLAT TOP
PROP. CB (6-23)	299+85.06	14.8 R	86.45		I=83.70' (PROP. DMH (6-26))	FLAT TOP
PROP. CB (6-25)	299+85.02	14.7 L	87.38		I=84.30' (PROP. DMH (6-26))	
PROP. CB (6-49)	301+79.41	14.9 R	87.84		I=84.10' (PROP. DMH (6-29))	FLAT TOP
PROP. CBCI (6-16)	298+20.50	15.0 R	86.31		I=82.70' (PROP. DMH (6-18))	
PROP. CBCI (6-19)	298+56.96	15.1 R	86.41		I=82.80' (PROP. DMH (6-21))	
PROP. CBCI (6-28)	301+67.56	14.9 L	88.15		I=84.50' (PROP. DMH (6-29))	FLAT TOP
PROP. CBCI (6-36)	297+90.12	15.0 L	86.50		I=83.40' (PROP. DMH (6-37))	
PROP. DMH (6-18)	298+20.60	2.9 R	86.57	I=82.45' (PROP. DMH (6-37)) I=82.60' (PROP. CBCI (6-16)) I=83.00' (PROP. CB (6-17))	I=82.45' (PROP. DMH (6-21))	

WQC/ACOE PLANS SHEET 33 OF 68

A00840 - 343

Proposal No. 608051 - 132406

608051_UT03(DRAINAGE-PLANS).DWG Plotted on 13-Mar-2025 9:01 AM

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

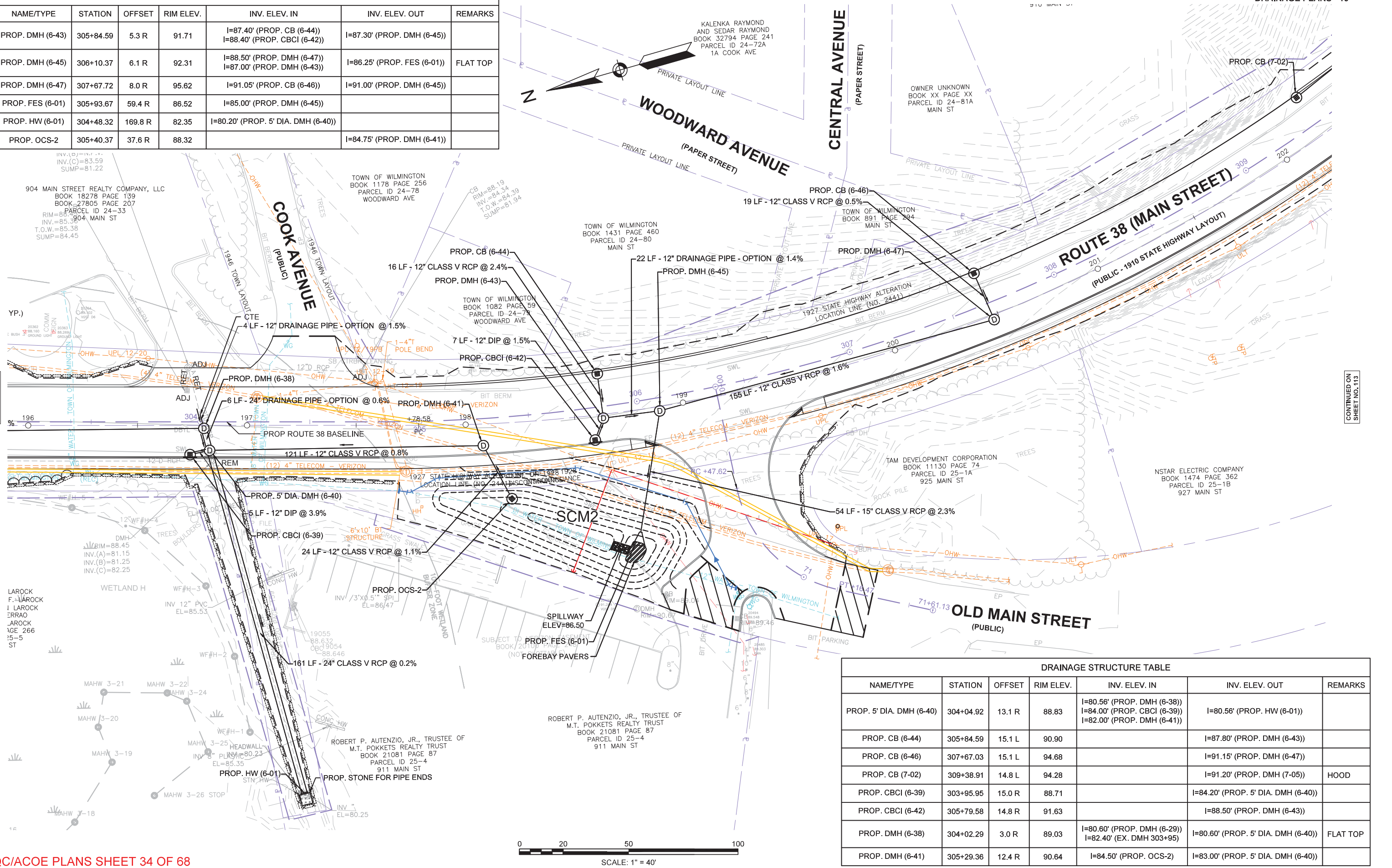
SEE SHEET 127

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	112	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 19

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (6-43)	305+84.59	5.3 R	91.71	I=87.40' (PROP. CB (6-44)) I=88.40' (PROP. CBCI (6-42))	I=87.30' (PROP. DMH (6-45))	
PROP. DMH (6-45)	306+10.37	6.1 R	92.31	I=88.50' (PROP. DMH (6-47)) I=87.00' (PROP. DMH (6-43))	I=86.25' (PROP. FES (6-01))	FLAT TOP
PROP. DMH (6-47)	307+67.72	8.0 R	95.62	I=91.05' (PROP. CB (6-46))	I=91.00' (PROP. DMH (6-45))	
PROP. FES (6-01)	305+93.67	59.4 R	86.52	I=85.00' (PROP. DMH (6-45))		
PROP. HW (6-01)	304+48.32	169.8 R	82.35	I=80.20' (PROP. 5' DIA. DMH (6-40))		
PROP. OCS-2	305+40.37	37.6 R	88.32		I=84.75' (PROP. DMH (6-41))	



DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. 5' DIA. DMH (6-40)	304+04.92	13.1 R	88.83	I=80.56' (PROP. DMH (6-38)) I=84.00' (PROP. CBCI (6-39)) I=82.00' (PROP. DMH (6-41))	I=80.56' (PROP. HW (6-01))	
PROP. CB (6-44)	305+84.59	15.1 L	90.90		I=87.80' (PROP. DMH (6-43))	
PROP. CB (6-46)	307+67.03	15.1 L	94.68		I=91.15' (PROP. DMH (6-47))	
PROP. CB (7-02)	309+38.91	14.8 L	94.28		I=91.20' (PROP. DMH (7-05))	HOOD
PROP. CBCI (6-39)	303+95.95	15.0 R	88.71		I=84.20' (PROP. 5' DIA. DMH (6-40))	
PROP. CBCI (6-42)	305+79.58	14.8 R	91.63		I=88.50' (PROP. DMH (6-43))	
PROP. DMH (6-38)	304+02.29	3.0 R	89.03	I=80.60' (PROP. DMH (6-29)) I=82.40' (EX. DMH 303+95)	I=80.60' (PROP. 5' DIA. DMH (6-40))	FLAT TOP
PROP. DMH (6-41)	305+29.36	12.4 R	90.64	I=84.50' (PROP. OCS-2)	I=83.00' (PROP. 5' DIA. DMH (6-40))	

CONTINUED ON SHEET NO. 111

CONTINUED ON SHEET NO. 113

A00840 344

Proposal No. 608051 - 132406

608051_UT03(DRAINAGE-PLANS).DWG Plotted on 13-Mar-2025 9:01 AM

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

SEE SHEET 128

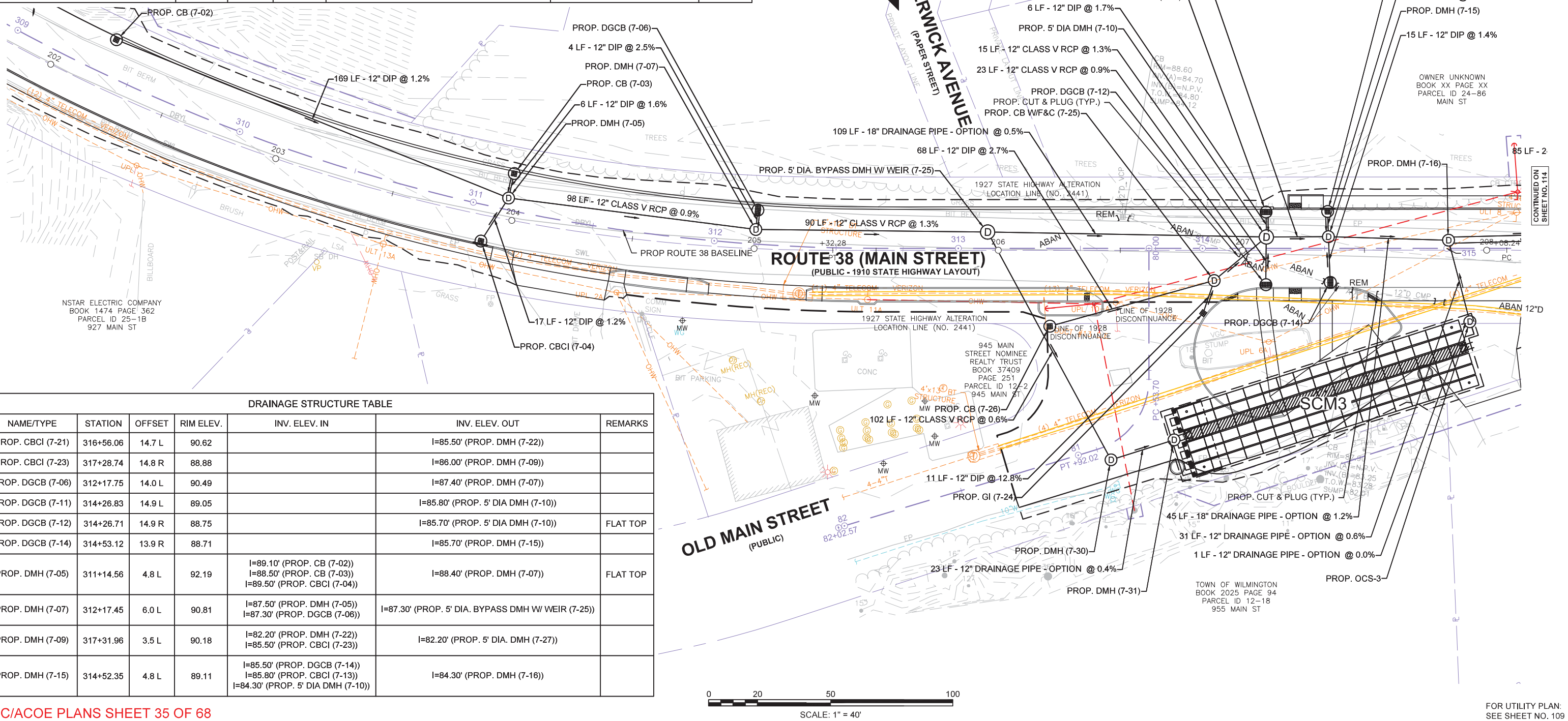
WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	113	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 20

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. 5' DIA DMH (7-10)	314+26.93	4.7 L	88.98	I=84.45' (PROP. 5' DIA. BYPASS DMH W/ WEIR (7-25)) I=85.50' (PROP. DGCB (7-12)) I=85.70' (PROP. DGCB (7-11)) I=85.20' (PROP. CB W/F&C (7-25))	I=84.45' (PROP. DMH (7-15))	
PROP. 5' DIA. BYPASS DMH W/ WEIR (7-25)	313+12.81	6.7 L	89.40	I=86.10' (PROP. DMH (7-07))	I=85.00' (PROP. 5' DIA DMH (7-10)) I=84.00' (PROP. DMH (7-30))	
PROP. CB (7-02)	309+38.91	14.8 L	94.28		I=91.20' (PROP. DMH (7-05))	HOOD
PROP. CB (7-03)	311+14.76	15.1 L	91.65		I=88.60' (PROP. DMH (7-05))	
PROP. CB (7-26)	313+38.27	31.9 R	89.47		I=87.25' (PROP. CB W/F&C (7-25))	FLAT TOP
PROP. CB W/F&C (7-25)	314+05.58	13.2 R	88.54	I=85.43' (PROP. GI (7-24)) I=85.43' (PROP. CB (7-26))	I=85.40' (PROP. 5' DIA DMH (7-10))	
PROP. CBCI (7-04)	311+07.23	14.8 R	92.78		I=89.70' (PROP. DMH (7-05))	
PROP. CBCI (7-13)	314+52.02	15.1 L	89.29		I=86.20' (PROP. DMH (7-15))	
PROP. CBCI (7-18)	315+62.05	14.7 R	88.80		I=84.60' (PROP. DMH (7-19))	
PROP. CBCI (7-20)	316+44.90	15.0 R	88.68		I=85.50' (PROP. DMH (7-22))	

DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (7-16)	315+01.54	3.3 L	89.35	I=83.77' (PROP. DMH (7-15)) I=83.77' (PROP. OCS-3)	I=83.67' (PROP. DMH (7-19))	
PROP. DMH (7-19)	315+60.01	6.3 L	89.79	I=83.30' (PROP. DMH (7-16)) I=84.45' (PROP. CBCI (7-18))	I=83.30' (PROP. DMH (7-22))	
PROP. DMH (7-22)	316+48.15	2.4 L	89.92	I=82.75' (PROP. CBCI (7-21)) I=85.40' (PROP. CBCI (7-20)) I=82.75' (PROP. DMH (7-19))	I=82.75' (PROP. DMH (7-09))	
PROP. DMH (7-30)	313+63.33	86.6 R	89.66	I=83.42' (PROP. 5' DIA. BYPASS DMH W/ WEIR (7-25))	I=83.39' (PROP. DMH (7-31))	
PROP. GI (7-24)	314+01.08	26.5 R	88.98		I=86.78' (PROP. CB W/F&C (7-25))	
PROP. OCS-3	315+10.27	30.0 R	89.00	I=83.30' () I=83.30' (SCM3)	I=83.94' (PROP. DMH (7-16))	



DRAINAGE STRUCTURE TABLE						
NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. CBCI (7-21)	316+56.06	14.7 L	90.62		I=85.50' (PROP. DMH (7-22))	
PROP. CBCI (7-23)	317+28.74	14.8 R	88.88		I=86.00' (PROP. DMH (7-09))	
PROP. DGCB (7-06)	312+17.75	14.0 L	90.49		I=87.40' (PROP. DMH (7-07))	
PROP. DGCB (7-11)	314+26.83	14.9 L	89.05		I=85.80' (PROP. 5' DIA DMH (7-10))	
PROP. DGCB (7-12)	314+26.71	14.9 R	88.75		I=85.70' (PROP. 5' DIA DMH (7-10))	FLAT TOP
PROP. DGCB (7-14)	314+53.12	13.9 R	88.71		I=85.70' (PROP. DMH (7-15))	
PROP. DMH (7-05)	311+14.56	4.8 L	92.19	I=89.10' (PROP. CB (7-02)) I=88.50' (PROP. CB (7-03)) I=89.50' (PROP. CBCI (7-04))	I=88.40' (PROP. DMH (7-07))	FLAT TOP
PROP. DMH (7-07)	312+17.45	6.0 L	90.81	I=87.50' (PROP. DMH (7-05)) I=87.30' (PROP. DGCB (7-06))	I=87.30' (PROP. 5' DIA. BYPASS DMH W/ WEIR (7-25))	
PROP. DMH (7-09)	317+31.96	3.5 L	90.18	I=82.20' (PROP. DMH (7-22)) I=85.50' (PROP. CBCI (7-23))	I=82.20' (PROP. 5' DIA. DMH (7-27))	
PROP. DMH (7-15)	314+52.35	4.8 L	89.11	I=85.50' (PROP. DGCB (7-14)) I=85.80' (PROP. CBCI (7-13)) I=84.30' (PROP. 5' DIA DMH (7-10))	I=84.30' (PROP. DMH (7-16))	

0 20 50 100

SCALE: 1" = 40'

FOR UTILITY PLAN:
SEE SHEET NO. 109

WQC/ACOE PLANS SHEET 35 OF 68

A00840 - 345

Proposal No. 608051 - 132406

Plotted on 4-Apr-2025 1:13 PM

608051_UT03\DRAINAGE-PLANS\.DWG

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

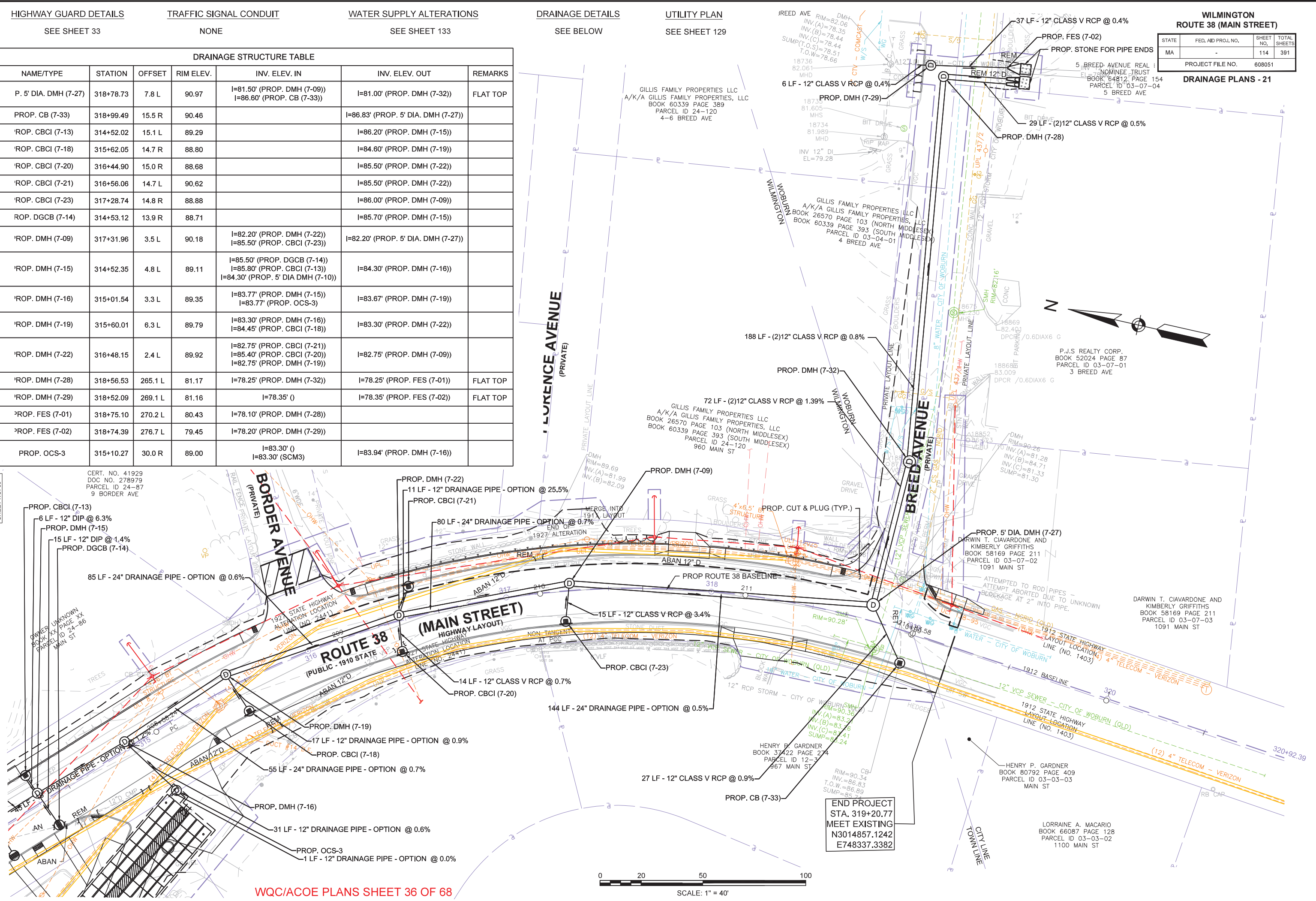
SEE BELOW

UTILITY PLAN

SEE SHEET 129

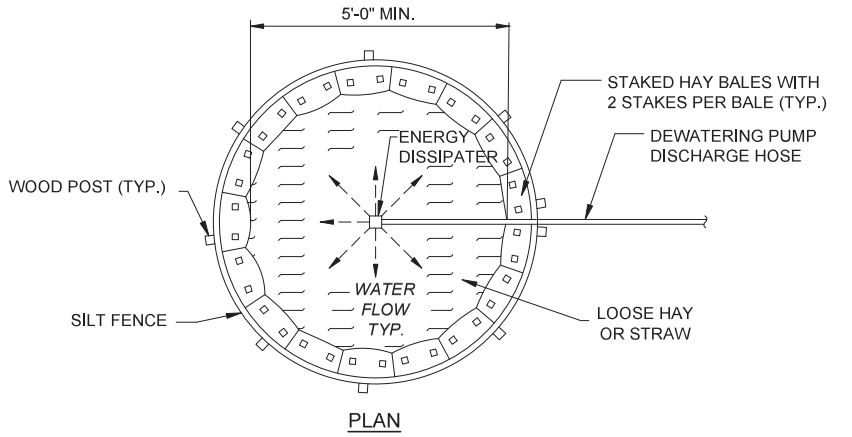
DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
P. 5' DIA. DMH (7-27)	318+78.73	7.8 L	90.97	I=81.50' (PROP. DMH (7-09)) I=86.60' (PROP. CB (7-33))	I=81.00' (PROP. DMH (7-32))	FLAT TOP
PROP. CB (7-33)	318+99.49	15.5 R	90.46		I=86.83' (PROP. 5' DIA. DMH (7-27))	
'ROP. CBCI (7-13)	314+52.02	15.1 L	89.29		I=86.20' (PROP. DMH (7-15))	
'ROP. CBCI (7-18)	315+62.05	14.7 R	88.80		I=84.60' (PROP. DMH (7-19))	
'ROP. CBCI (7-20)	316+44.90	15.0 R	88.68		I=85.50' (PROP. DMH (7-22))	
'ROP. CBCI (7-21)	316+56.06	14.7 L	90.62		I=85.50' (PROP. DMH (7-22))	
'ROP. CBCI (7-23)	317+28.74	14.8 R	88.88		I=86.00' (PROP. DMH (7-09))	
ROP. DGCB (7-14)	314+53.12	13.9 R	88.71		I=85.70' (PROP. DMH (7-15))	
'ROP. DMH (7-09)	317+31.96	3.5 L	90.18	I=82.20' (PROP. DMH (7-22)) I=85.50' (PROP. CBCI (7-23))	I=82.20' (PROP. 5' DIA. DMH (7-27))	
'ROP. DMH (7-15)	314+52.35	4.8 L	89.11	I=85.50' (PROP. DGCB (7-14)) I=85.80' (PROP. CBCI (7-13)) I=84.30' (PROP. 5' DIA DMH (7-10))	I=84.30' (PROP. DMH (7-16))	
'ROP. DMH (7-16)	315+01.54	3.3 L	89.35	I=83.77' (PROP. DMH (7-15)) I=83.77' (PROP. OCS-3)	I=83.67' (PROP. DMH (7-19))	
'ROP. DMH (7-19)	315+60.01	6.3 L	89.79	I=83.30' (PROP. DMH (7-16)) I=84.45' (PROP. CBCI (7-18))	I=83.30' (PROP. DMH (7-22))	
'ROP. DMH (7-22)	316+48.15	2.4 L	89.92	I=82.75' (PROP. CBCI (7-21)) I=85.40' (PROP. CBCI (7-20)) I=82.75' (PROP. DMH (7-19))	I=82.75' (PROP. DMH (7-09))	
'ROP. DMH (7-28)	318+56.53	265.1 L	81.17	I=78.25' (PROP. DMH (7-32))	I=78.25' (PROP. FES (7-01))	FLAT TOP
'ROP. DMH (7-29)	318+52.09	269.1 L	81.16	I=78.35' ()	I=78.35' (PROP. FES (7-02))	FLAT TOP
?ROP. FES (7-01)	318+75.10	270.2 L	80.43	I=78.10' (PROP. DMH (7-28))		
?ROP. FES (7-02)	318+74.39	276.7 L	79.45	I=78.20' (PROP. DMH (7-29))		
PROP. OCS-3	315+10.27	30.0 R	89.00	I=83.30' () I=83.30' (SCM3)	I=83.94' (PROP. DMH (7-16))	



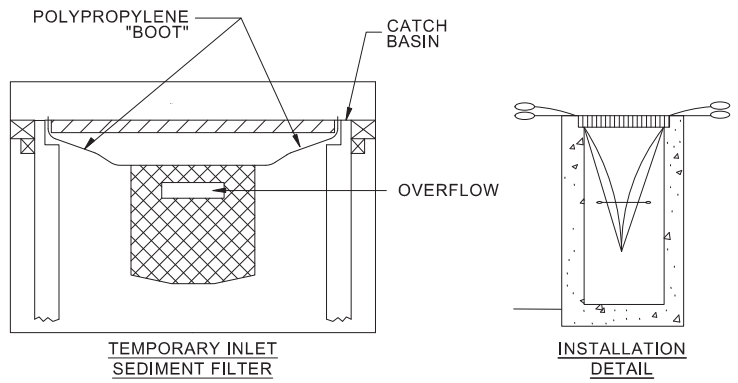
CONTINUED ON SHEET NO. 39

Proposal No. 608051 - 132406
608051_UT03(DRAINAGE-PLANS).DWG Plotted on 13-Mar-2025 9:02 AM
A008040 346



NOTE:
THIS DETAIL SHOWS ONE METHOD OF SEDIMENTATION CONTROL DURING DEWATERING.

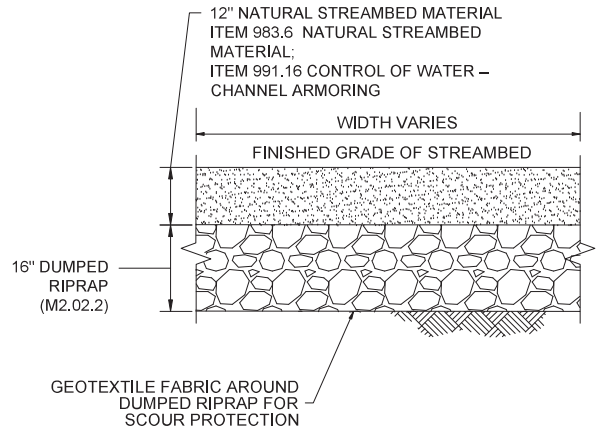
DEWATERING SEDIMENTATION BASIN DETAIL
NOT TO SCALE



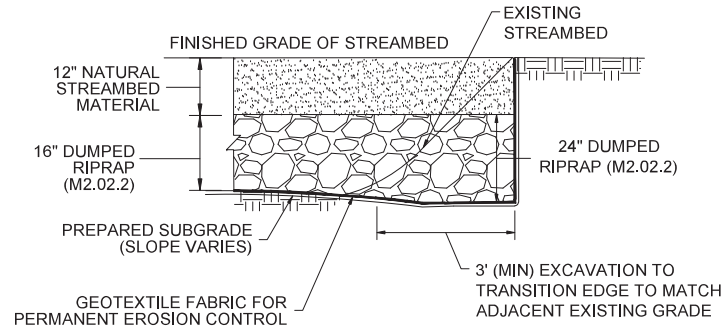
NOTE:

1. INSTALL INLET PROTECTION IN EXISTING CATCH BASIN, BEFORE COMMENCING WORK.
2. GRATE TO BE PLACED OVER INLET PROTECTION.
3. INLET PROTECTION SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND CLEANING OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.

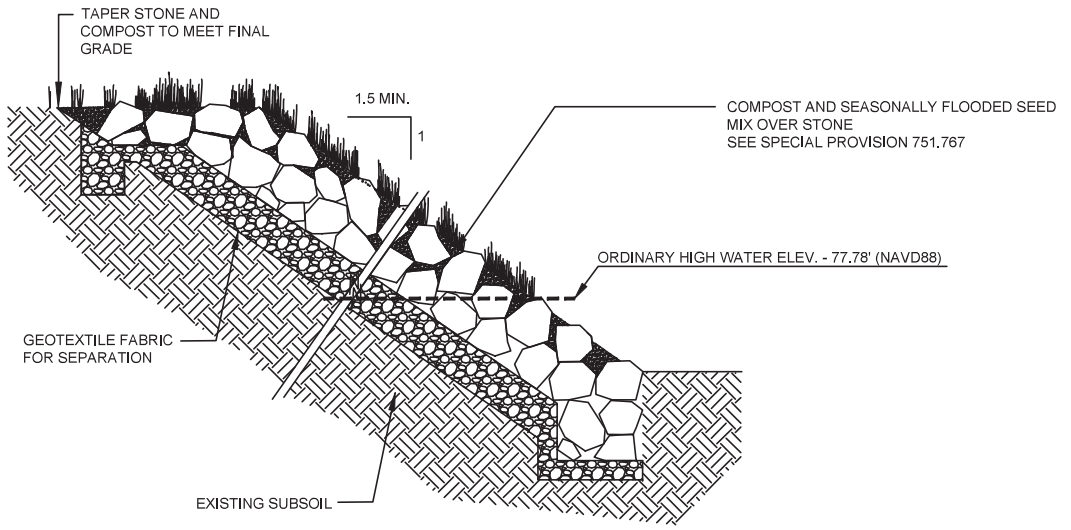
INLET PROTECTION FILTER BAG
NOT TO SCALE



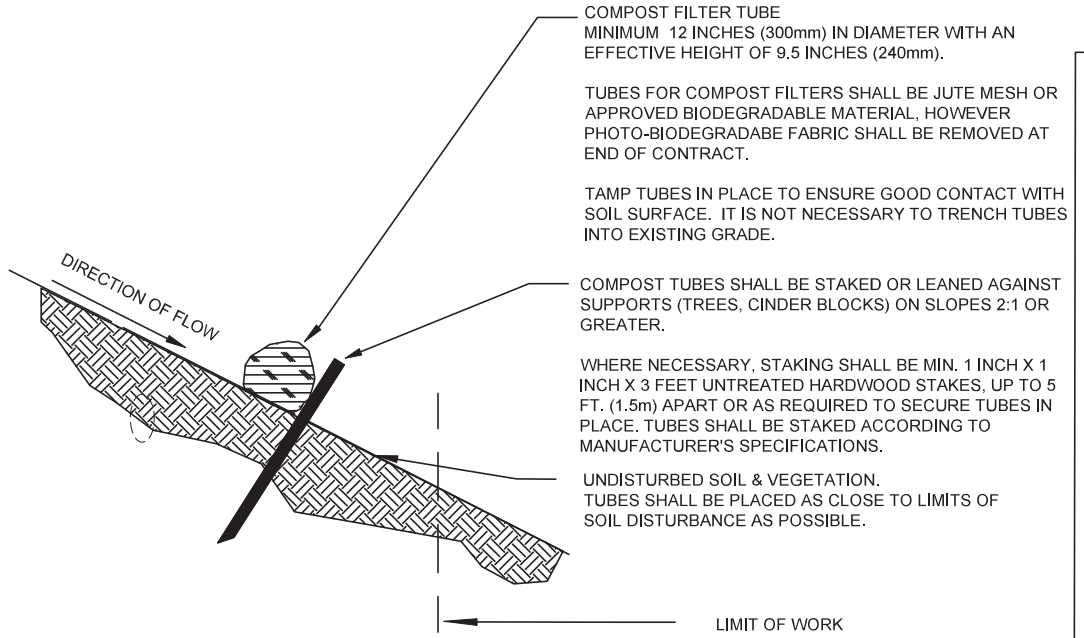
CHANNEL ARMORING
NOT TO SCALE



RIPRAP ARMORING END TRANSITION
NOT TO SCALE

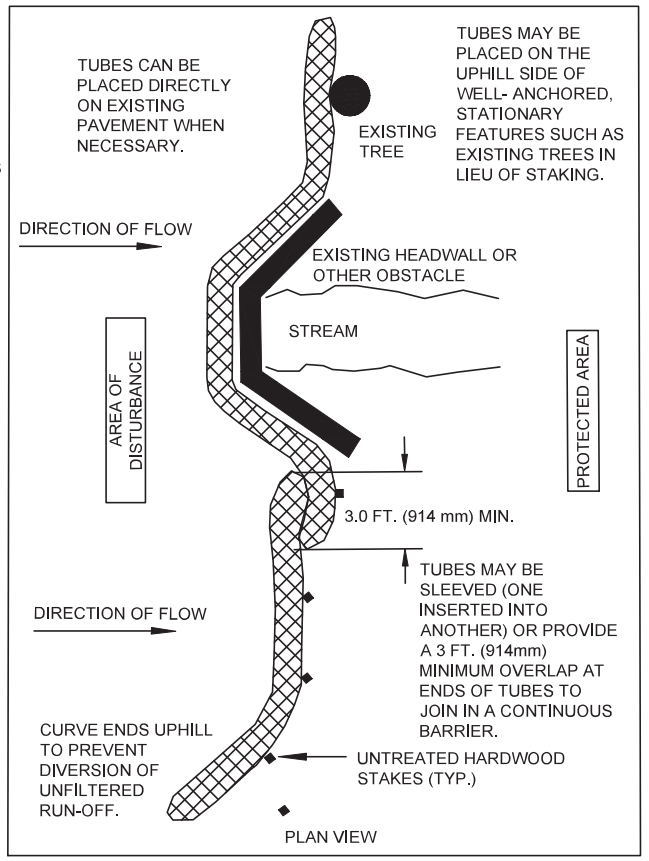


COMPOST AND SEASONALLY FLOODED SEED MIX OVER STONE
NOT TO SCALE



GENERAL NOTES:

1. PROVIDE A MINIMUM TUBE DIAMETER OF 12 INCHES (300mm) FOR SLOPES UP TO 50 FEET (15.24m) IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
2. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
3. TUBE LOCATION MAY BE SHIFTED TO ADJUST TO LANDSCAPE FEATURES, BUT SHALL PROTECT UNDISTURBED AREA AND VEGETATION TO MAXIMUM EXTENT POSSIBLE.
4. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
5. ADDITIONAL TUBES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
6. ADDITIONAL STAKING SHALL BE USED AT THE DIRECTION OF THE ENGINEER.



TYPICAL COMPOST FILTER TUBE DETAIL
NOT TO SCALE

EROSION AND SEDIMENT CONTROLS

1. THE CONTRACTOR IS RESPONSIBLE FOR CONTROLLING THE EROSION AND SEDIMENT DURING THE CONSTRUCTION PROCESS. SITE SPECIFIC CONDITIONS MAY REQUIRE MODIFICATIONS IN THE FIELD, BUT THE CONTRACTOR MUST ENSURE THAT THE CHANGES MEET THE MINIMUM REQUIREMENTS OF THIS PLAN AND ARE APPROVED BY THE ENGINEER.
2. IN ORDER TO MINIMIZE EROSION AND SEDIMENT RUNOFF FROM THE SITE, THE CONTRACTOR SHALL MAINTAIN EXISTING VEGETATION WHERE POSSIBLE AND STABILIZE THE DISTURBED PORTIONS OF THE SITE AS QUICKLY AS POSSIBLE. THIS MAY INCLUDE PHASING THE PROJECT AS NEEDED TO MINIMIZE THE SIZE OF THE DISTURBED AREAS ON THE SITE. THE COST OF PHASING THE PROJECT IS INCIDENTAL TO THE CONTRACT.
3. THE CONTRACTOR MUST ALSO ANTICIPATE INCREASED RUNOFF FROM STEEPER SLOPES AND DURING HIGH GROUNDWATER CONDITIONS. THIS MAY OCCUR DURING THE WET SEASON (TYPICALLY MARCH THROUGH APRIL) OR AFTER SIGNIFICANT PRECIPITATION EVENTS.
4. THE CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION OF SILT FENCES, DRAINAGE SWALES, EARTH DIKES, TEMPORARY SETTLING BASINS, CHECK DAMS AND TEMPORARY SEDIMENT BASINS. THESE PRACTICES INCLUDE DIVERTING FLOWS FROM EXPOSED SOILS, LIMITING RUNOFF AND LIMITING THE DISCHARGE OF POLLUTANTS FROM EXPOSED AREAS OF THE SITE TO THE MAXIMUM EXTENT PRACTICABLE AND SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
5. ALL DISTURBED SURFACES SHALL BE STABILIZED WITHIN 14 DAYS AFTER CONSTRUCTION IN ANY PORTION OF THE SITE THAT HAS BEEN COMPLETED OR WHERE CONSTRUCTION HAS TEMPORARILY CEASED.
6. THE CONTRACTOR SHALL, AT ALL TIMES, HAVE A STOCKPILE OF COMPOST FILTER TUBES AND SILT FENCE ADEQUATE TO REINFORCE/REPLACE EROSION AND SEDIMENT CONTROL AS NEEDED.
7. IF REQUIRED, THE CONTRACTOR SHALL OBTAIN ALL PERMITS ASSOCIATED WITH DEWATERING ACTIVITIES AT NO ADDITIONAL COST TO THE TOWN.

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608051_UT02(DRAINAGE-DETAILS).DWG Plotted on 20-Mar-2025 5:38 PM

608051_LT02(DRAINAGE-DETAILS).DWG Plotted on 20-Mar-2025 5:38 PM

Proposal No. 608051 - 132406

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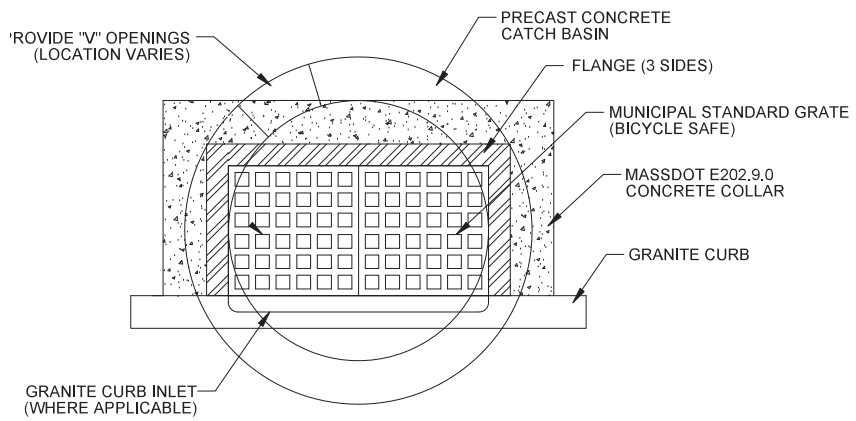
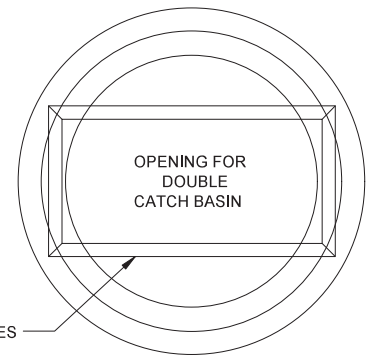
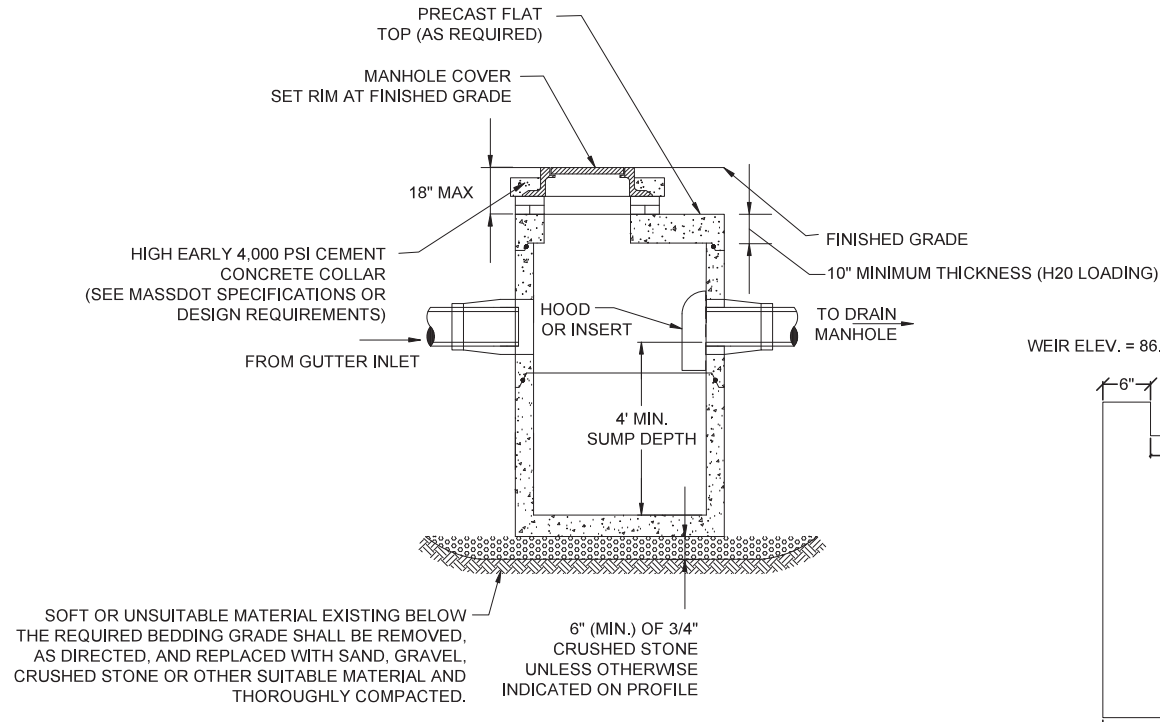


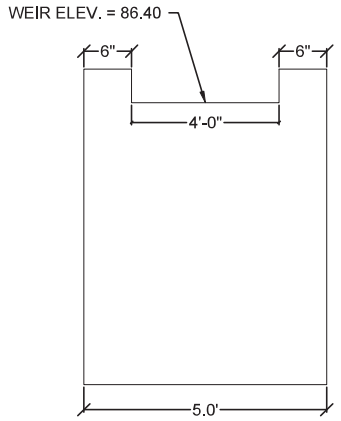
PLAN





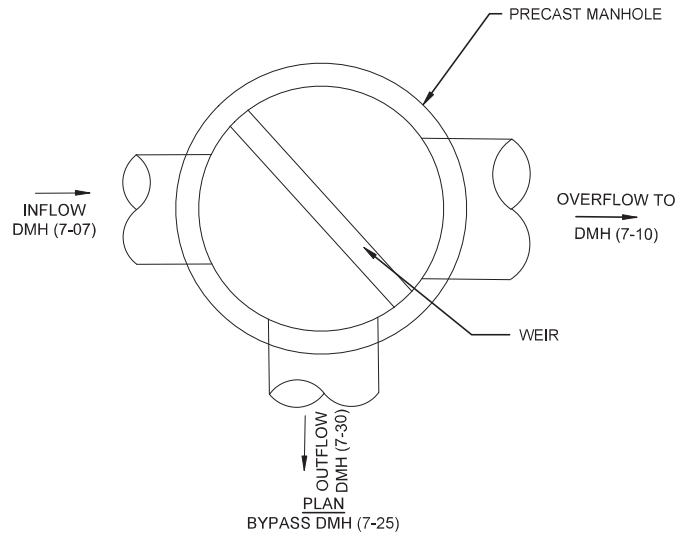
CATCH BASIN WITH FRAME AND COVER

NOT TO SCALE



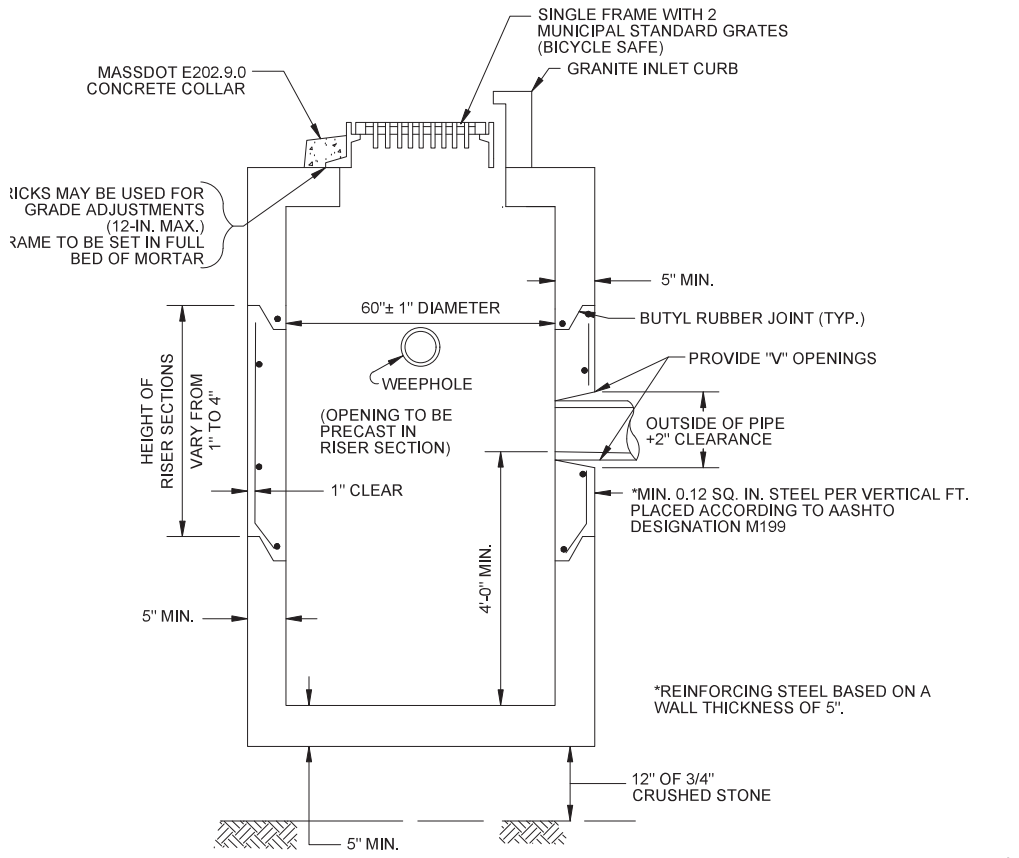
CONCRETE WEIR PROFILE

NOT TO SCALE



PLAN

BYPASS DMH (7-25)

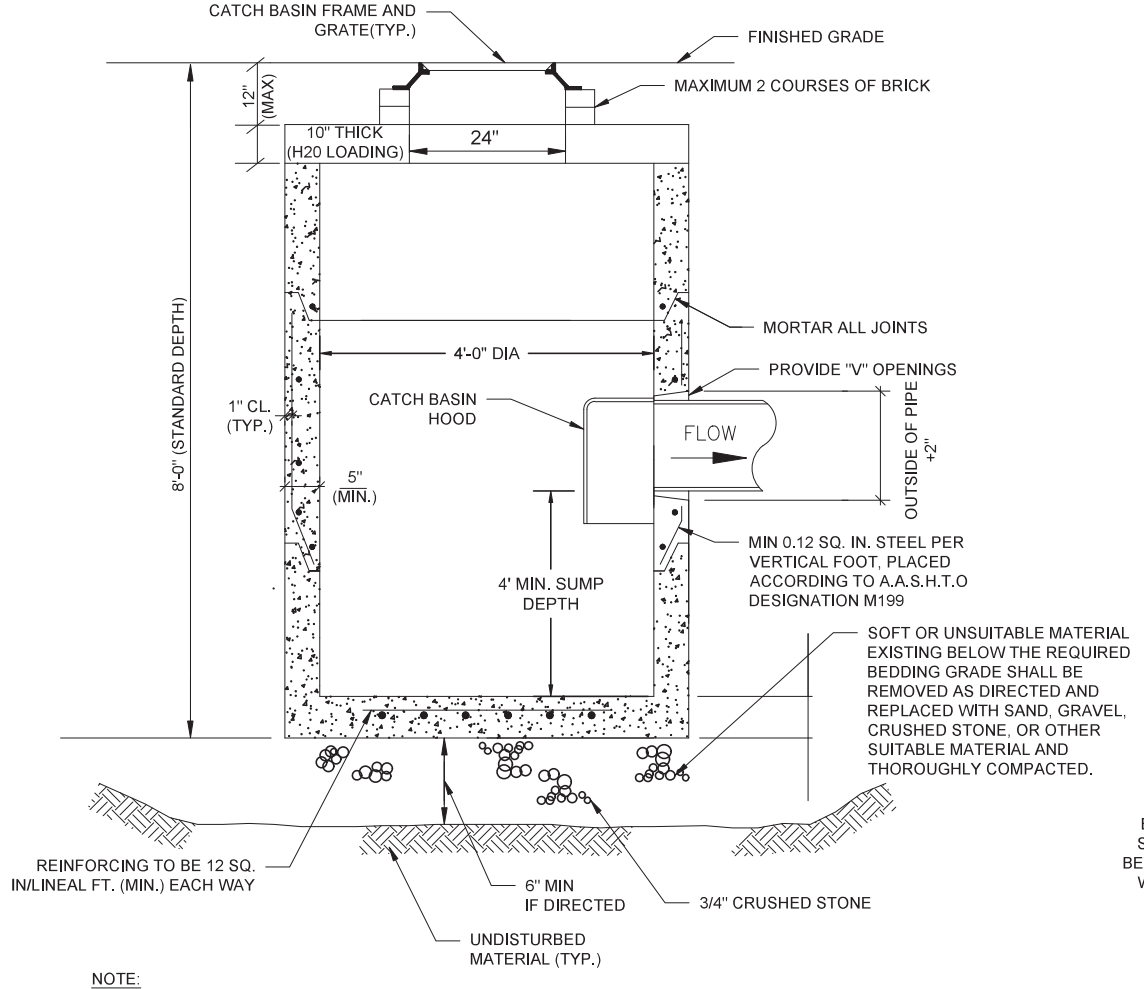


DOUBLE GRATE CATCH BASIN

NOT TO SCALE

NOTE:

1. FACE OF PIPE FLUSH OR NOT TO PROJECT MORE THAN 4" FROM FACE OF WALL ALONG CENTERLINE OF PIPE.
2. FRAME SHALL BE EQUAL TO EJUSA 0MA544000001
3. ALL CONCRETE TO BE AIR ENTRAINED.
4. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE SPECIFICATIONS.

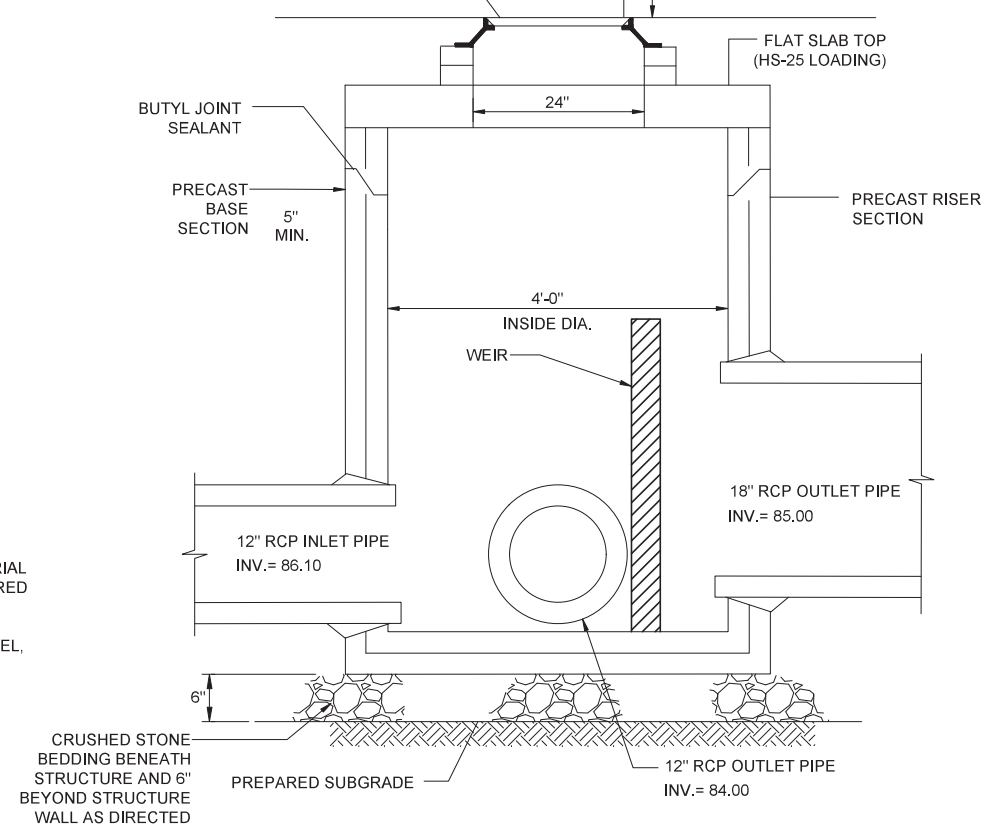


NOTE:

4" HEAVY DUTY FRAME AND GRATE TO BE USED FOR FLAT TOP DRAINAGE STRUCTURES WHERE DISTANCE BETWEEN TOP OF PIPE AND GROUND IS 2 FEET OR LESS.

TYPICAL FLAT TOP SLAB CATCH BASIN DETAIL

NOT TO SCALE



NOTES:

1. PRECAST CONCRETE SECTIONS SHALL CONFORM TO ASTM C-478
2. STEEL REINFORCING SHALL CONFORM TO ASTM A185

5' DIAMETER BYPASS DMH WITH WEIR (7-25)

NOT TO SCALE

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	###	391
PROJECT FILE NO.		608051	

DRAINAGE & UTILITY DETAILS - 3

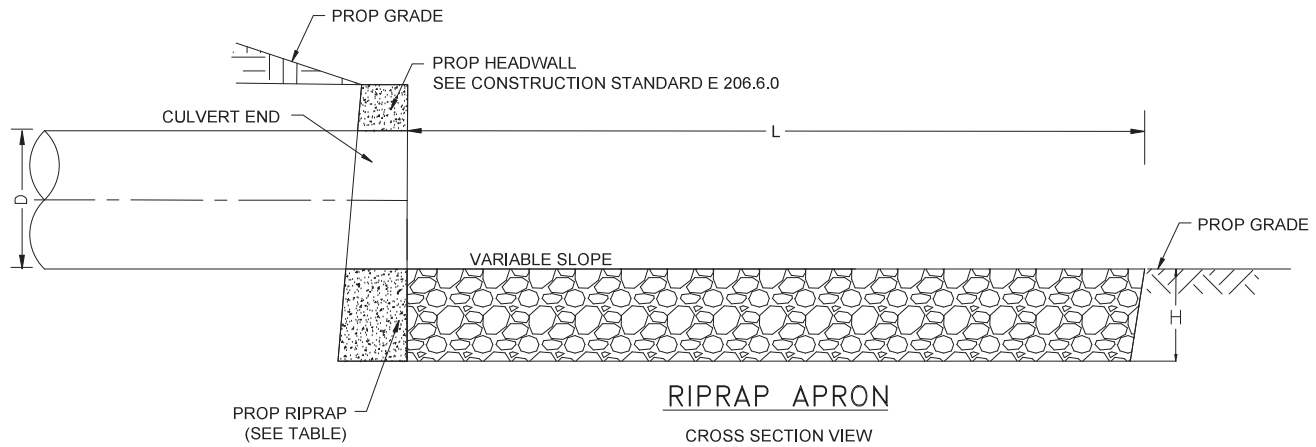
CULVERT SIZE D (INCHES)	LENGTH OF APRON L (FEET)	DEPTH OF APRON H (INCHES)	MASSDOT RIPRAP SIZE
30	12.5	24	M2.02.2
36	16	24	M2.02.2
42	21	30	M2.02.1
48	24	30	M2.02.1

SOURCE:

FHWA STANDARD DRAWING C251-50

NOTES:

FOR PIPES 24" DIA. AND LESS, USE STONE PIPE ENDS
MASSDOT STANDARD DETAIL E 206.7.0

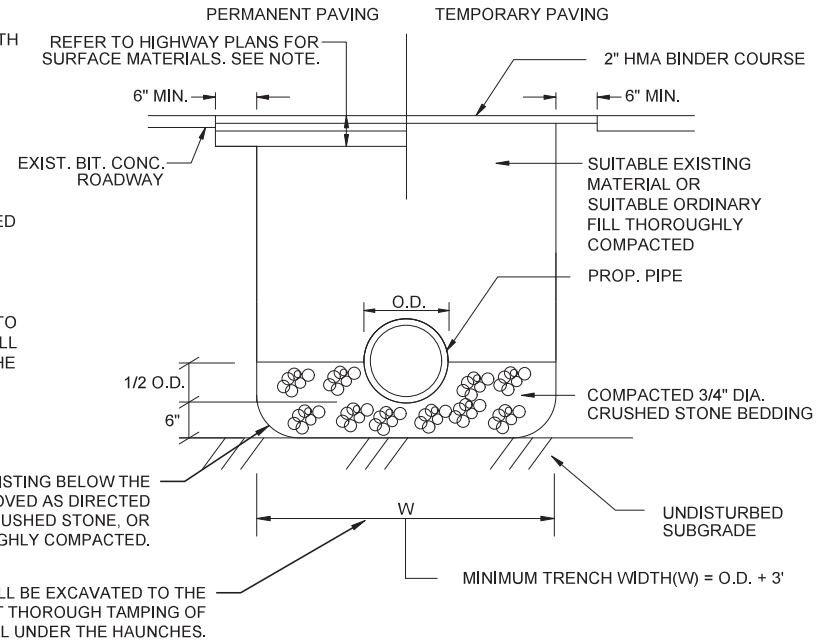


RIPRAP APRON

CROSS SECTION VIEW
NOT TO SCALE

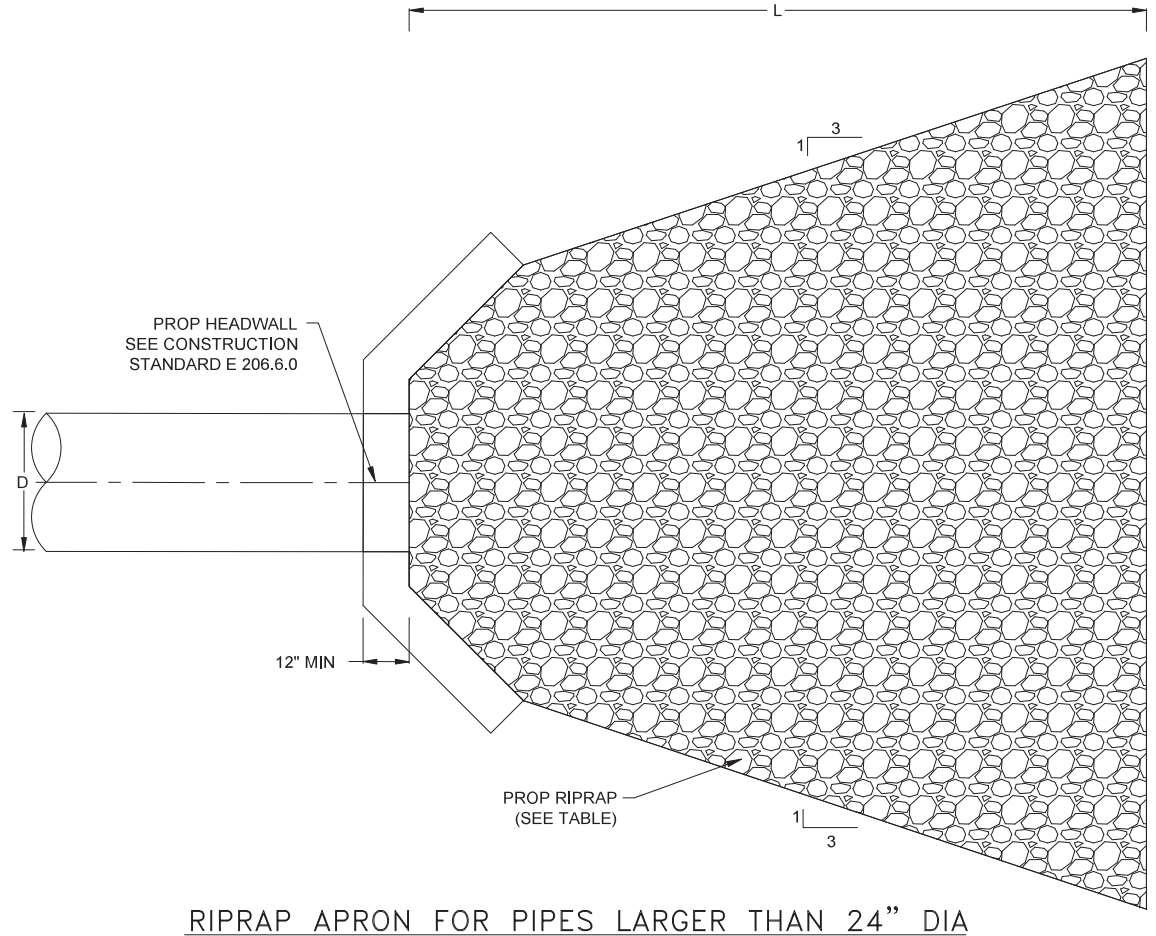
NOTE:

1. PERMANENT PAVING TO BE USED IN ALL AREAS OF MILL AND OVERLAY. MATERIALS SHALL MATCH CORRESPONDING FULL DEPTH SECTION. REFER TO TYPICAL ROADWAY SECTIONS.
2. HMA FOR PATCHING TO BE USED IN AREAS OF FUTURE FULL DEPTH CONSTRUCTION.
3. EXISTING MATERIAL OBTAINED FROM EXCAVATION THAT IS DETERMINED TO BE SUITABLE, AND APPROVED BY THE ENGINEER, OR SATISFACTORY BORROW SHALL BE USED. BACKFILL SHALL BE PLACED IN LAYERS NO MORE THAN 6 INCHES IN DEPTH AND THOROUGHLY COMPACTED. BACKFILLING TO A POINT 2 FEET OVER THE PIPE SHALL CONTAIN NO STONES LARGER THAN 3 INCHES - EXCEPT MATERIAL USED TO BACKFILL CORRUGATED PLASTIC PIPE SHALL CONSIST OF GRAVEL BORROW MEETING THE REQUIREMENTS OF M1.03.0: GRAVEL BORROW TYPE D, TO A DEPTH OF 2 FEET OVER THE TOP OF PIPE.



TYPICAL PIPE TRENCH

NOT TO SCALE



RIPRAP APRON FOR PIPES LARGER THAN 24" DIA

PLAN VIEW
NOT TO SCALE

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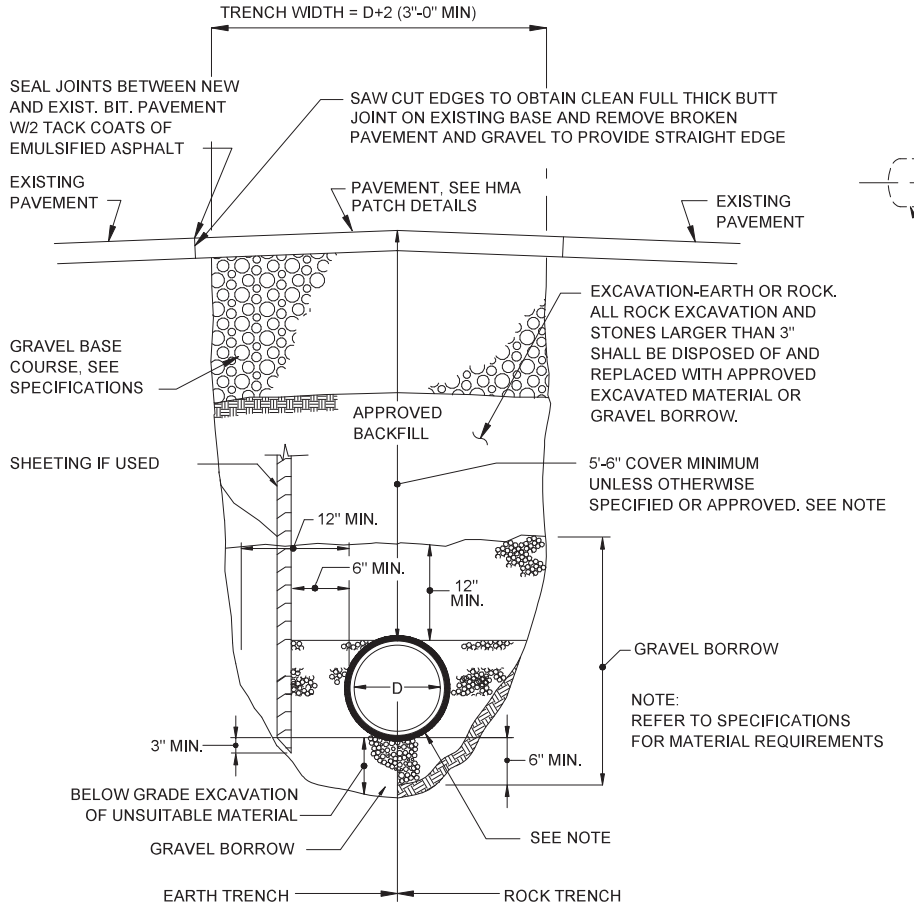
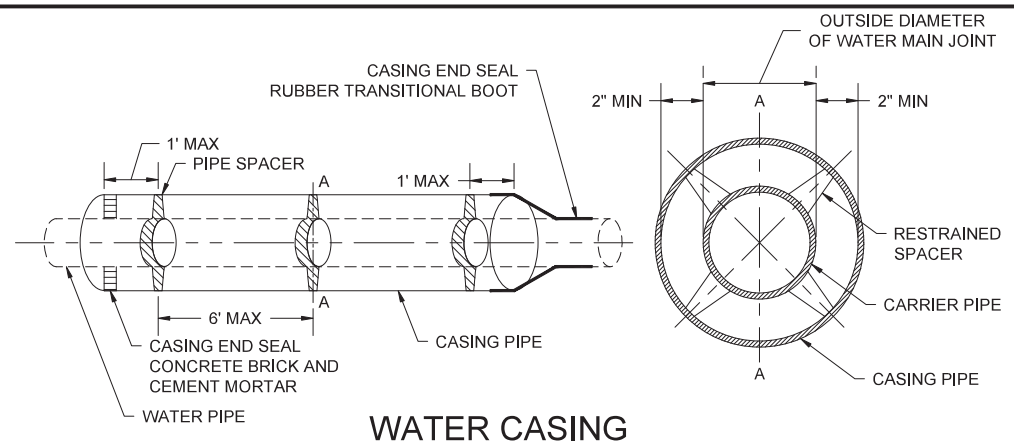
Plotted on 20-Mar-2025 5:38 PM
608051_UT02(DRAINAGE-DETAILS).DWG
Proposal No. 608051 - 132406
A00840 - 350



NOTE: FURNISH AND INSTALL CLOSED CELL GLASS INSULATION, 2" THICK FOAMGLASS ONE BY PITTSBURG CORNING OR EQUAL, WITH PITTWRAPP AA JACKETING BY PITTSBURG CORNING OR EQUAL WHEN WATER MAIN CANNOT BE INSTALLED AT OR BELOW THE BURIAL DEPTH OF FIVE (5) FEET BELOW GRADE.

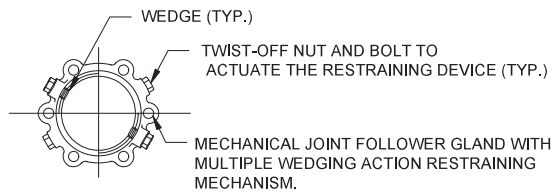
WATER TRENCH SECTION
NOT TO SCALE



WATER CASING
NOT TO SCALE

NOTE:

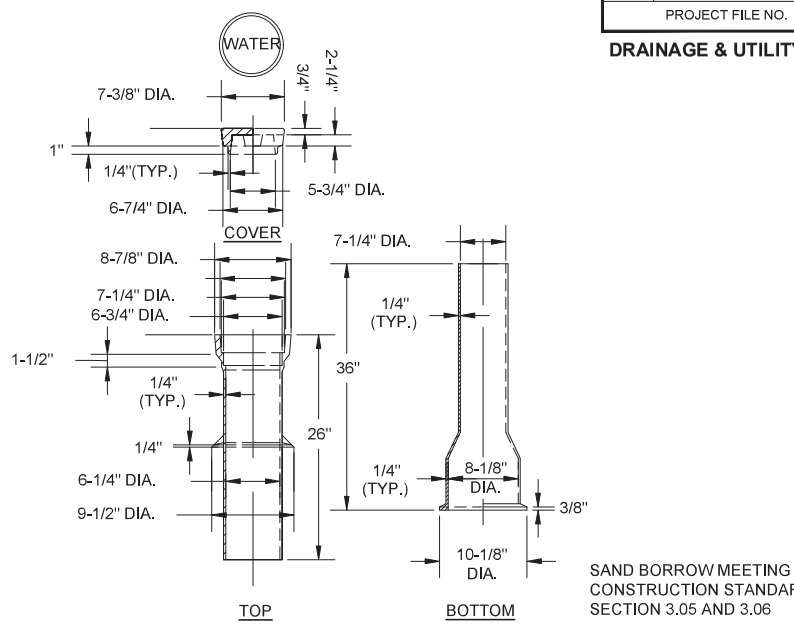
1. CARRIER PIPE MUST BE REMOVABLE FROM CASING IN EITHER DIRECTION.
2. SPACERS ARE REQUIRED FOR ALL USES OF CASING PIPE.
3. SPACER TO BE INSTALLED WITHIN TWO FEET OF SPIGOT END OF PIPE.
4. ADJUSTABLE CASING SPACERS ARE ALLOWED FOR ADJUSTMENT OF CARRIER PIPE SLOPE.
5. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE SPECIFICATIONS.



NOTES:

1. GLANDS SHALL BE DUCTILE IRON CONFORMING TO A.S.T.M. A 536-80 STEEL.
2. DIMENSIONS OF THE GLAND SHALL BE SUCH THAT IT CAN BE USED WITH THE STANDARDIZED MECHANICAL JOINT BELL AND TEE-HEAD BOLTS CONFORMING TO A.N.S.I./A.W.W.A. A 21.11 AND A.N.S.I./A.W.W.A. C 153/A 21.53 OF LATEST REVISION.
3. LENGTH OF RESTRAINED PIPE SHALL BE IN ACCORDANCE WITH "THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE" AS PUBLISHED BY THE DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA).

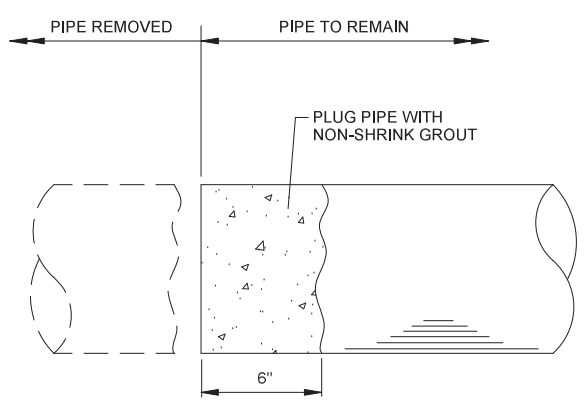
MECHANICAL JOINT RESTRAINT
NOT TO SCALE



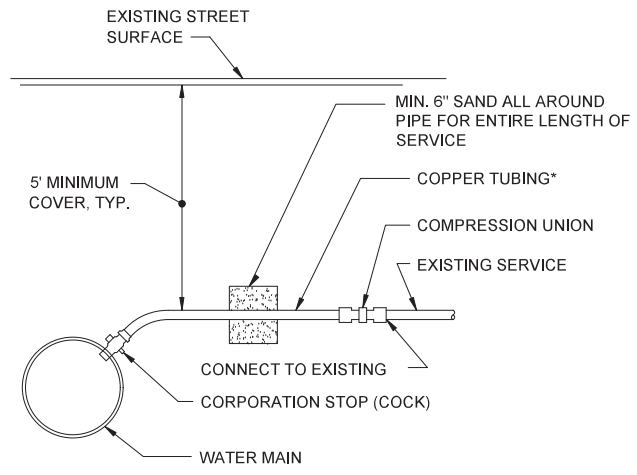
SAND BORROW MEETING CWD CONSTRUCTION STANDARDS SECTION 3.05 AND 3.06

1. ALL VALVES SHALL BE PROVIDED WITH STANDARD VALVE BOXES AND COVERS OF THE SLIDING TYPE.
2. DUCTILE IRON MAY BE SUBSTITUTED FOR CAST IRON VALVE BOXES.
3. MECHANICAL JOINTS, AFTER PIPE GASKETS AND FOLLOWER GLAND HAVE BEEN ASSEMBLED ACCORDING TO THE MANUFACTURERS INSTRUCTIONS, SHALL HAVE BOLTS INSERTED AND TIGHTENED BY HAND UNTIL ALL ARE EVEN. A RATCHET WRENCH IS THEN USED TO COMPLETE TIGHTENING OF THE BOLTS AND NUTS WITH CARE BEING TAKEN TO TIGHTEN THE OPPOSITE NUTS SO AS TO KEEP GLAND SQUARE WITH SOCKET AND BOLT STRESS EVENLY DISTRIBUTED.
4. DIRECTION OF VALVE OPENING TO BE IN ACCORDANCE WITH TOWN OF WILMINGTON REQUIREMENTS.

STANDARD VALVE BOX AND COVER
NOT TO SCALE

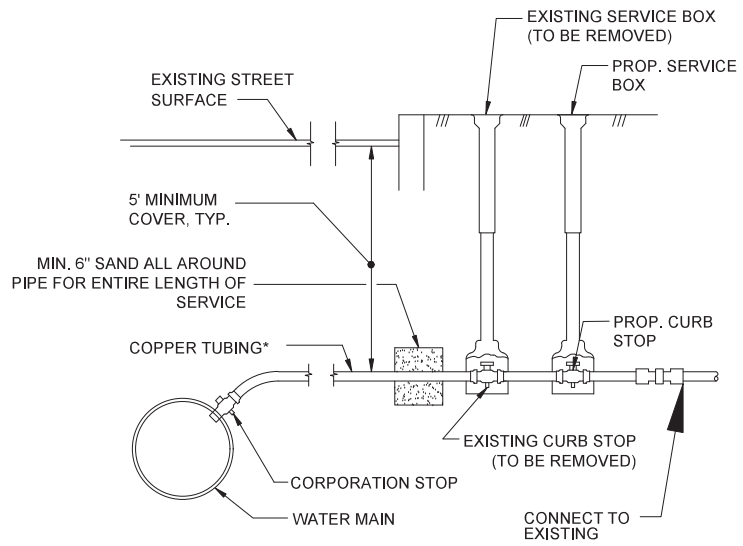


TYPICAL PIPE PLUGGING DETAIL
NOT TO SCALE



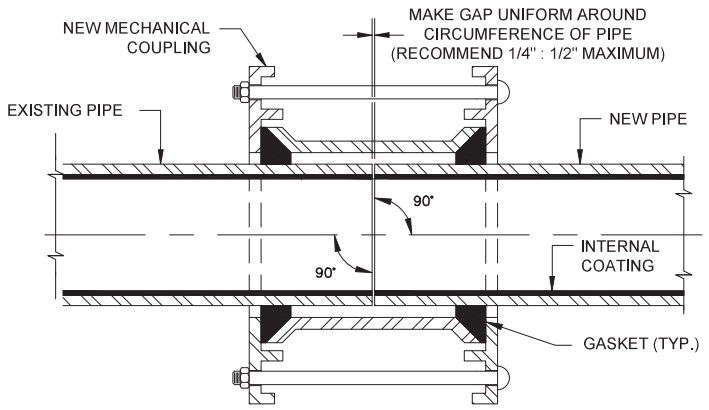
* NOTE: REFER TO SPECIAL PROVISIONS FOR MATERIAL REQUIREMENTS

WATER SERVICE CONNECTION
NOT TO SCALE



*NOTE: FOR USE ONLY AREAS DESCRIBED IN GENERAL NOTE 8. REFER TO SPECIAL PROVISIONS FOR MATERIAL REQUIREMENTS.

WATER SERVICE CONNECTION WITH NEW CURB STOP
NOT TO SCALE



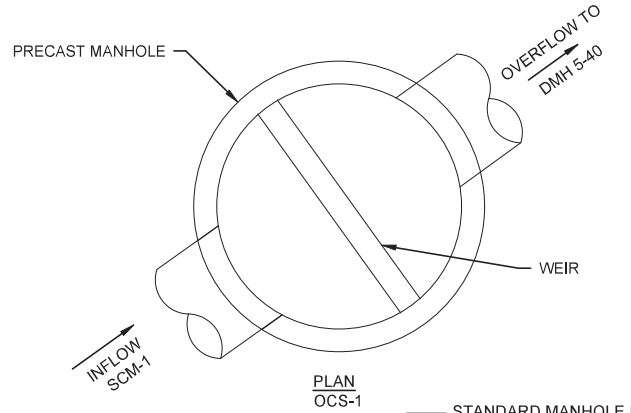
MECHANICAL COUPLING (NON-INSULATING)

NOTES:

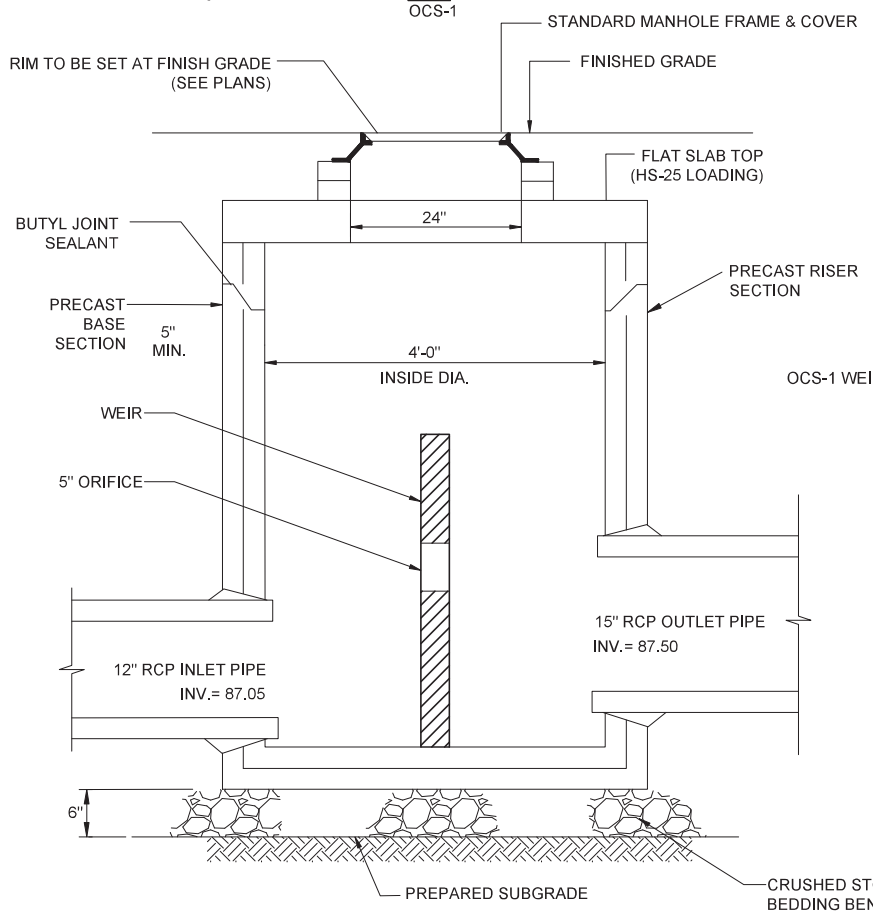
1. CONTRACTOR TO VERIFY OUTSIDE DIAMETER OF ALL EXISTING AND PROPOSED PIPES FOR SIZING COUPLINGS.
2. TRANSITION COUPLINGS WITH LARGER GASKETS OR REDUCING MIDDLE RINGS AS REQUIRED BY MANUFACTURER TO SPAN PIPES WITH DIFFERENT SIZE OUTSIDE DIAMETERS. A REDUCING MIDDLE RING SHALL BE USED AT LOCATIONS WHERE OUTSIDE DIAMETERS DIFFER BY 1-INCH OR MORE.
3. MECHANICAL COUPLINGS AND ALL HARDWARE SHALL BE COMPLETELY WRAPPED WITH WAX-TAPE COATING SYSTEM.
4. MECHANICAL COUPLINGS AND ALL HARDWARE SHALL BE INSTALLED AND TESTED AS PER MANUFACTURER'S STANDARDS AND INSTALLATION GUIDELINES.

MECHANICAL COUPLINGS
NOT TO SCALE

608051_UT02(DRAINAGE-DETAILS).DWG Plotted on 20-Mar-2025 5:38 PM



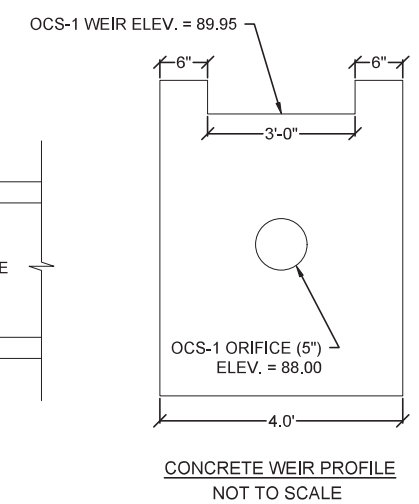
PLAN
OCS-1



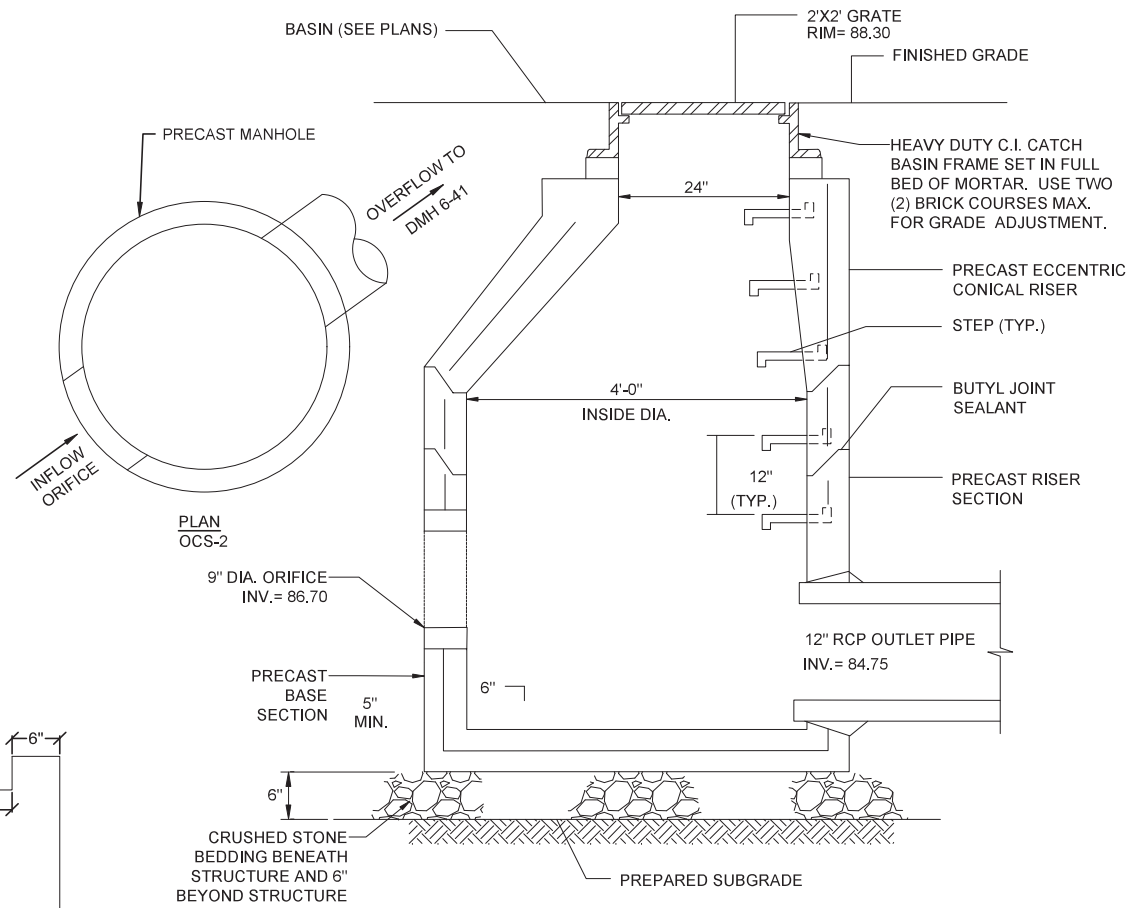
NOTES:

1. PRECAST CONCRETE SECTIONS SHALL CONFORM TO ASTM C-478
2. STEEL REINFORCING SHALL CONFORM TO ASTM A185

TYPICAL OUTLET CONTROL STRUCTURE (OCS-1)
NOT TO SCALE



CONCRETE WEIR PROFILE
NOT TO SCALE

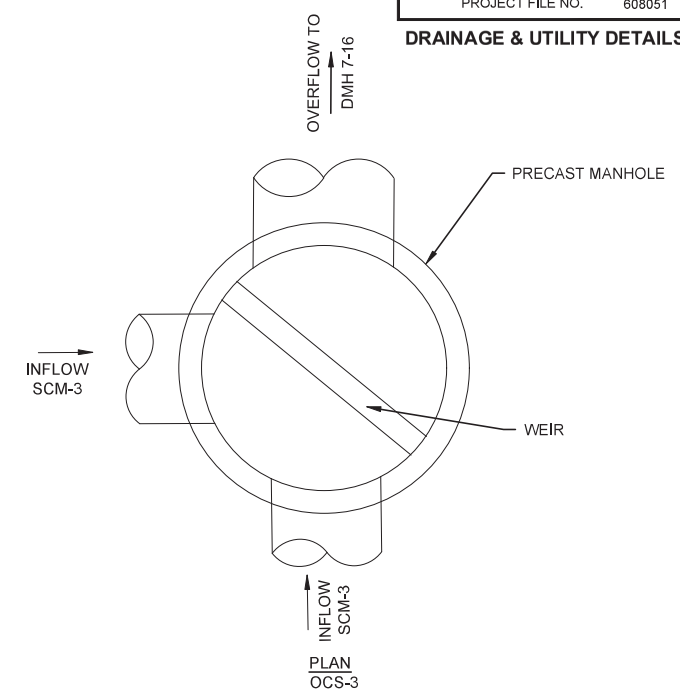


PLAN
OCS-2

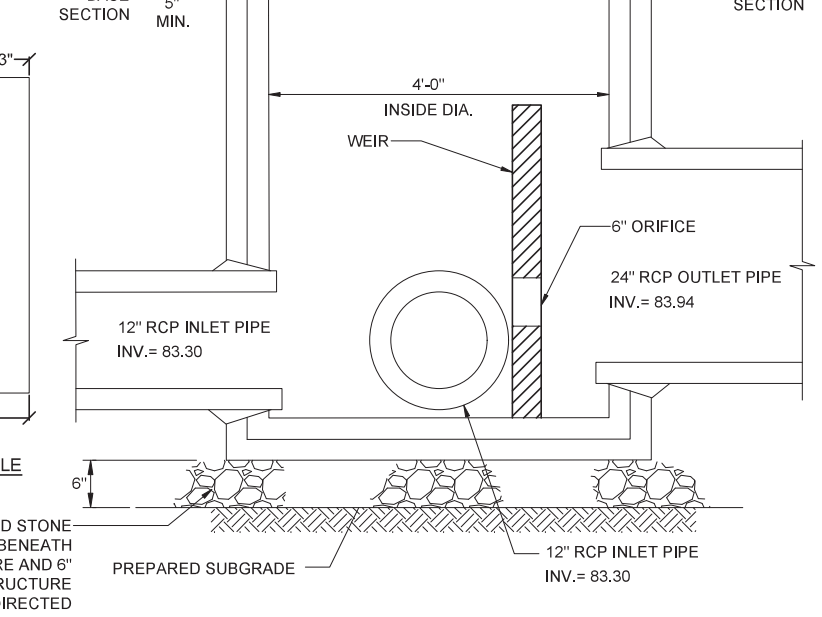
NOTES:

1. PRECAST CONCRETE SECTIONS SHALL CONFORM TO ASTM C-478
2. STEEL REINFORCING SHALL CONFORM TO ASTM A185
3. MANHOLE STEPS SHALL BE 14" WIDE STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC AND SHALL BE CAST INTO MANHOLE SECTIONS BY THE PRECAST MANHOLE MANUFACTURER.

TYPICAL OUTLET CONTROL STRUCTURE (OCS-2)
NOT TO SCALE



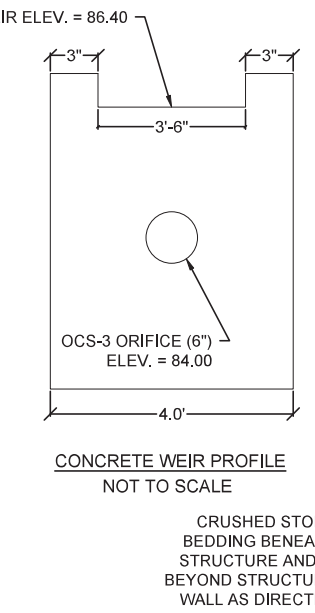
PLAN
OCS-3



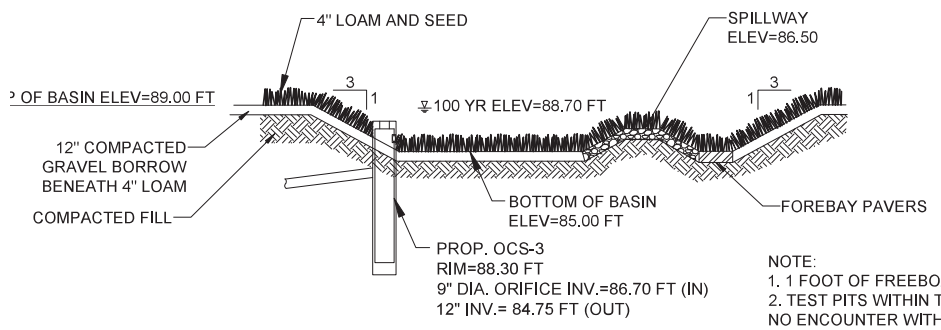
NOTES:

1. PRECAST CONCRETE SECTIONS SHALL CONFORM TO ASTM C-478
2. STEEL REINFORCING SHALL CONFORM TO ASTM A185

TYPICAL OUTLET CONTROL STRUCTURE (OCS-3)
NOT TO SCALE

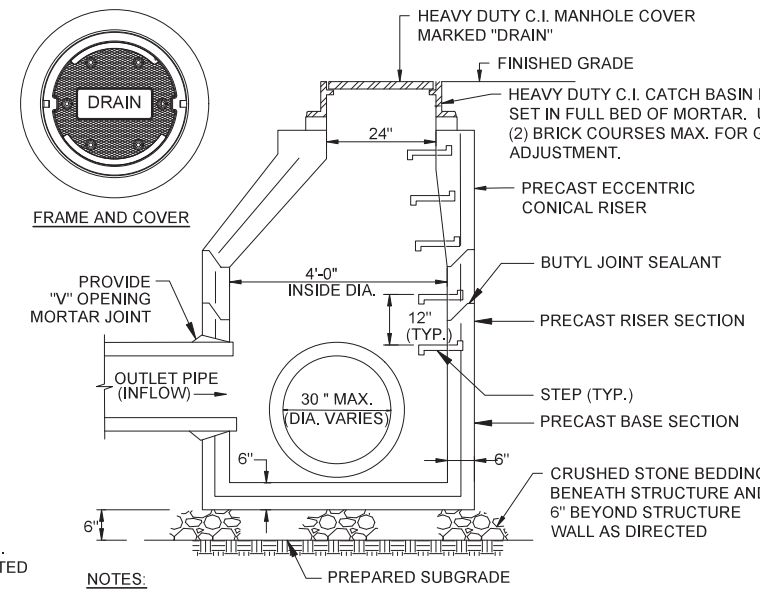


CONCRETE WEIR PROFILE
NOT TO SCALE



NOTE:
1. 1 FOOT OF FREEBOARD IS PROVIDED.
2. TEST PITS WITHIN THE BASIN INDICATED NO ENCOUNTER WITH GROUNDWATER

TYPICAL SECTION INFILTRATION BASIN (SCM-2)
NOT TO SCALE



NOTES:

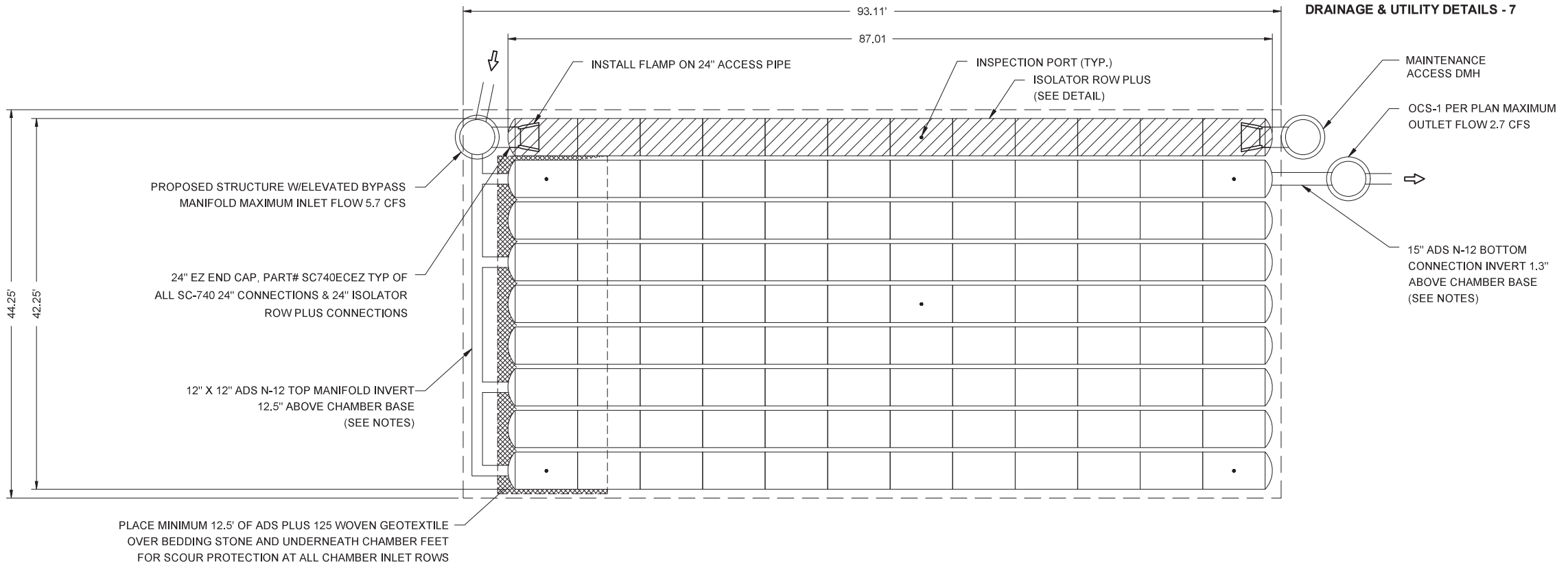
1. PRECAST CONCRETE SECTIONS SHALL CONFORM TO ASTM C-478
2. STEEL REINFORCING SHALL CONFORM TO ASTM A185
3. MANHOLE STEPS SHALL BE 14" WIDE STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC AND SHALL BE CAST INTO MANHOLE SECTIONS BY THE PRECAST MANHOLE MANUFACTURER.
4. OCS-2 AND OCS-4 ARE TYPICAL DRAIN MANHOLES WHERE THE OUTFLOW INVERT IS HIGHER THAN INFLOW INVERT.

TYPICAL DRAIN MANHOLE DETAIL
NOT TO SCALE

PROPOSED LAYOUT (SCM1)	
108	STORMTECH SC-740 CHAMBERS
18	STORMTECH SC-740 END CAPS
12	STONE ABOVE (in)
6	STONE BELOW (in)
30	% STONE VOID
8,418	**INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)**
4120	SYSTEM AREA (ft²)
275	SYSTEM PERIMETER (ft)

PROPOSED ELEVATIONS (SCM2)	
97.55	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)
91.55	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)
91.05	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)
91.05	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)
91.05	MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)
90.55	TOP OF STONE
89.55	TOP OF SC-740 CHAMBER
88.09	12" TOP MANIFOLD INVERT
87.06	15" BOTTOM CONNECTION INVERT
87.06	24" ISOLATOR ROW PLUS CONNECTION INVERT
87.05	BOTTOM OF SC-740 CHAMBER
86.55	BOTTOM OF STONE

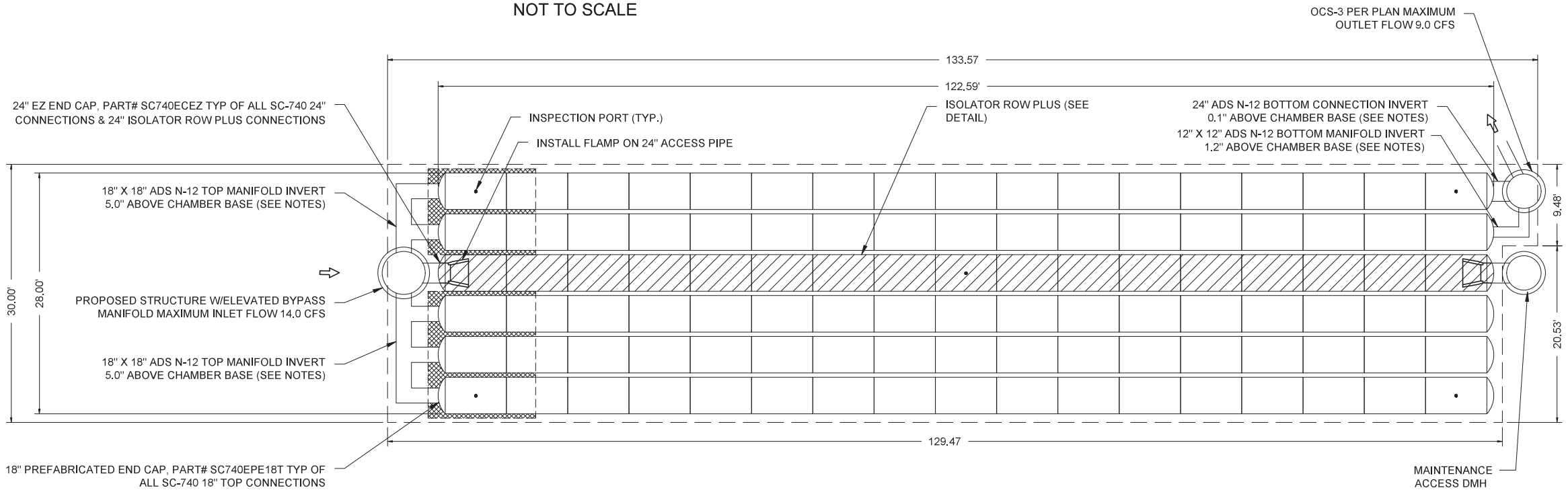
NOTES
- SEE TECHNICAL NOTE 6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.



SUBSURFACE INFILTRATION SYSTEM (SCM-1) (STORMTECH SC-740 OR APPROVED EQUAL)
NOT TO SCALE

PROPOSED LAYOUT (SCM3)	
102	STORMTECH SC-740 CHAMBERS
12	STORMTECH SC-740 END CAPS
12	STONE ABOVE (in)
6	STONE BELOW (in)
30	% STONE VOID
7,988	**INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)**
3923	SYSTEM AREA (ft²)
327	SYSTEM PERIMETER (ft)

PROPOSED ELEVATIONS (SCM3)	
93.70	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)
87.70	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)
87.20	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)
87.20	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)
87.20	MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)
86.70	TOP OF STONE
85.70	TOP OF SC-740 CHAMBER
83.62	18" TOP MANIFOLD INVERT
83.30	12" BOTTOM CONNECTION INVERT
83.21	24" BOTTOM CONNECTION INVERT
83.21	24" ISOLATOR ROW PLUS CONNECTION INVERT
83.20	BOTTOM OF SC-740 CHAMBER
82.70	BOTTOM OF STONE



SUBSURFACE INFILTRATION SYSTEM (SCM-3) (STORMTECH SC-740 OR APPROVED EQUAL)
NOT TO SCALE

WQC/ACOE PLANS SHEET 42 OF 68

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	###	391
PROJECT FILE NO.	608051		

DRAINAGE & UTILITY DETAILS - 7

Plotted on 20-Mar-2025 5:38 PM
608051_UT02(DRAINAGE-DETAILS).DWG

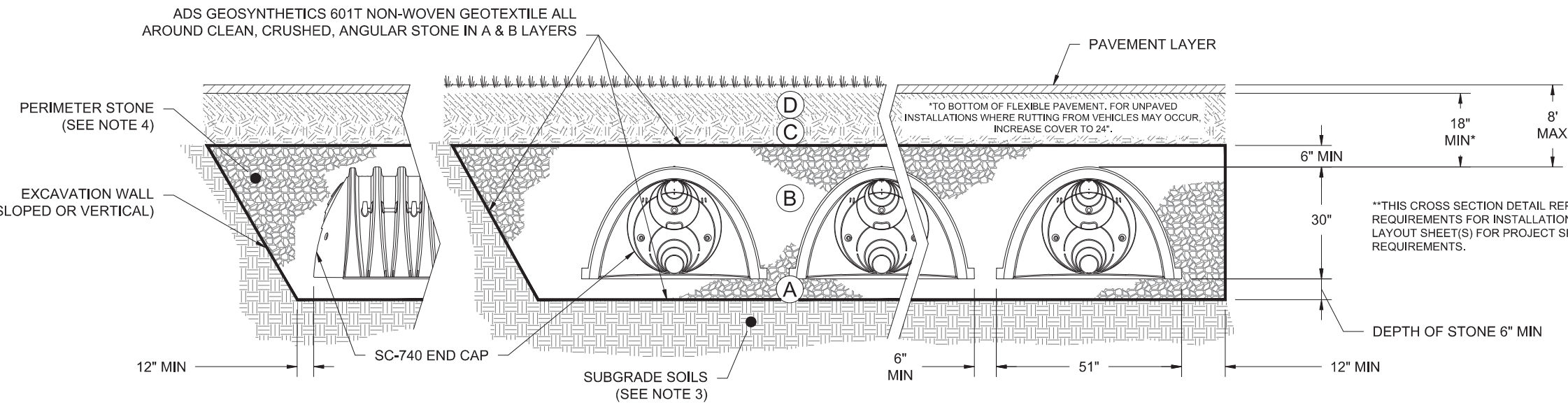
A008400 - 352

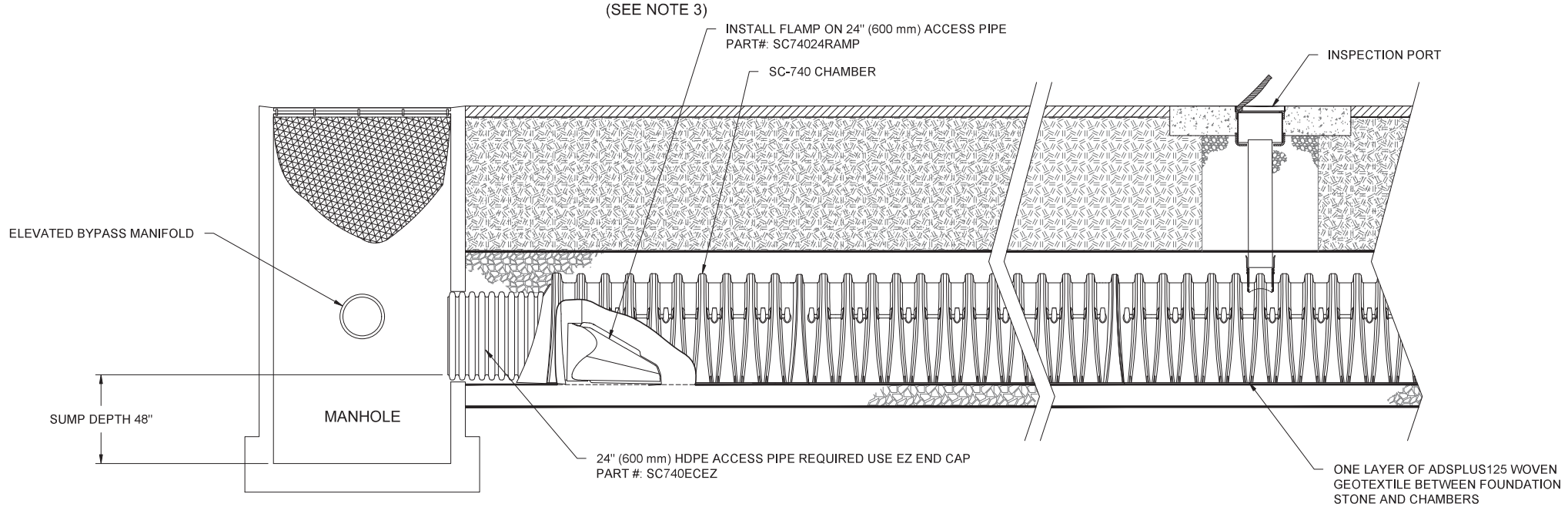
Proposal No. 608051 - 132406

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.





SC-740 ISOLATOR ROW PLUS DETAIL

NTS

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	###	391
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DRAINAGE & UTILITY DETAILS - 8

NOTES:
1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, A) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%, AND B) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

WQC/ACOE PLANS SHEET 43 OF 68

A00840 353

Proposal No. 608051 - 132406

608051_UT02(DRAINAGE-DETAILS).DWG Plotted on 20-Mar-2025 5:38 PM

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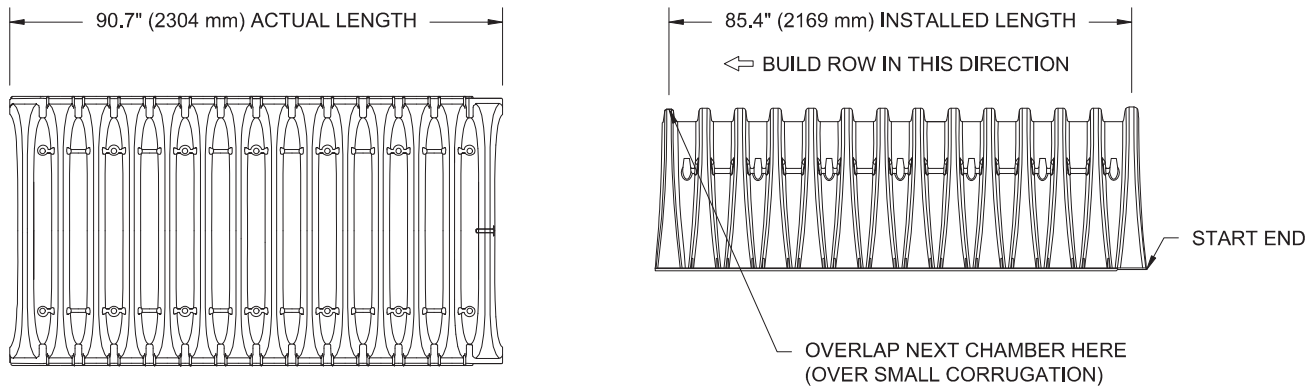
Proposal No. 608051 - 132406
A00840-354

SC-740 TECHNICAL SPECIFICATION

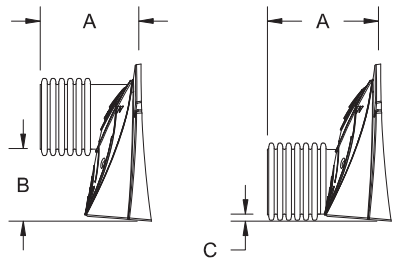
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740ECEZ*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740ECEZ ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740ECEZ THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

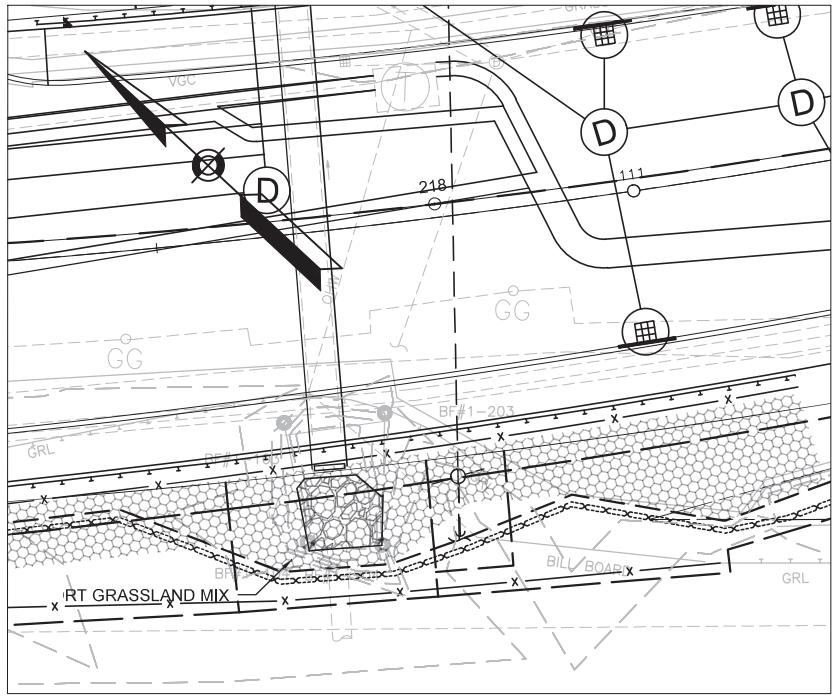
NOTE: ALL DIMENSIONS ARE NOMINAL

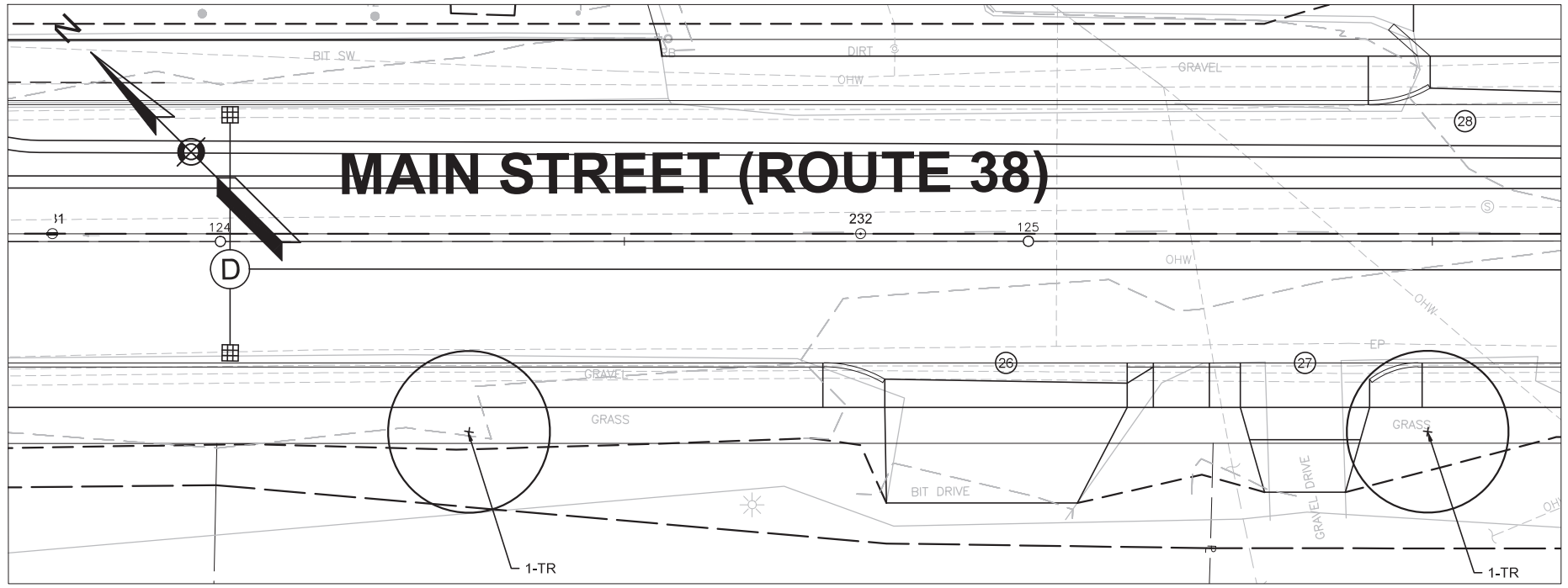
WQC/ACOE PLANS SHEET 44 OF 68

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	213	391
PROJECT FILE NO.	608051		

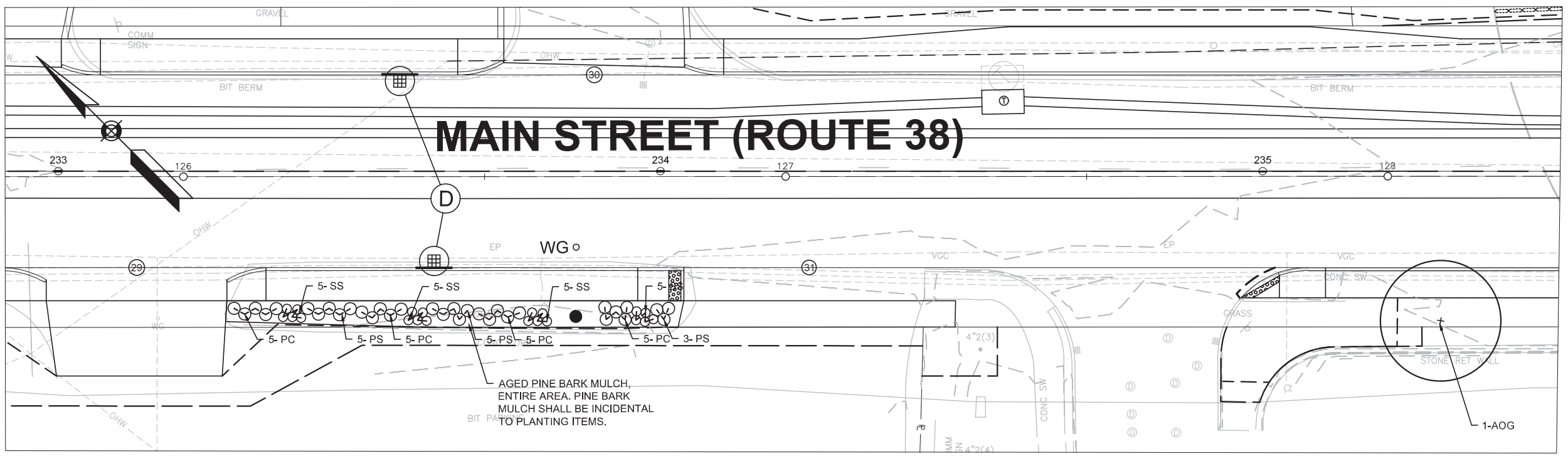
LANDSCAPING PLANS - 1





STATION 218 RT PLANTING PLAN

STATION 231 TO STATION 233 LT PLANTING PLAN



STATION 233 TO STATION 235 RT PLANTING PLAN

LEGEND

COMPOST BLANKET & PART SHADE ROADSIDE MIX

PLANTING BED WITH ORNAMENTAL GRASS, EVERGREENS AND PINE BARK MULCH

4" LOAM, COMPOST BLANKET AND SHORT GRASSLAND MIX

NOTE: ANY DISTURBED AREAS NOT DESIGNATED FOR NATIVE SEED MIX SHALL BE LOAM AND SEED

SEE LANDSCAPE PLANS - 3 FOR PLANTING, WATERING AND UPLAND NATIVE SEEDING NOTES.

0 10 20 30 40

SCALE: 1" = 20'

PLANT LIST - SHEET 1

KEY	QTY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING	ROOT
		DECIDUOUS TREES				
AOG	1	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	2-2.5" CAL		B&B
TR	2	TILIA AMERICANA 'REMOND'	REDMOND LINDEN	2-2.5" CAL		B&B
		ORNAMENTAL GRASSES				
PC	20	PANICUM VIRGATUM 'CLOUD NINE'	CLOUD NINE SWITCH GRASS		24" SP	#1 CONT
PS	13	PANICUM VIRGATUM 'SHENANDOAH'	SHENANDOAH SWITCH GRASS		24" SP	#1 CONT
SS	20	SCHIZACHYRIUM SCOPARIUM 'THE BLUES'	THE BLUES LITTLE BLUESTEM		18" SP	#1 CONT

WQC/ACOE PLANS SHEET 45 OF 68

NOTE: MASSDOT LANDSCAPE ARCHITECT SHALL BE ON SITE FOR ALL PLANTING.

608051_LD02 (LANDSCAPING PLANS).DWG Plotted on 3-Apr-2025 3:14 PM

Proposal No. 608051 - 132406

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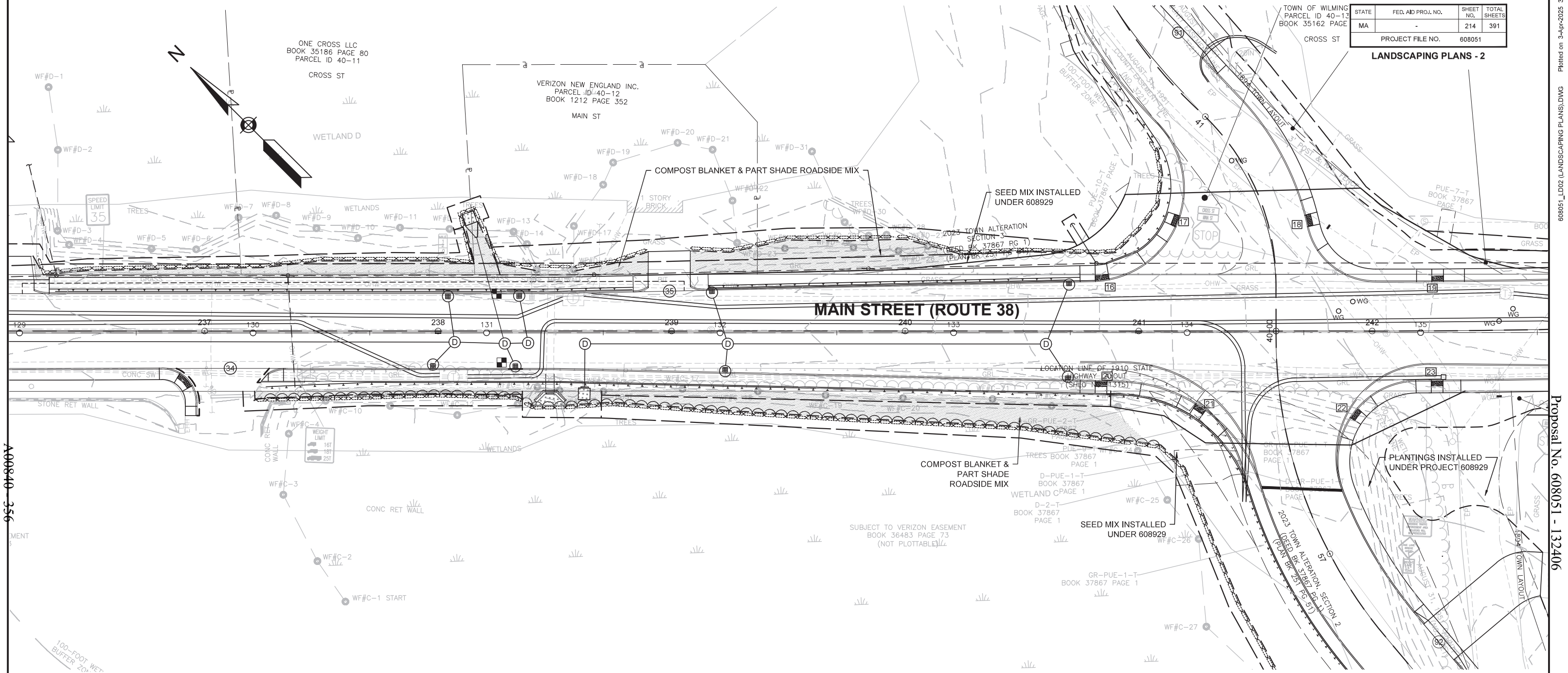
WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	214	391
PROJECT FILE NO.	608051		

LANDSCAPING PLANS - 2



STATION 237 TO STATION 241 PLANTING PLAN

0 20 50 100

SCALE: 1" = 40'

LEGEND

- COMPOST BLANKET & PART SHADE ROADSIDE MIX
- 4" LOAM, COMPOST BLANKET AND SHORT GRASSLAND MIX

NOTE: ANY DISTURBED AREAS NOT DESIGNATED FOR NATIVE SEED MIX SHALL BE LOAM AND SEED

- PLANTING BED WITH ORNAMENTAL GRASS, EVERGREENS AND PINE BARK MULCH

PLANTING NOTES

1. CONTRACTOR SHALL HAVE ALL SUBSURFACE UTILITIES MARKED PRIOR TO THE START OF WORK.
2. PLANT LOCATIONS ARE APPROXIMATE. PRIOR TO PLANTING, LOCATION OF ALL PLANT MATERIAL WILL BE APPROVED BY THE RESIDENT ENGINEER AND THE LANDSCAPE ARCHITECT.
3. ALL PLANT MATERIAL WILL HAVE TAGS INDICATING COMMON NAME, BOTANICAL NAME, CULTIVAR, & SIZE.
4. IMMEDIATELY AFTER ACCEPTANCE OF PLANTING, TAGS AND RIBBONS SHALL BE REMOVED.
5. ALL PLANTS WILL BE MULCHED PER PLANS AND SPECIFICATIONS.
6. ALL SHRUB AND PERENNIAL BEDS WILL BE WEEDED AND OTHERWISE NEATLY MAINTAINED FOR THE DURATION OF THE CONTRACT.
7. PLANTS AND PLANTING BEDS SHALL BE THOROUGHLY WATERED AS NECESSARY AND PER SPECIFICATIONS.

WATERING NOTES

1. IRRIGATION BAGS MAY BE USED FOR STREETSCAPE AND PARK PLANTINGS ONLY.
2. A SCHEDULE FOR FILLING AND REMOVAL SHALL BE SUBMITTED TO THE ENGINEER.
3. USE AND SCHEDULE MUST BE APPROVED BY THE MASSDOT LANDSCAPE ARCHITECT.
4. A MINIMUM OF 2 BAGS PER TREE SHALL BE USED. BAGS SHALL BE ATTACHED TO STAKES.
5. NO BAGS SHALL BE PLACED AROUND THE TREE TRUNK.
6. BAGS SHALL BE MAINTAINED FULL JUNE 1 - OCTOBER 1 OR AS APPROVED.
7. BAGS SHALL BE REMOVED AT THE END OF THE SEASON.

UPLAND NATIVE SEEDING NOTES

1. SEEDING SHALL BE BROADCAST METHOD ONLY (NOT HYDROSEED) UNLESS APPROVED OTHERWISE BY THE MASSDOT LANDSCAPE ARCHITECT.
2. SEEDING AND SUBMITTALS SHALL BE PER THE SPECIAL PROVISIONS.
3. SUBMITTALS FOR SEED MIXES SHALL BE APPROVED BY THE ENGINEER AND LANDSCAPE ARCHITECT PRIOR TO SEED APPLICATION.
4. SITE PREPARATION SHALL BE PER SPECIFICATIONS AND APPROVED BY THE ENGINEER PRIOR TO SEEDING.
5. WHEN SEEDING OUT OF SEASON APPLICATION RATE SHALL BE INCREASED BY 50%.

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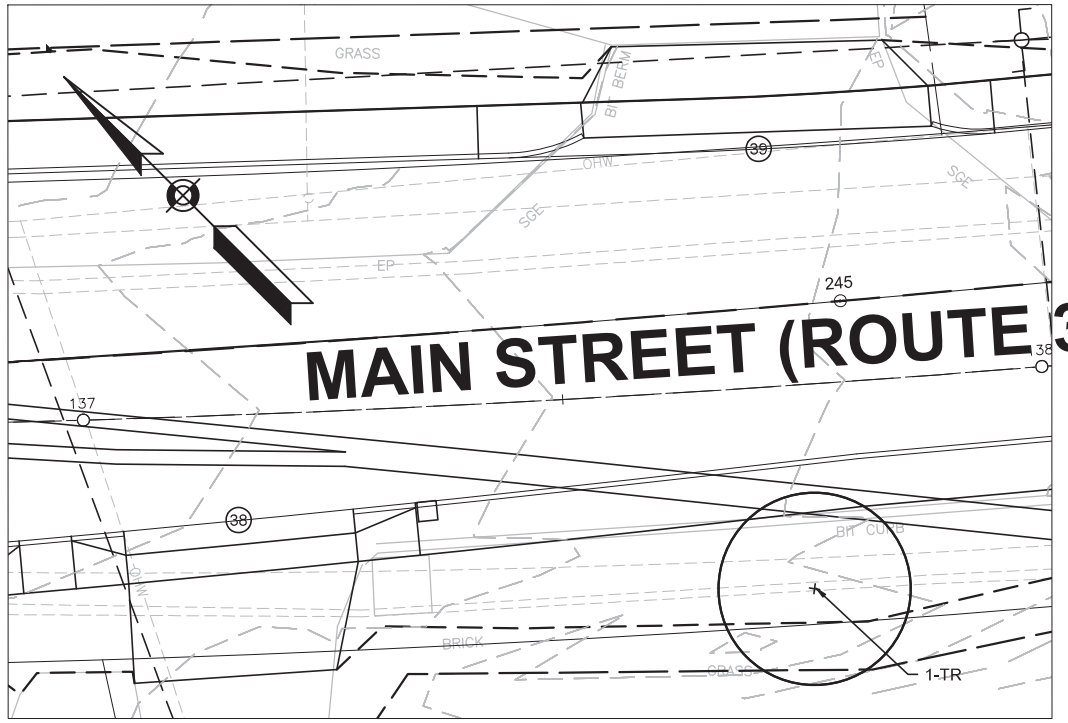
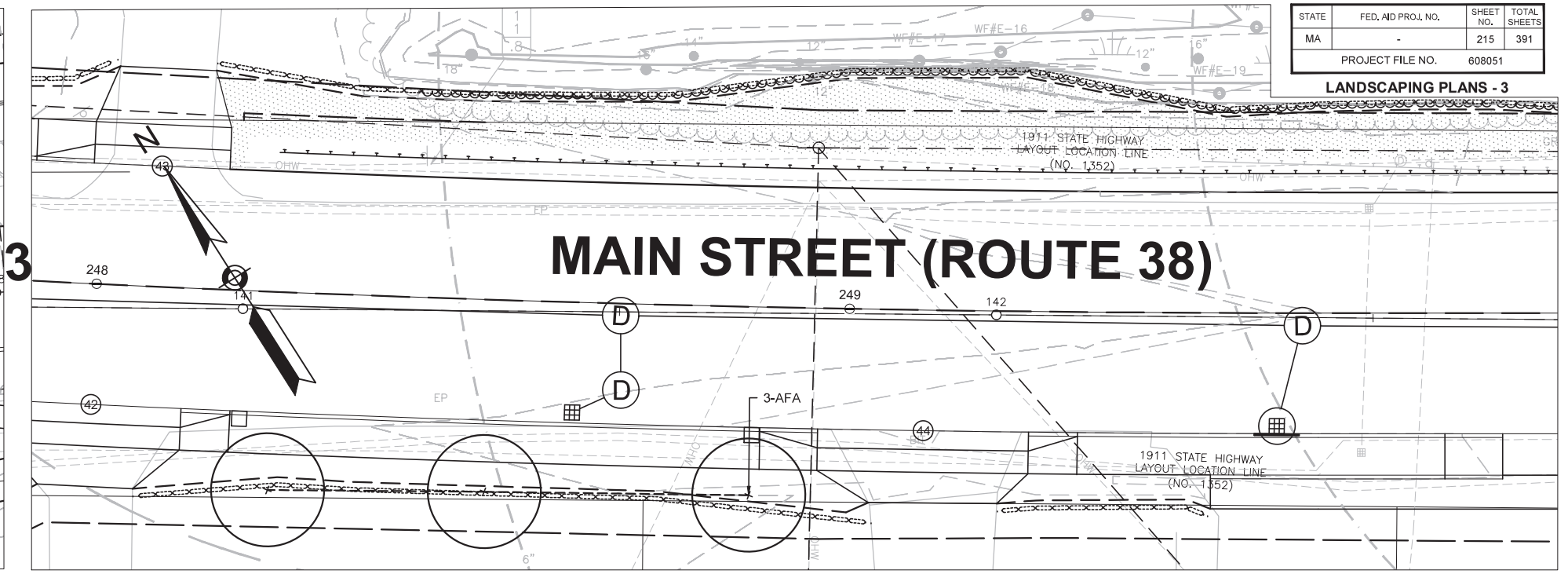
Proposal No. 608051 - 132406
608051_LD02 (LANDSCAPING PLANS).DWG Plotted on 3-Apr-2025 3:14 PM

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	215	391
PROJECT FILE NO.	608051		

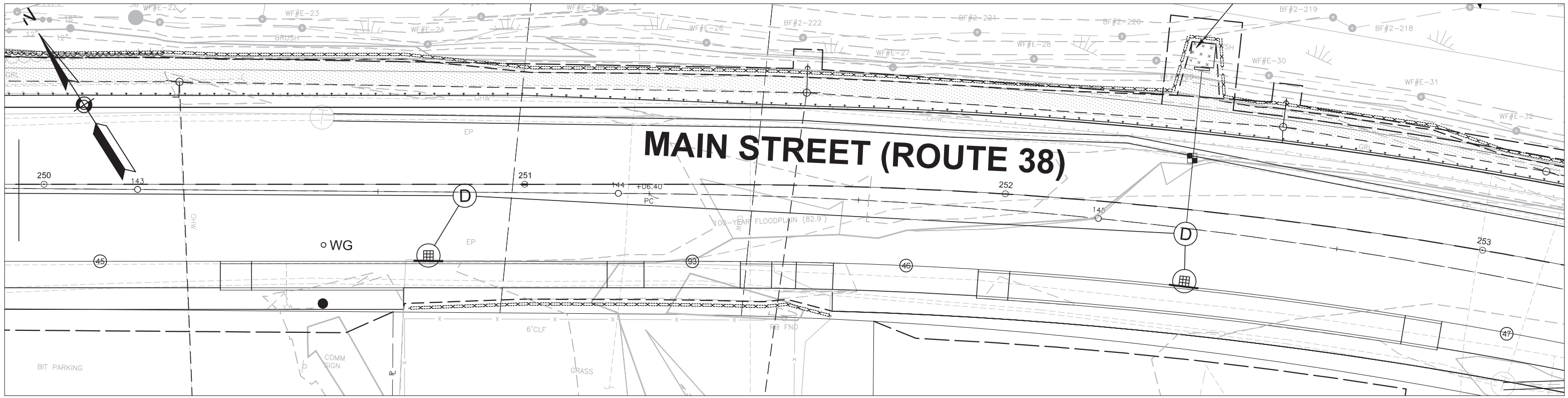
LANDSCAPING PLANS - 3



STATION 244 TO STATION 245 RT PLANTING PLAN



STATION 248 TO STATION 249 RT PLANTING PLAN



STATION 250 TO STATION 253 LT PLANTING PLAN

0 10 20 30 40
SCALE: 1" = 20'

LEGEND

- COMPOST BLANKET & PART SHADE ROADSIDE MIX
- 4" LOAM, COMPOST BLANKET AND SHORT GRASSLAND MIX
- PLANTING BED WITH ORNAMENTAL GRASS, EVERGREENS AND PINE BARK MULCH

NOTE: ANY DISTURBED AREAS NOT DESIGNATED FOR NATIVE SEED MIX SHALL BE LOAM AND SEED

SEE LANDSCAPE PLANS - 3 FOR PLANTING, WATERING AND UPLAND NATIVE SEEDING NOTES.

PLANT LIST - SHEET 3

KEY	QTY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT
		DECIDUOUS TREES			
TR	1	TILIA AMERICANA 'REMOND'	REDMOND LINDEN	2-2.5" CAL	B&B
AFA	3	ACER X FREEMANII 'ARMSTRONG'	ARMSTRONG MAPLE	2-2.5" CAL	B&B

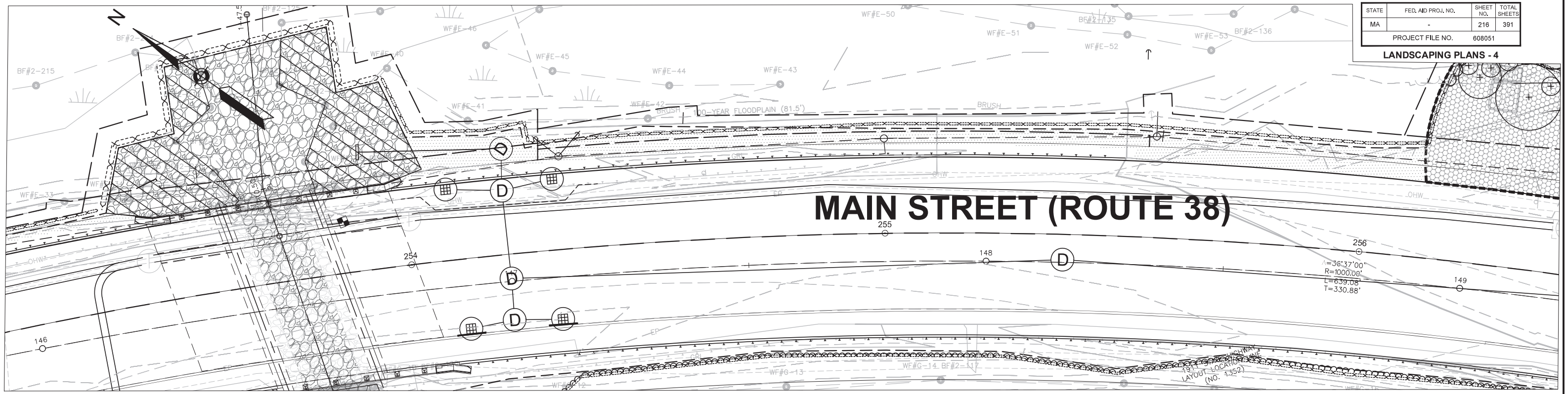
NOTE: MASSDOT LANDSCAPE ARCHITECT SHALL BE ON SITE FOR ALL PLANTING.

A00840 - 357
Proposal No. 608051 - 132406
608051_LD02 (LANDSCAPING PLANS).DWG Plotted on 3-Apr-2025 3:15 PM

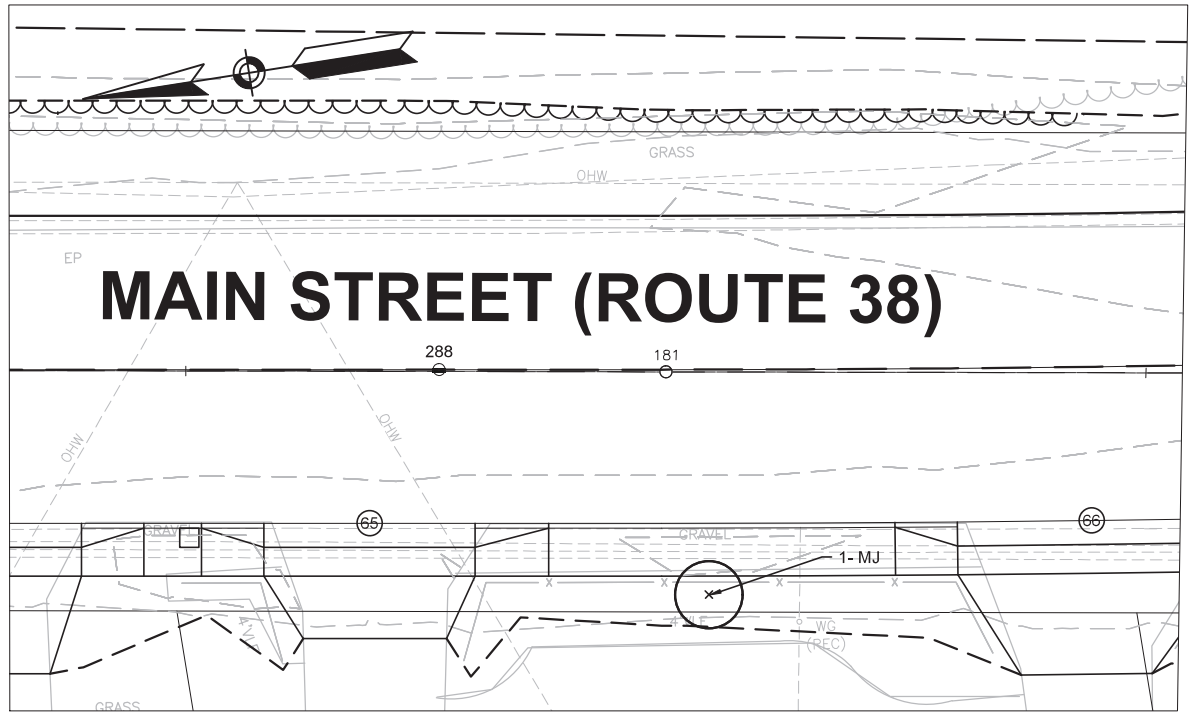
WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	216	391
PROJECT FILE NO.	608051		

LANDSCAPING PLANS - 4



STATION 254 TO STATION 256 LT PLANTING PLAN



STATION 288 PLANTING PLAN

LEGEND

COMPOST BLANKET & PART SHADE ROADSIDE MIX

PLANTING BED WITH ORNAMENTAL GRASS, EVERGREENS AND PINE BARK MULCH

4" LOAM, COMPOST BLANKET AND SHORT GRASSLAND MIX

NOTE: ANY DISTURBED AREAS NOT DESIGNATED FOR NATIVE SEED MIX SHALL BE LOAM AND SEED

SEE LANDSCAPE PLANS - 3 FOR PLANTING, WATERING AND UPLAND NATIVE SEEDING NOTES.

0 10 20 30 40
SCALE: 1" = 20'

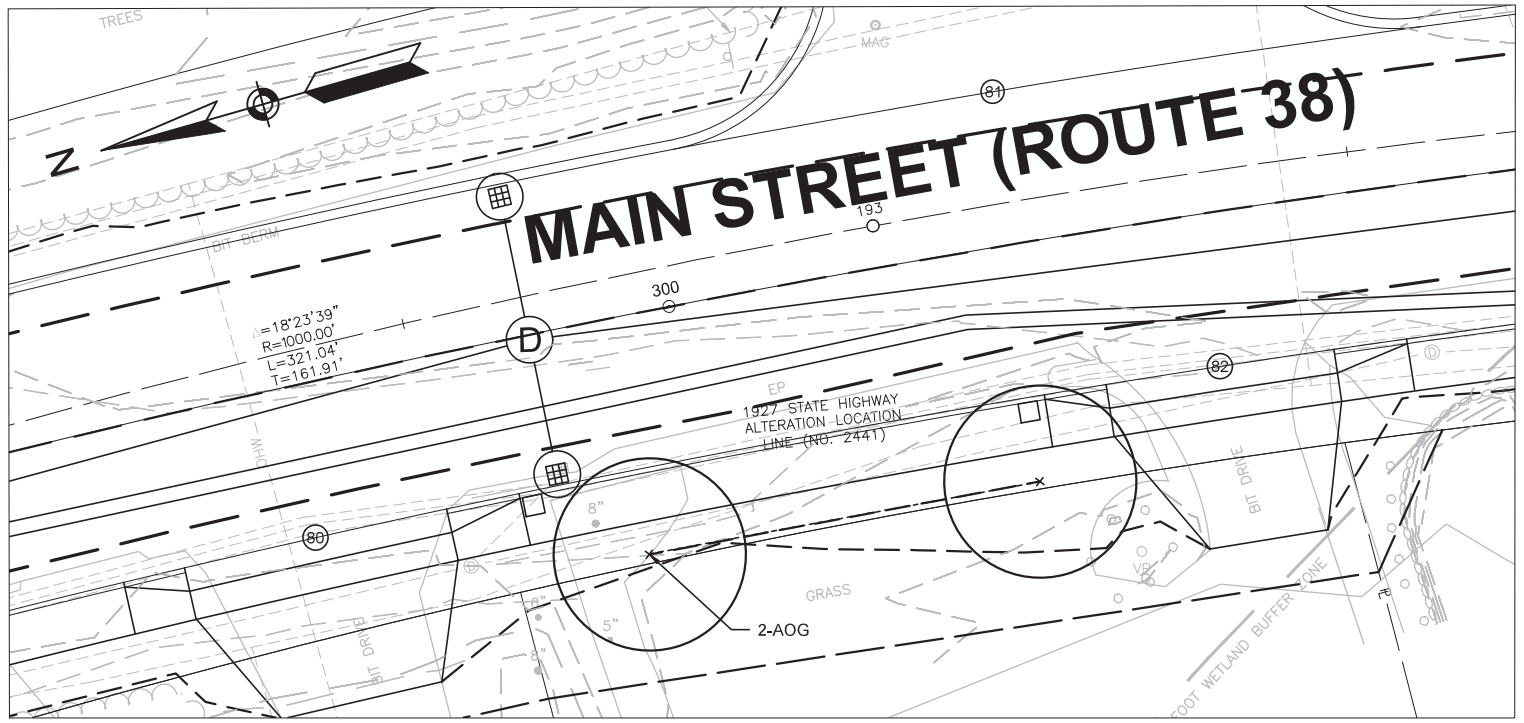
PLANT LIST - SHEET 4

KEY	QTY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT
		DECIDUOUS TREES			
MJ	1	MALUS 'JFS KW214MX PP 31076	IVORY SPEAR CRABAPPLE	1.5-2" CAL	B&B

NOTE: MASSDOT LANDSCAPE ARCHITECT SHALL BE ON SITE FOR ALL PLANTING.

WQC/ACOE PLANS SHEET 48 OF 68

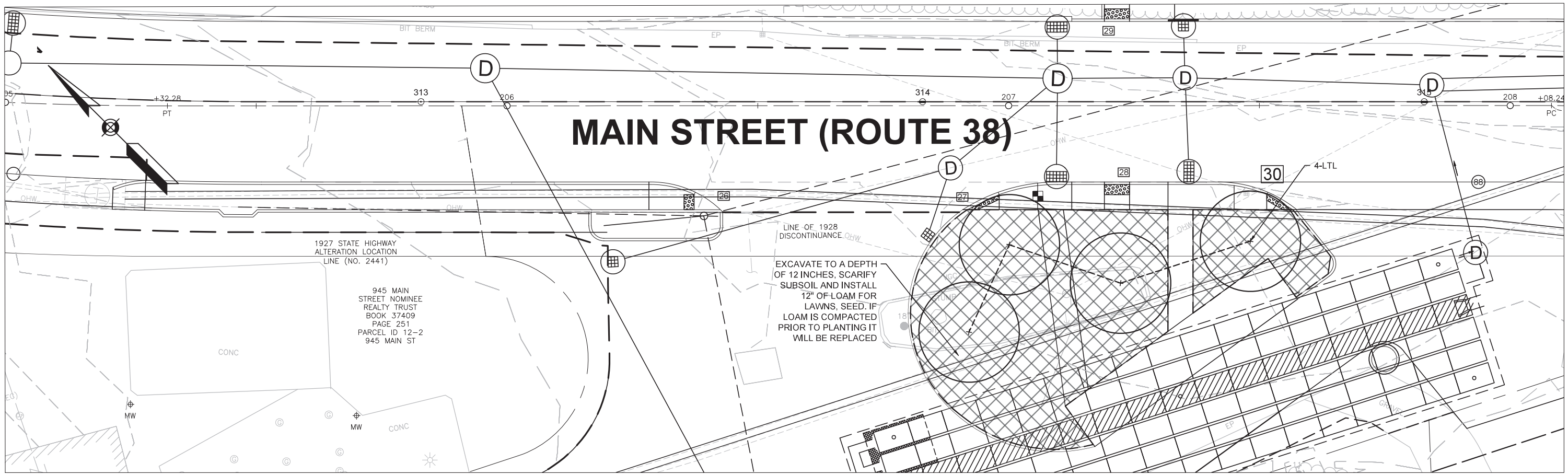
A008440 - 358
Proposal No. 608051 - 132406
608051_LD02 (LANDSCAPING PLANS).DWG Plotted on 3-Apr-2025 3:15 PM



STATION 300 PLANTING PLAN

PLANT LIST - SHEET 5					
KEY	QTY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT
		DECIDUOUS TREES			
AOG	2	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	2-2.5" CAL	B&B
LTL	4	LIRODENDRON TULIPIFERA	TULIP TREE	2-2.5" CAL	B&B

NOTE: MASSDOT LANDSCAPE ARCHITECT SHALL BE ON SITE FOR ALL PLANTING.



LEGEND

COMPOST BLANKET & PART SHADE ROADSIDE MIX

4" LOAM, COMPOST BLANKET AND SHORT GRASSLAND MIX

NOTE: ANY DISTURBED AREAS NOT DESIGNATED FOR NATIVE SEED MIX SHALL BE LOAM AND SEED

SEE LANDSCAPE PLANS - 3 FOR PLANTING, WATERING AND UPLAND NATIVE SEEDING NOTES.

PLANTING BED WITH ORNAMENTAL GRASS, EVERGREENS AND PINE BARK MULCH

STATION 314 TO 315 PLANTING PLAN

0 10 20 30 40

SCALE: 1" = 20'

WQC/ACOE PLANS SHEET 49 OF 68

608051_LD02 (LANDSCAPING PLANS).DWG Plotted on 3-Apr-2025 3:16 PM

Proposal No. 608051 - 132406

LEGEND

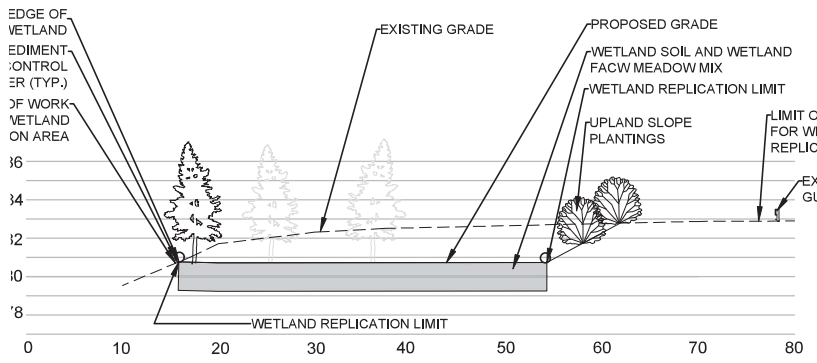
- LIMIT OF WORK
- SEDIMENT CONTROL BARRIER
- 595 — PROPOSED CONTOUR
- 595 — EXISTING CONTOUR
- 124.694 — PROPOSED SPOT GRADE
- 124.694 — EXISTING SPOT GRADE
- 4" LOAM AND COMPOST BLANKET & SHORT GRASSLAND MIX
- WETLAND SOIL AND WETLAND FACW MEADOW MIX
- COMPOST BLANKET & PART SHADE ROADSIDE MIX
- PROPOSED SHRUB
- PROPOSED TREE
- PROPOSED SHRUB WITHIN WETLAND REPLICATION
- PROPOSED TREE WITHIN WETLAND REPLICATION

FACW MEADOW MIX = 4,400 S.F.

NATIVE SHORT GRASSLAND MIX = 5,807 S.F.

NOTES:

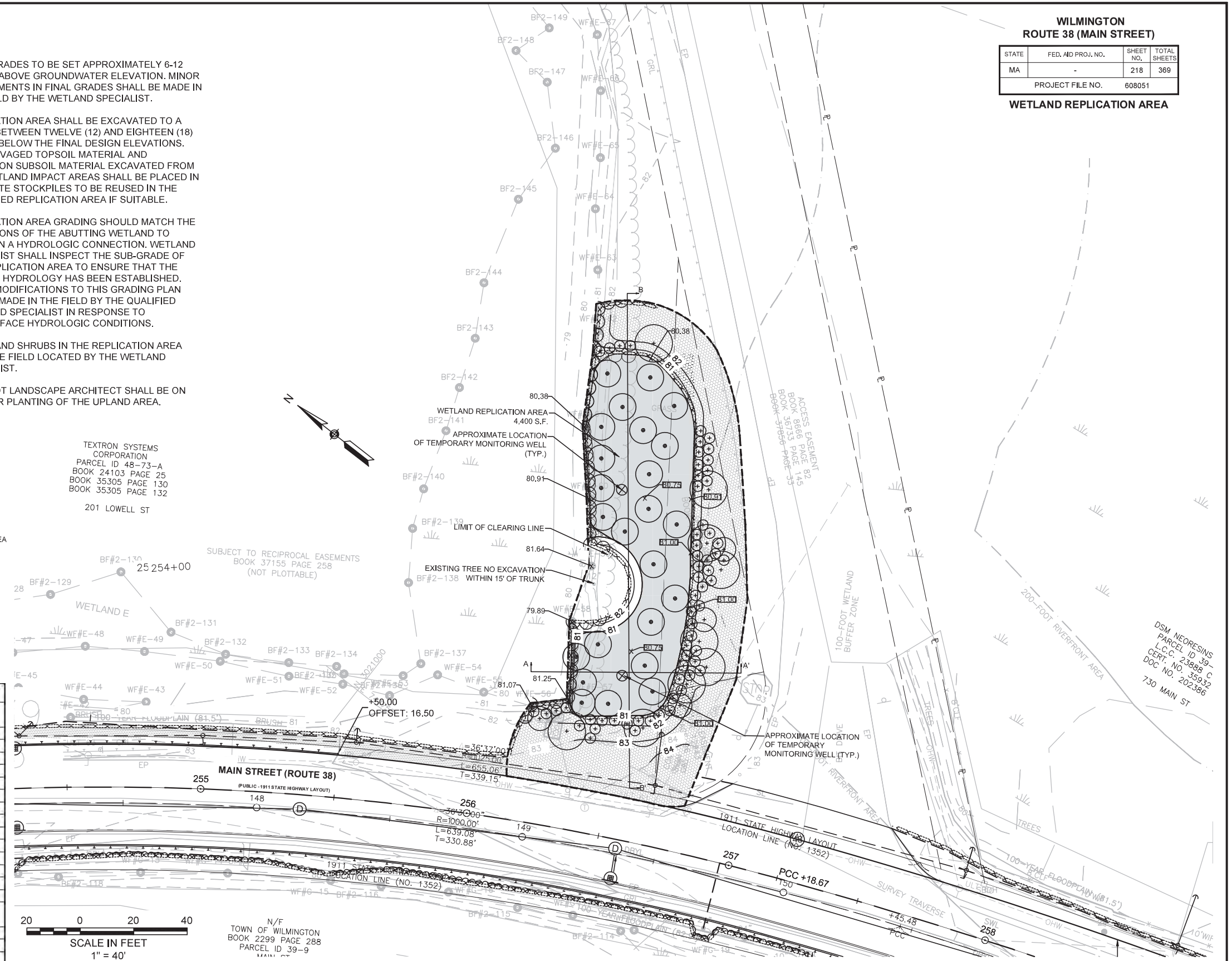
1. FINAL GRADES TO BE SET APPROXIMATELY 6-12 INCHES ABOVE GROUNDWATER ELEVATION. MINOR ADJUSTMENTS IN FINAL GRADES SHALL BE MADE IN THE FIELD BY THE WETLAND SPECIALIST.
2. REPLICATION AREA SHALL BE EXCAVATED TO A DEPTH BETWEEN TWELVE (12) AND EIGHTEEN (18) INCHES BELOW THE FINAL DESIGN ELEVATIONS. THE SALVAGED TOPSOIL MATERIAL AND B-HORIZON SUBSOIL MATERIAL EXCAVATED FROM THE WETLAND IMPACT AREAS SHALL BE PLACED IN SEPARATE STOCKPILES TO BE REUSED IN THE PROPOSED REPLICATION AREA IF SUITABLE.
3. REPLICATION AREA GRADING SHOULD MATCH THE ELEVATIONS OF THE ABUTTING WETLAND TO MAINTAIN A HYDROLOGIC CONNECTION. WETLAND SPECIALIST SHALL INSPECT THE SUB-GRADE OF THE REPLICATION AREA TO ENSURE THAT THE PROPER HYDROLOGY HAS BEEN ESTABLISHED. MINOR MODIFICATIONS TO THIS GRADING PLAN MAY BE MADE IN THE FIELD BY THE QUALIFIED WETLAND SPECIALIST IN RESPONSE TO SUBSURFACE HYDROLOGIC CONDITIONS.
4. TREES AND SHRUBS IN THE REPLICATION AREA SHALL BE FIELD LOCATED BY THE WETLAND SPECIALIST.
5. MASSDOT LANDSCAPE ARCHITECT SHALL BE ON SITE FOR PLANTING OF THE UPLAND AREA.

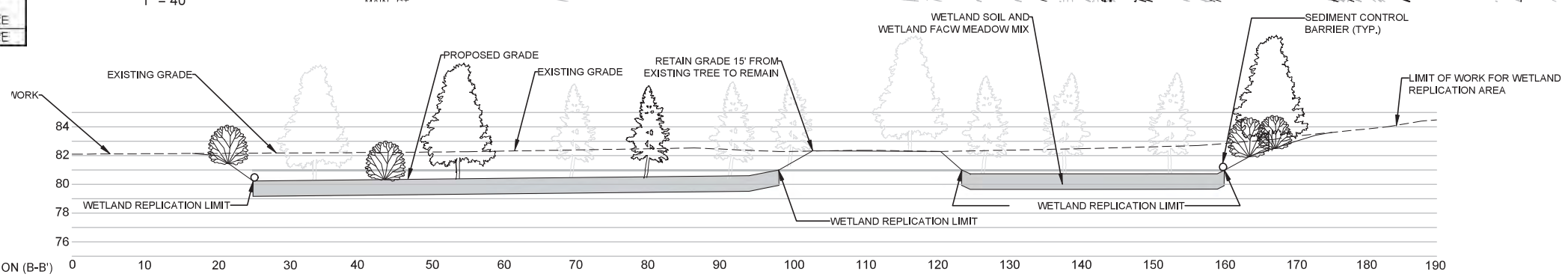


SECTION (A-A')
(HOR. SCALE 1" = 20' , VERT. SCALE 1" = 10')

PLANT LIST - WETLAND REPLICATION AND ASSOCIATED UPLAND

KEY	QTY	WETLAND STATUS	BOTANICAL NAME	COMMON NAME	PLANT SIZE
DECIDUOUS TREES IN UPLAND AREA					
AC	4	FAC	AMELANCHIER CANADENSIS	SERVICEBERRY	4-5' HT
LT	4	FACU	LIRODENDRON TULIPIFERA	TULIP TREE	1-1.5" CAL
QC	5	FACU	QUERCUS COCCINEA	SCARLET OAK	1-1.5" CAL
DECIDUOUS TREES IN REPLICATION AREA- 24 TOTAL					
AR	2	FAC	ACER RUBRUM	RED MAPLE	4-6' HT
AS	10	FACW	ACER SACCHARINUM	SILVER MAPLE	4-6' HT
QB	4	FACW	QUERCUS BICOLOR	SWAMP WHITE OAK	4-6' HT
SN	8	OBL	SALIX NIGRA	BLACK WILLOW	4-6' HT
DECIDUOUS SHRUBS IN UPLAND AREA					
CP	15	UPL	COMPTONIA PEREGRINA	SWEETFERN	1 GALLON
CR	15	FAC	CORNUS RACEMOSA	GRAY TWIG DOGWOOD	2-3' HT
RA	15	UPL	RHUS AROMATICA (NO CULTIVARS)	FRAGRANT SUMAC	2-3' HT
VD	15	FAC	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	2-3' HT
HERBACEOUS					
-	-	-	WETLAND =ACW MEADOW MIX		20 LBS PER ACRE
-	-	-	SHORT GRASSLAND MIX		20 LBS PER ACRE

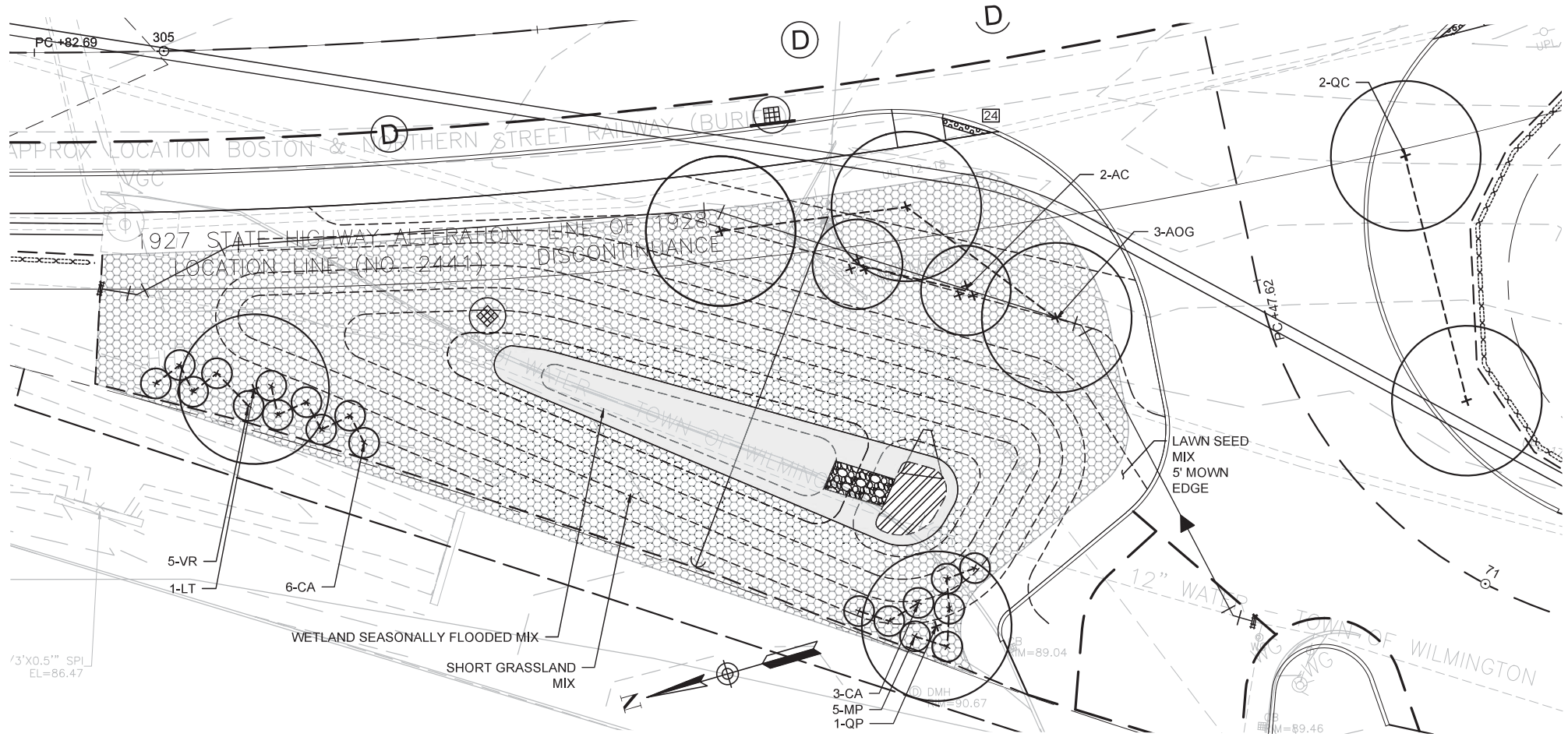




SECTION (B-B')
(HOR. SCALE 1" = 20' , VERT. SCALE 1" = 10')

A00840 - 360

Proposal No. 608051 - 132406
608051_EV(P-REPLICATION).DWG Plotted on 12-Mar-2025 3:30 PM



A00840 - 361

LEGEND

4" LOAM, COMPOST BLANKET AND SHORT GRASSLAND MIX

COMPOST BLANKET AND WETLAND SEASONALLY FLOODED MIX

INFILTRATION BASIN AT OLD MAIN STREET - PLANTING DESIGN PLAN

PLANT LIST - INFILTRATION BASIN PLAN

KEY	QTY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT
		DECIDUOUS TREES			
AOG	3	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	2-2.5" CAL	B&B
LT	1	LIRODENDRON TULIPIFERA	TULIP TREE	1-1.5" CAL	B&B
QC	2	QUERCUS COCCINEA	SCARLET OAK	2-2.5" CAL	B&B
QP	1	QUERCUS PALUSTIS	PIN OAK	1-1.5" CAL	B&B
AC	2	AMELANCHIER CANADENSIS	SERVICEBERRY	4-5' MULTI-STEMMED	B&B
		DECIDUOUS SHRUBS			
CA	9	CORNUS SERICEA	REDTWIG DOGWOOD	2-3' HT	#3 CONT.
MP	5	MYRICA PENSYLVANICA	NORTHERN BAYBERRY	2-3' HT	#3 CONT.
VR	5	VIBURNUM RECOGNITUM	NORTHERN ARROWWOOD	2-3' HT	#3 CONT.

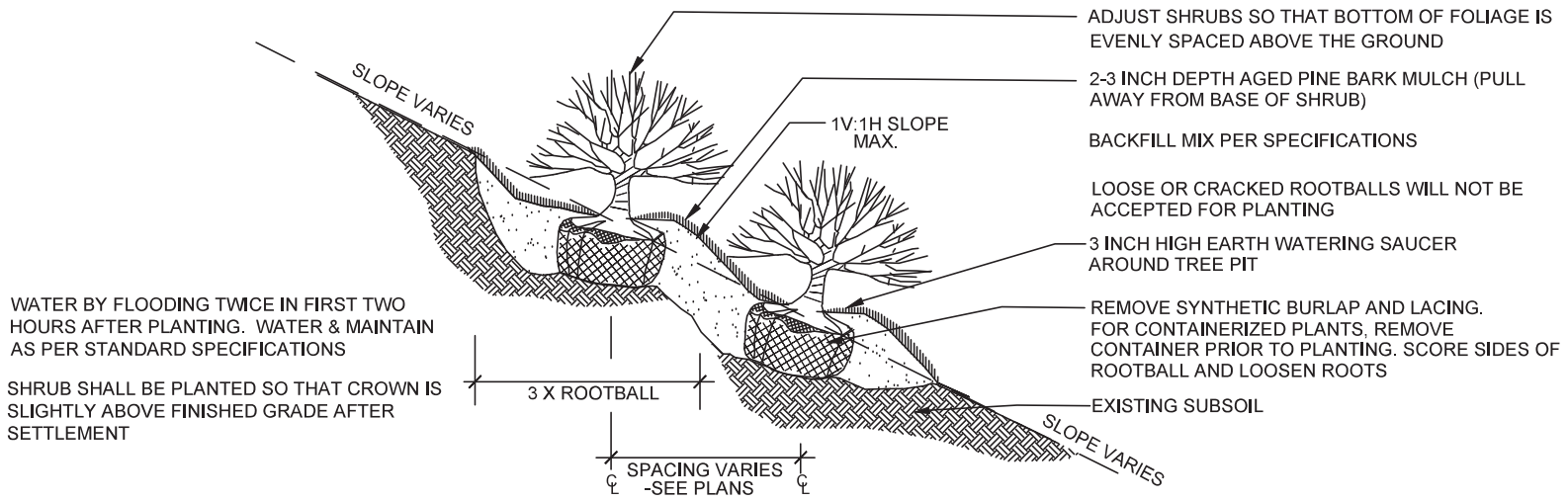
PLANT LIST - UPLAND PROJECT TOTAL

KEY	QTY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING	ROOT
		DECIDUOUS TREES				
AFA	3	ACER X FREEMANII 'ARMSTRONG'	ARMSTRONG MAPLE	2-2.5" CAL		B&B
AC	2	AMELANCHIER CANADENSIS	SERVICEBERRY	4-5' MULTI-STEMMED		B&B
AOG	6	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	2-2.5" CAL		B&B
LT	1	LIRODENDRON TULIPIFERA	TULIP TREE	1-1.5" CAL		B&B
LTL	4	LIRODENDRON TULIPIFERA	TULIP TREE	2-2.5" CAL		B&B
QC	2	QUERCUS COCCINEA	SCARLET OAK	2-2.5" CAL		B&B
QP	1	QUERCUS PALUSTIS	PIN OAK	1-1.5" CAL	B&B	
TR	3	TILIA AMERICANA 'REDMOND'	REDMOND LINDEN	2-2.5" CAL		B&B
MJ	1	MALUS 'JFS KW214MX' PP 31076	IVORY SPEAR CRABAPPLE	1.5-2" CAL		B&B
		DECIDUOUS SHRUBS				
CA	9	CORNUS SERICEA	REDTWIG DOGWOOD	2-3' HT		#3 CONT.
MP	5	MYRICA PENSYLVANICA	NORTHERN BAYBERRY	2-3' HT		#3 CONT.
VR	5	VIBURNUM RECOGNITUM	NORTHERN ARROWWOOD	2-3' HT		#3 CONT.
		ORNAMENTAL GRASSES				
PC	20	PANICUM VIRGATUM 'CLOUD NINE'	CLOUD NINE SWITCH GRASS		24" SP	#1 CONT.
PS	13	PANICUM VIRGATUM 'SHENANDOAH'	SHENANDOAH SWITCH GRASS		24" SP	#1 CONT.
SS	20	SCHIZACHYRIUM SCOPARIUM 'THE BLUES'	THE BLUES LITTLE BLUESTEM		18" SP	#1 CONT.

0 10 20 30 40

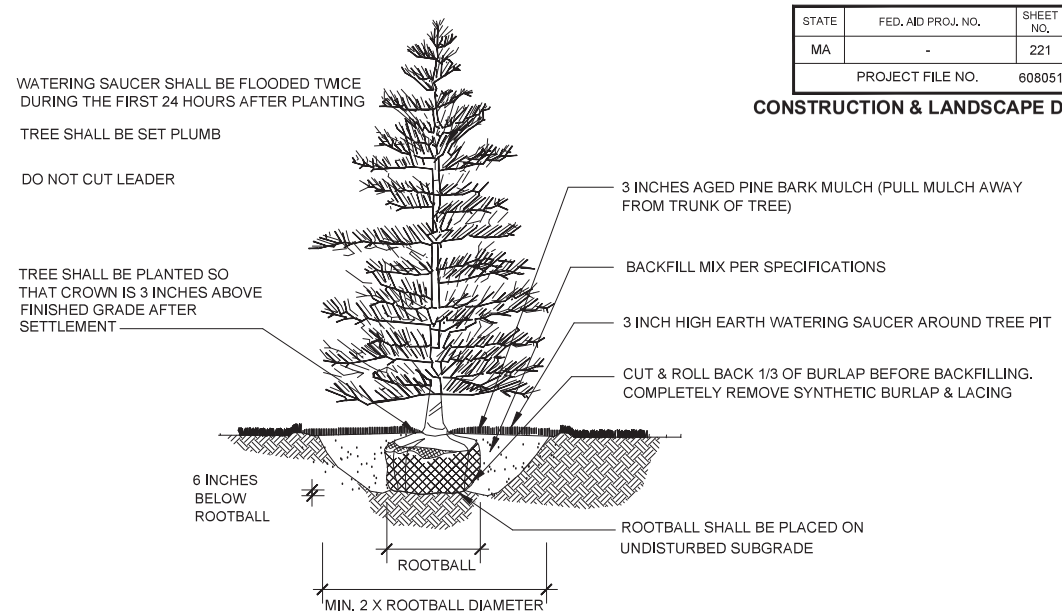
SCALE: 1" = 20'

Plotted on 3-Apr-2025 2:08 PM
608051_LD01(LANDSCAPE DETAILS).DWG
Proposal No. 608051 - 132406



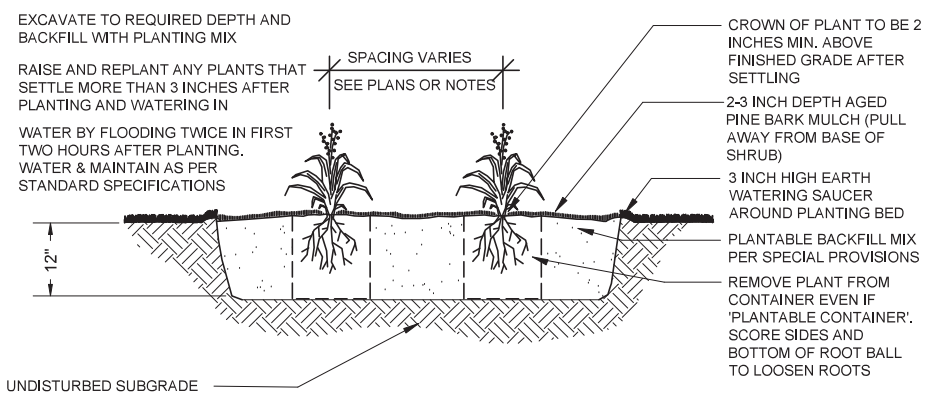
1 CONTAINERIZED SHRUB PLANTING (SLOPE) DETAIL

NOT TO SCALE



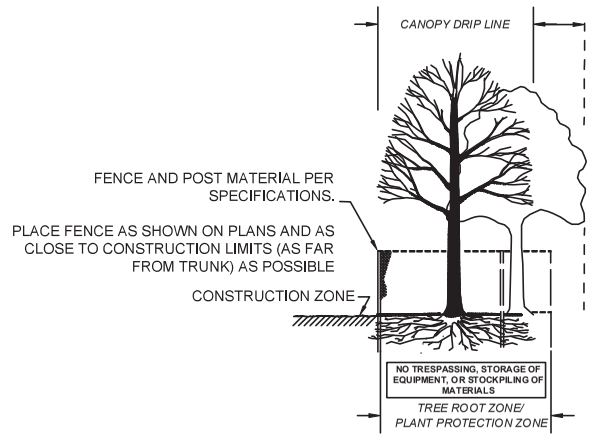
2 EVERGREEN TREE PLANTING

NOT TO SCALE

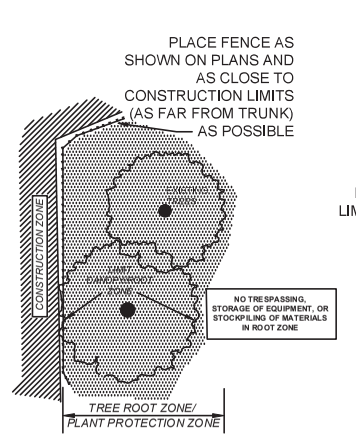


3 ORNAMENTAL GRASS PLANTING

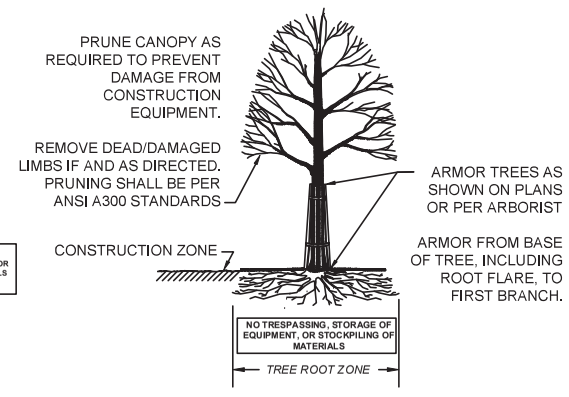
NOT TO SCALE



SECTION - FENCE PROTECTION OF ROOT ZONE



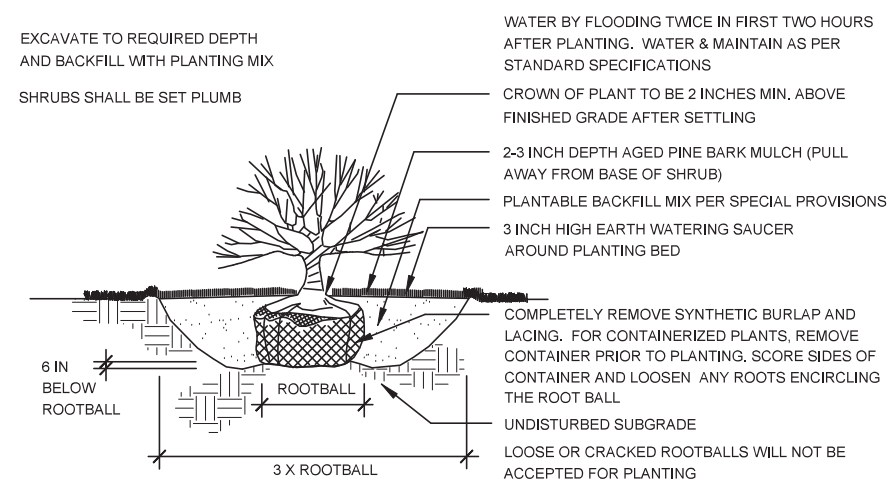
PLAN VIEW - FENCE PROTECTION OF ROOT ZONE



SECTION - TRUNK ARMORING & PRUNING

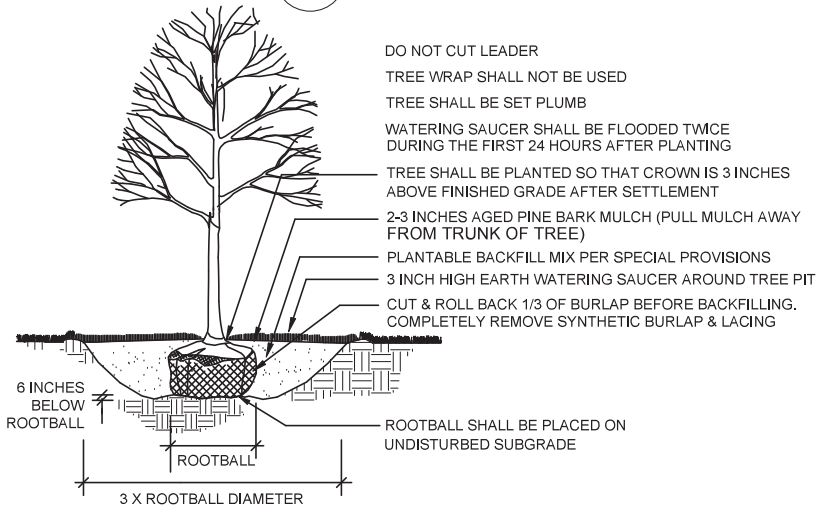
4 TREE PROTECTION DETAILS

NOT TO SCALE



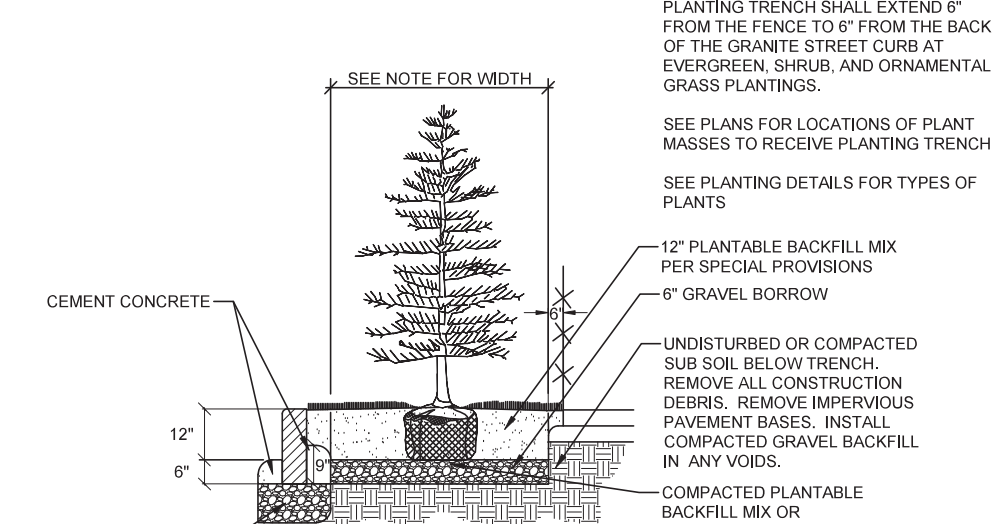
5 SHRUB PLANTING

NOT TO SCALE



6 TREE PLANTING

NOT TO SCALE



NOTE:
PLANTING TRENCH SHALL EXTEND 6" FROM THE FENCE TO 6" FROM THE BACK OF THE GRANITE STREET CURB AT EVERGREEN, SHRUB, AND ORNAMENTAL GRASS PLANTINGS.

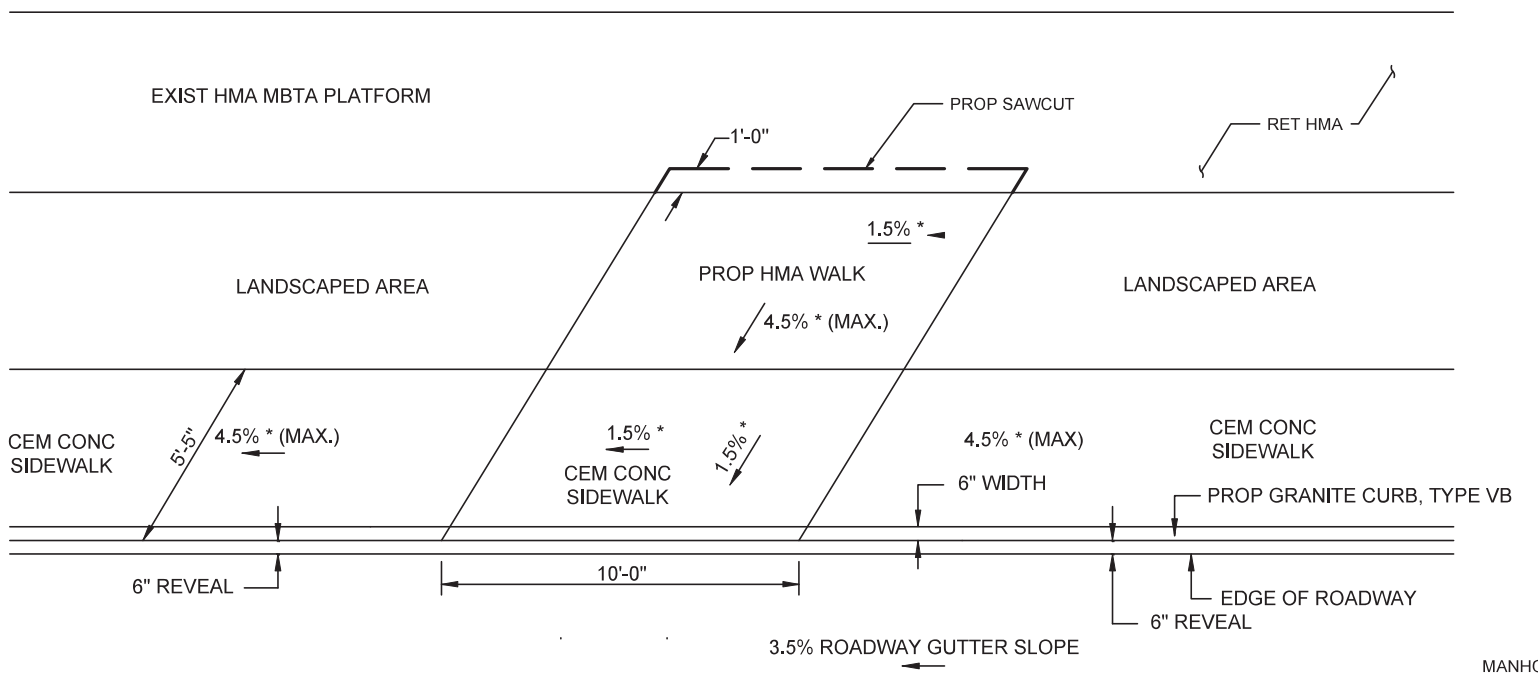
SEE PLANS FOR LOCATIONS OF PLANT MASSES TO RECEIVE PLANTING TRENCH

SEE PLANTING DETAILS FOR TYPES OF PLANTS

7 PLANTING TRENCH

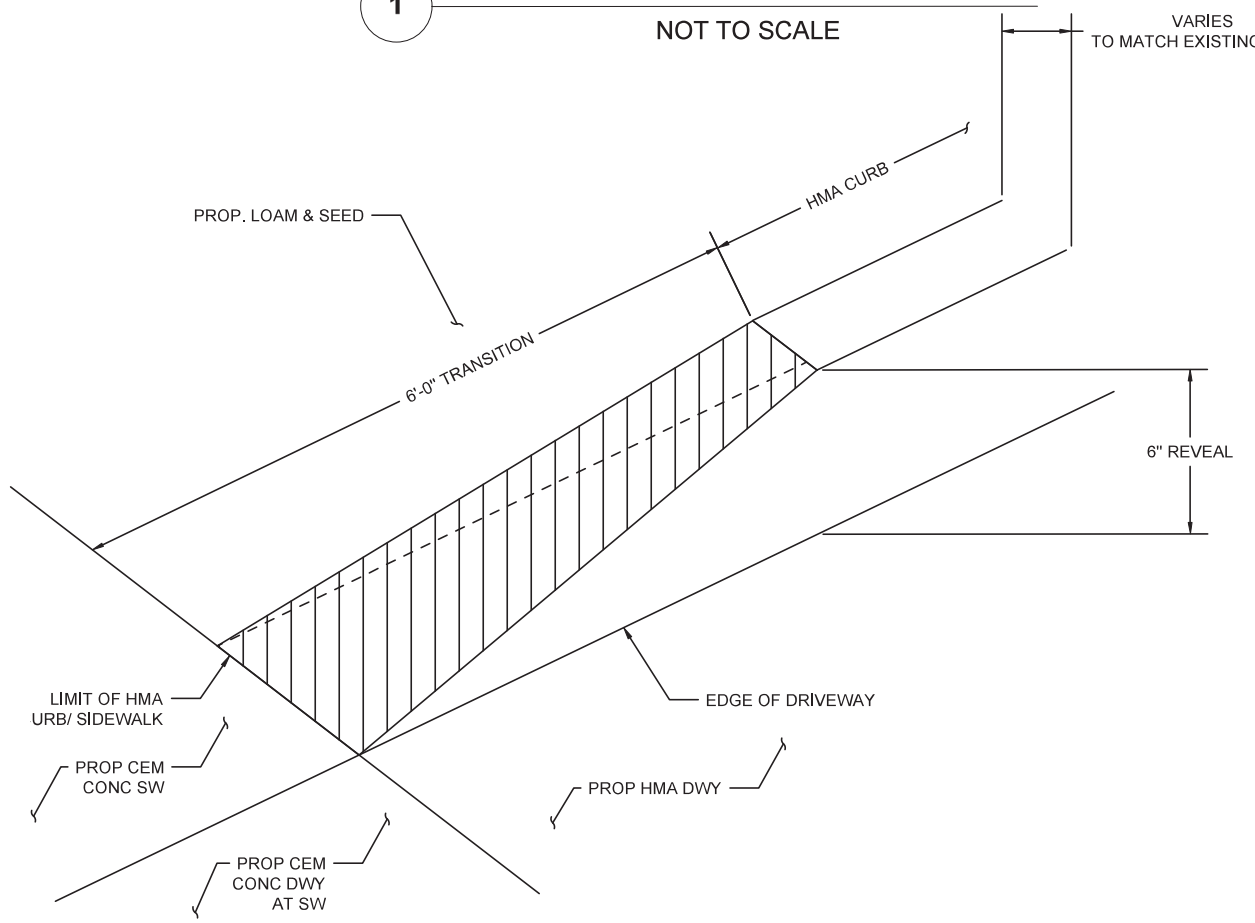
NOT TO SCALE

608051_HD11(CONSTRUCTION DETAILS).DWG Plotted on 12-Mar-2025 3:30 PM
Proposal No. 608051 - 132406
A00840 - 362

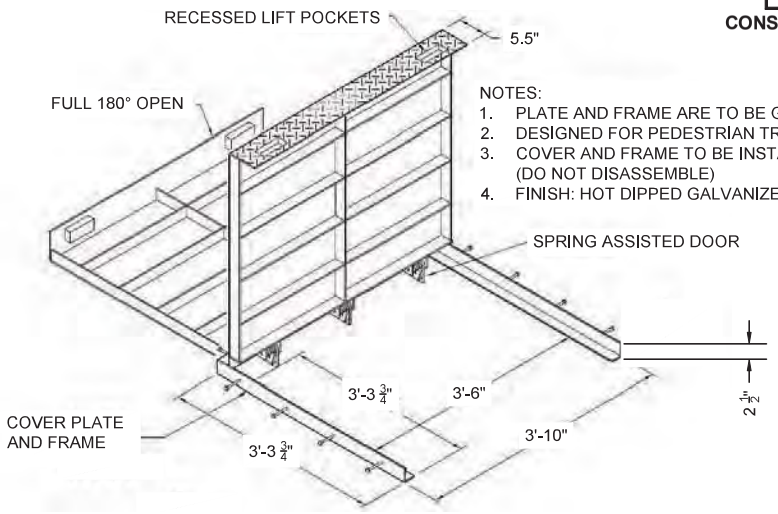


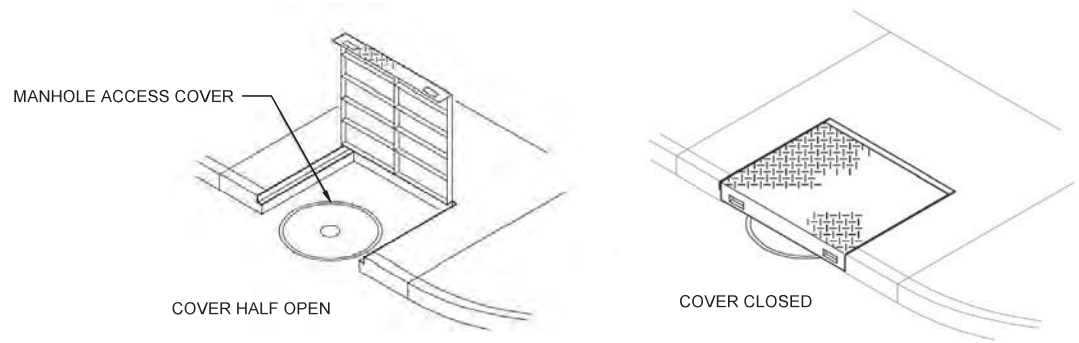
NOTES:
* CONSTRUCTION TOLERANCE ± 0.5%
- CONTRACTOR IS ULTIMATELY RESPONSIBLE FOR CONSTRUCTING RAMPS COMPLIANT WITH ADA/AAB RULES, REGULATIONS AND STANDARDS. CONTRACTOR SHALL VERIFY RAMPS ARE ADA/AAB COMPLIANT BEFORE POURING CEMENT CONCRETE.

1 HMA WALKWAY TO MBTA PLATFORM
NOT TO SCALE

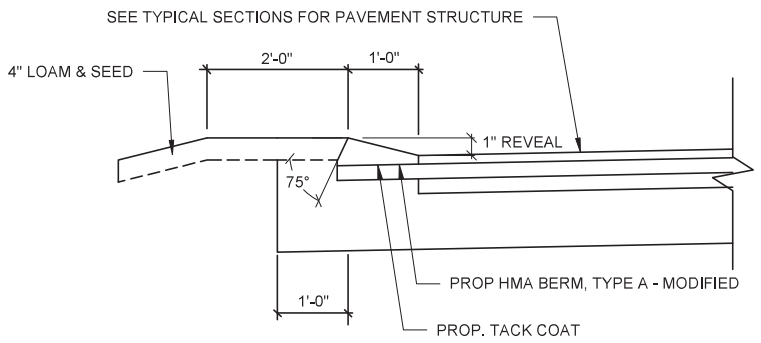


3 HMA CURB TRANSITION TO BACK OF SIDEWALK
NOT TO SCALE

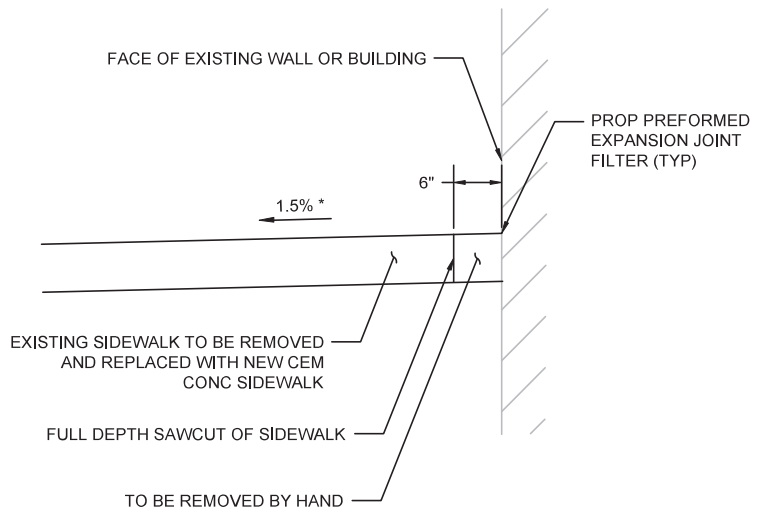




2 CURB COVER AND FRAME
NOT TO SCALE



4 HMA BERM, TYPE A - MODIFIED
NOT TO SCALE

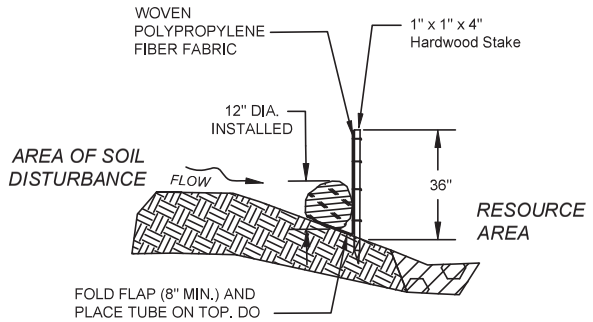


5 EXCAVATION ADJACENT TO WALL OR BUILDING DETAIL
NOT TO SCALE

NOTES:
* CONSTRUCTION TOLERANCE ± 0.5%

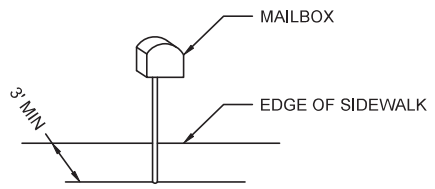
A00840-363
608051_HD11(CONSTRUCTION DETAILS).DWG Plotted on 12-Mar-2025 3:30 PM
Proposal No. 608051 - 132406

Plotted on 12-Mar-2025 3:30 PM
608051_HD11(CONSTRUCTION DETAILS).DWG
Proposal No. 608051 - 132406
A00840 - 364



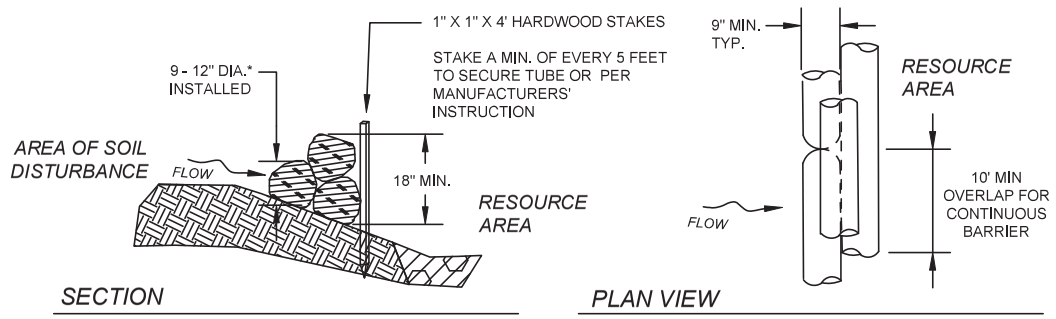
COMPOST FILTER TUBE & SILT FENCE

NOT TO SCALE



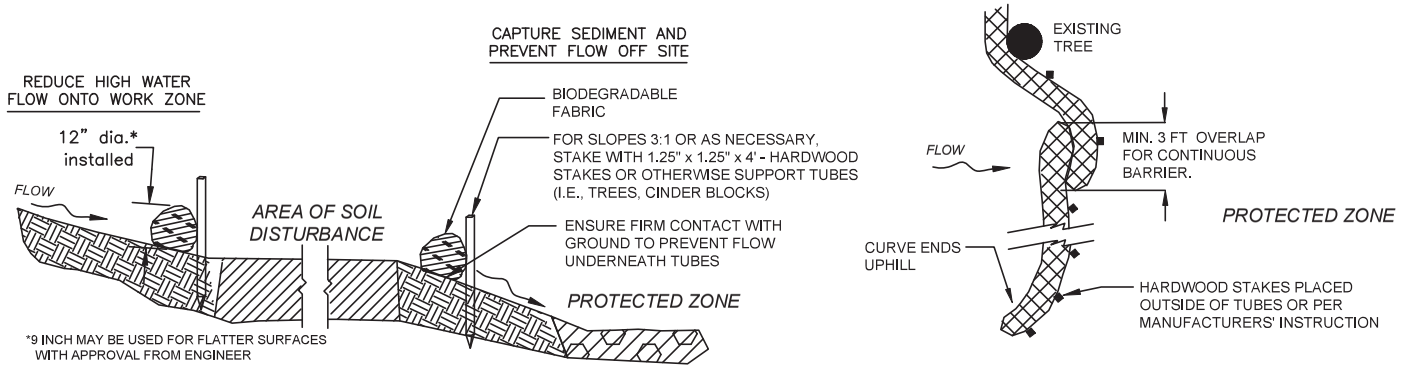
2 MAILBOX

NOT TO SCALE



COMPOST FILTER TUBE BERM (SLOPES 2:1 OR STEEPER)

NOT TO SCALE

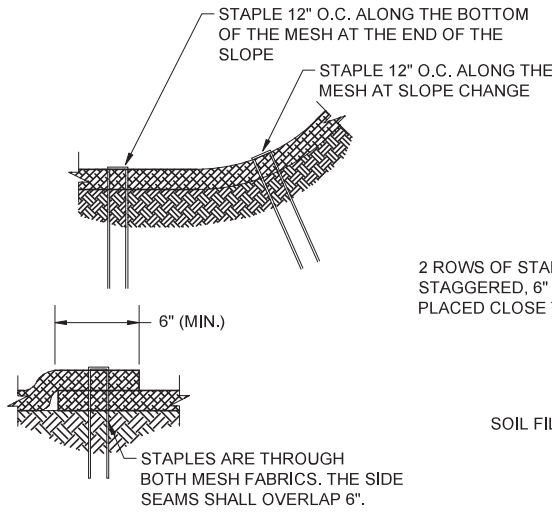


SEDIMENT BARRIER - COMPOST FILTER TUBE

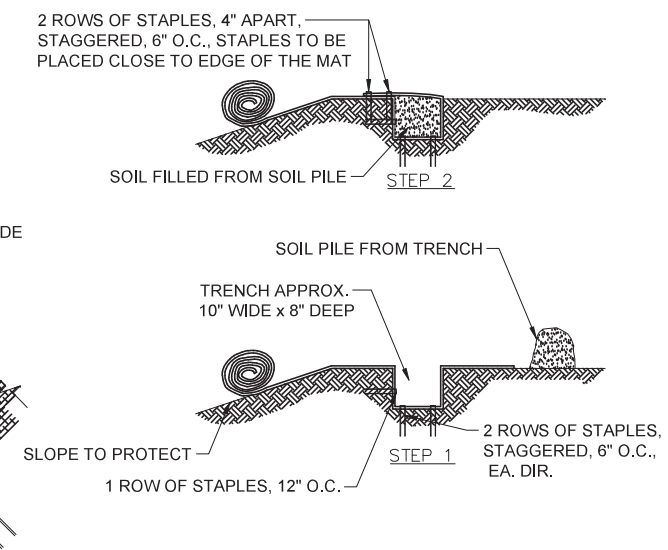
NOT TO SCALE

1 SEDIMENT CONTROL BARRIERS - COMPOST FILTER TUBE

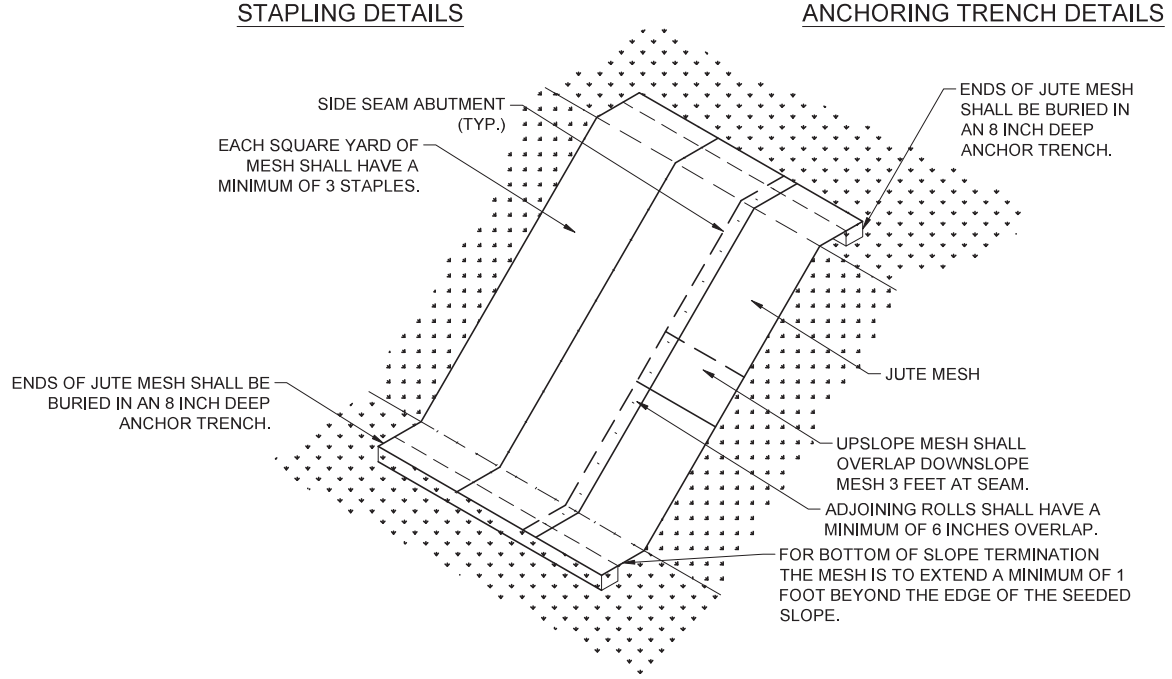
NOT TO SCALE



STAPLING DETAILS



ANCHORING TRENCH DETAILS



JUTE MESH FABRIC ON SLOPE

NOTES:

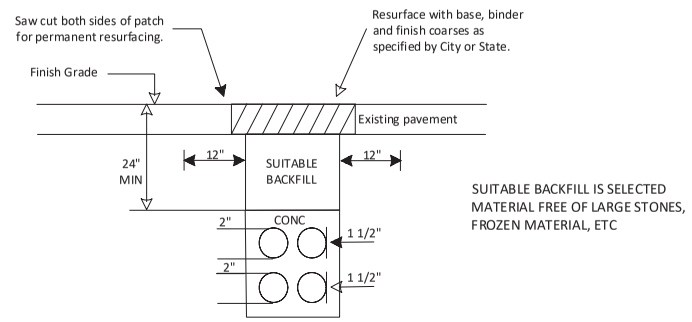
1. SEE MANUFACTURER'S STAPLE PATTERN GUIDE FOR DETAILS.
2. INSTALL JUTE MESH ON SLOPES GREATER THAN 3 FEET HORIZONTAL TO 1 FOOT VERTICAL AND WHERE ADDED STABILIZATION FOR EROSION CONTROL IS NEEDED.
3. JUTE MESH SHALL BE INSTALLED WITH CONTINUOUS CONTACT WITH THE SOIL.
4. AREAS WITH JUTE MESH SHALL BE SEEDED PRIOR TO THE INSTALLATION OF THE JUTE MESH.
5. STAPLES SHALL BE DRIVEN IN UNTIL THEIR TOPS ARE FLUSH WITH THE SOIL.
6. STAPLES SHALL BE 11 GAUGE STEEL 6 OR 9 INCHES IN LENGTH. IN AREAS THAT WILL BE MOWN FREQUENTLY EIGHT INCH WOOD STAKES SHALL BE USED TO ANCHOR MESH.
7. JUTE MESH SHALL BE BIODEGRADABLE.

3 JUTE MESH

NOT TO SCALE

VERIZON CONDUIT REQUIREMENT

- 4" PVC – SCHEDULE 40
- 3" SEPARATION IN COMMON TRENCH WITH SEPARATE POURS
- PIPES (GAS,OIL, WATER, ETC) 6" WHEN CROSSING; 12" WHEN PARALLEL (SEE-NESC 320 B 2)
- 2500 lb. 3/8" CONCRETE



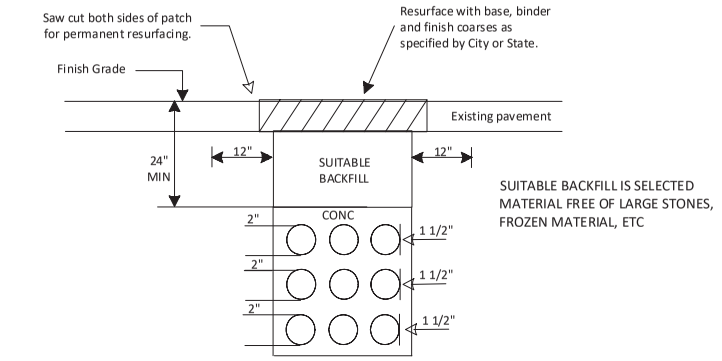
Typical Verizon duct bank cross section

TYPICAL VERIZON DUCT BANK - 2X2 CONFIGURATION

NOT TO SCALE

VERIZON CONDUIT REQUIREMENT

- 4" PVC – SCHEDULE 40
- 3" SEPARATION IN COMMON TRENCH WITH SEPARATE POURS
- PIPES (GAS,OIL, WATER, ETC) 6" WHEN CROSSING; 12" WHEN PARALLEL (SEE-NESC 320 B 2)
- 2500 lb. 3/8" CONCRETE



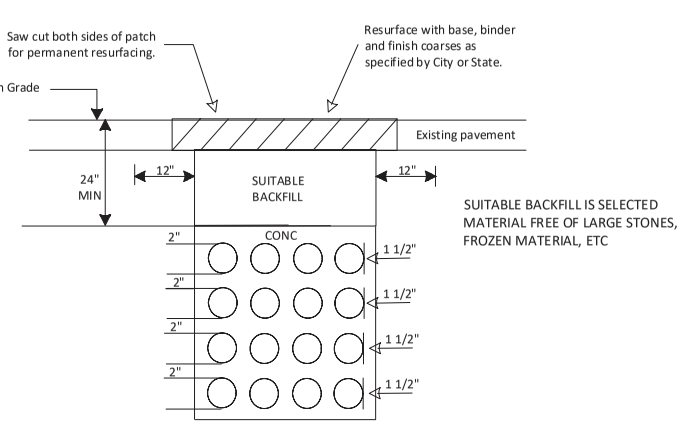
Typical Verizon duct bank cross section

TYPICAL VERIZON DUCT BANK - 3X3 CONFIGURATION

NOT TO SCALE

VERIZON CONDUIT REQUIREMENT

- 4" PVC – SCHEDULE 40
- 3" SEPARATION IN COMMON TRENCH WITH SEPARATE POURS
- PIPES (GAS,OIL, WATER, ETC) 6" WHEN CROSSING; 12" WHEN PARALLEL (SEE-NESC 320 B 2)
- 2500 lb. 3/8" CONCRETE



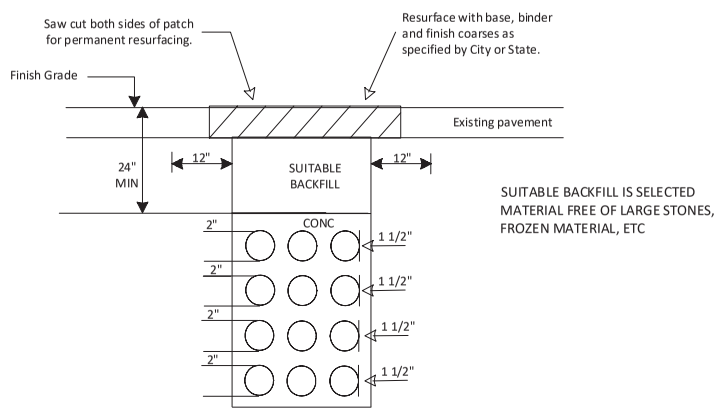
Typical Verizon duct bank cross section

TYPICAL VERIZON DUCT BANK - 4X4 CONFIGURATION

NOT TO SCALE

VERIZON CONDUIT REQUIREMENT

- 4" PVC – SCHEDULE 40
- 3" SEPARATION IN COMMON TRENCH WITH SEPARATE POURS
- PIPES (GAS,OIL, WATER, ETC) 6" WHEN CROSSING; 12" WHEN PARALLEL (SEE-NESC 320 B 2)
- 2500 lb. 3/8" CONCRETE



Typical Verizon duct bank cross section

TYPICAL VERIZON DUCT BANK - 3X4 CONFIGURATION

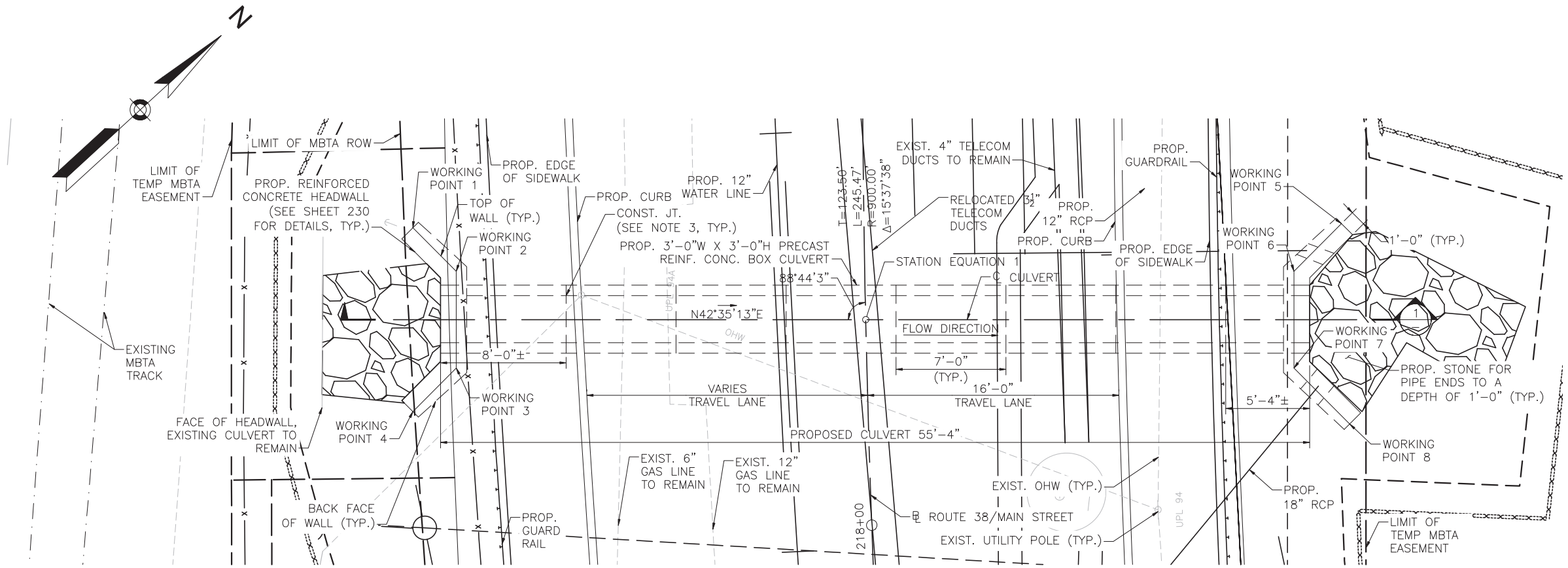
NOT TO SCALE

A00840 - 365

608051_HD11(CONSTRUCTION DETAILS).DWG Plotted on 12-Mar-2025 3:30 PM

Proposal No. 608051 - 132406

WQC/ACOE PLANS SHEET 55 OF 68



SPECIAL DRAINAGE STRUCTURE NO. 1 PLAN

SCALE: $\frac{1}{8}$" = 1'-0"

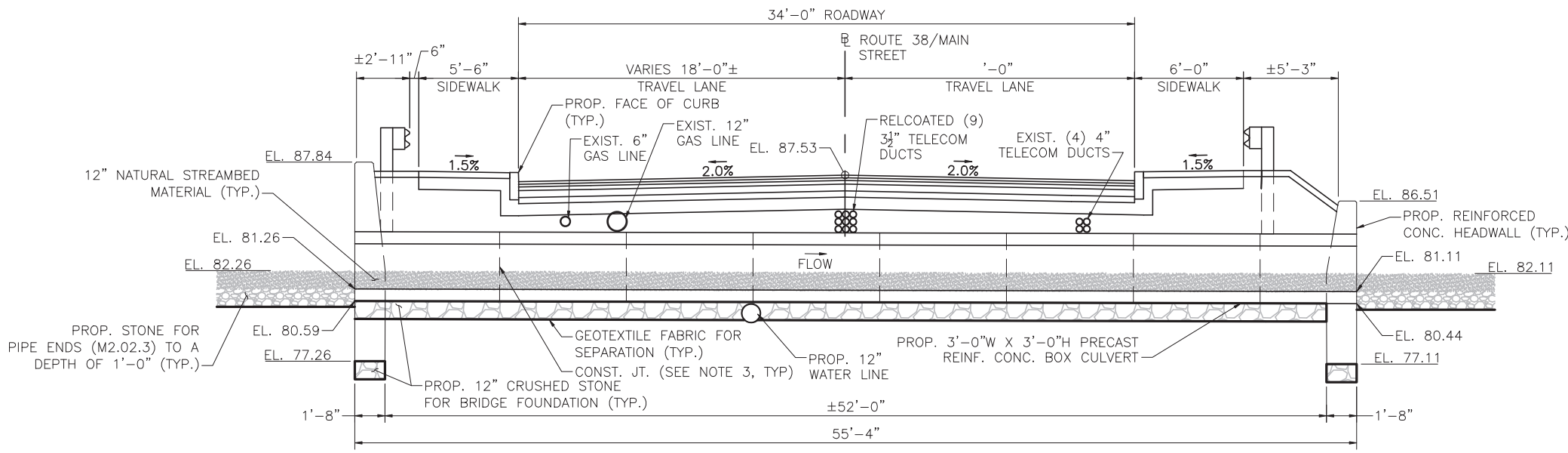
WORKING POINT	STA.	OFFSET R, FT	NORTHING	EASTING
1	217+80.64	28.73	3023401.55	744848.30
2	217+83.36	26.01	3023401.72	744852.21
3	217+89.34	26.14	3023397.55	744856.75
4	217+91.96	28.98	3023393.64	744856.91
5	217+81.28	−30.41	3023445.28	744888.13
6	217+84.36	−27.33	3023441.00	744888.31
7	217+90.71	−27.19	3023436.83	744892.85
8	217+94.48	−30.64	3023437.04	744897.87

STATION EQUATION 1: RT 38 CONSTRUCTION ℄ STA. 217+86.85 = CULVERT CENTERLINE

4 0 4 8
SCALE IN FEET

NOTES:

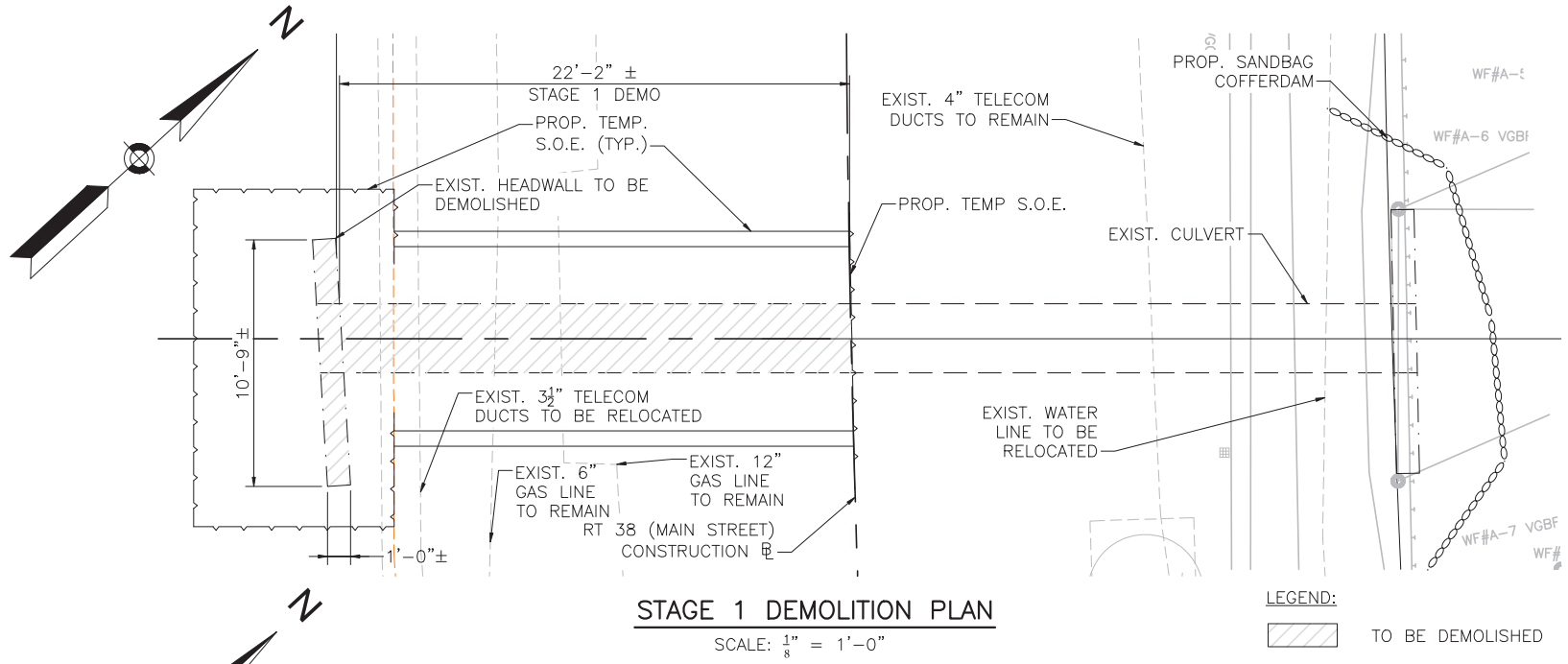
1. GUARDRAIL WILL SPAN OVER PROPOSED CULVERT SECTION.
2. SEE SHEETS 15 – 19 FOR TYPICAL APPROACH/ROADWAY CROSS SECTION AT CULVERT LOCATION.
3. PRECAST REINFORCED CONCRETE CULVERT CONSTRUCTION JOINT SPACING WILL VARY PER PRECASTER UP TO 7'-0" MAXIMUM SPACING.



SECTION (DOWNSTATION) 1/–

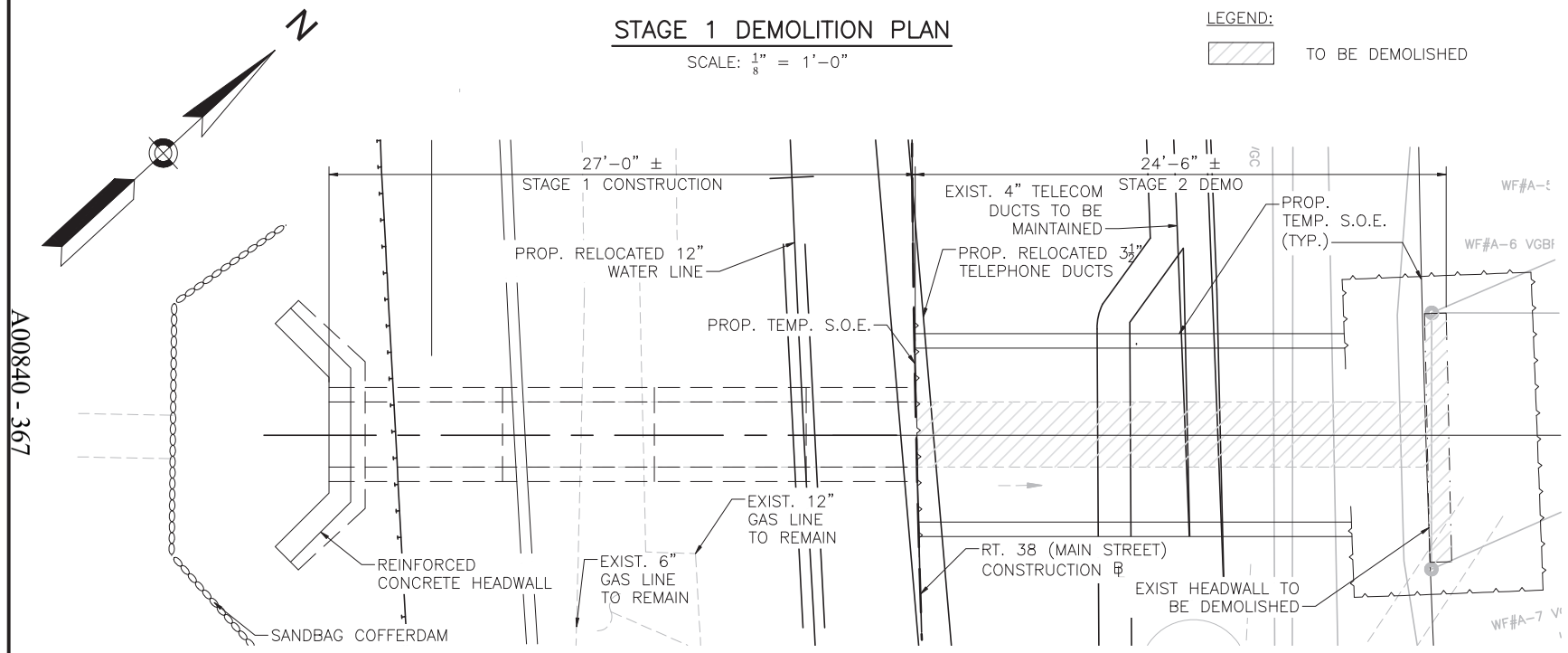
SCALE: $\frac{1}{8}$" = 1'-0"

A00840 - 366
6080051_BR01.DWG Plotted on 3-Apr-2025 1:52 PM
Proposal No. 608051 - 132406



STAGE 1 DEMOLITION PLAN

SCALE: $\frac{1}{8}$" = 1'-0"



STAGE 1 CONSTRUCTION & STAGE 2 DEMOLITON PLAN

SCALE: $\frac{1}{8}$" = 1'-0"

4 0 4 8

SCALE IN FEET

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	229	391
PROJECT FILE NO.	608051		

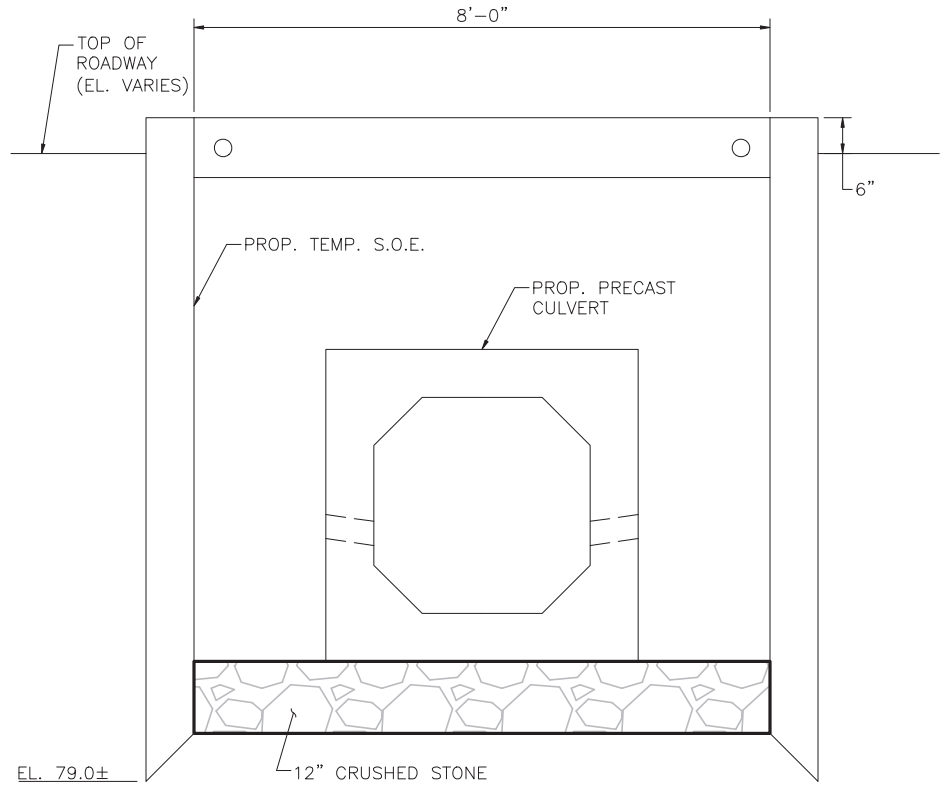
CULVERT DEMOLITION PLAN

GENERAL STAGE CONSTRUCTION NOTES:

1. THE SUPPORT OF EXCAVATION IS DESIGNED AS A TEMPORARY STRUCTURE.
2. SURCHARGES AND STOCKPILES SHALL BE LIMITED TO 250 PSF.
3. LOCATE ALL UTILITIES, EXISTING, AND PROPOSED STRUCTURES PRIOR TO THE START OF WORK.
4. INSTALL SUPPORT OF EXCAVATION (S.O.E.) TO THE REQUIRED DEPTHS AS DESIGNED BY THE CONTRACTOR.
5. UNLESS OTHERWISE NOTED, DETAILS SHOWN ON ANY DRAWING ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITIONS.
6. VERIFY NEARBY STRUCTURES WILL NOT BE AFFECTED BY PROPOSED WORK.

SUGGESTED SEQUENCE OF CONSTRUCTION:

1. INSTALL SANDBAG COFFERDAM AT THE UPSTREAM END OF CULVERT. INSTALL S.O.E. AROUND LIMITS OF PROPOSED STAGE 1 HEADWALL DEMOLITION.
2. EXCAVATE AND REMOVE EXISTING CULVERT TO STAGE 1 LIMITS SHOWN. PLACE AND MAINTAIN TRENCH BOX TO SUPPORT EXCAVATION FOR STAGE 1 CONSTRUCTION.
3. RELOCATE 12" WATER LINE TO PROPOSED LOCATION
4. CONSTRUCT STAGE 1 PORTION OF PROPOSED CULVERT.
5. REMOVE AND RESET S.O.E./SANDBAG COFFERDAM TO STAGE 2 LOCATIONS. REMOVAL OF SOE MUST NOT RESULT IN SETTLEMENT OF ANY PROPOSED WORK.
6. EXCAVATE AND REMOVE EXISTING CULVERT TOP STAGE 2 LIMITS SHOWN. PLACE AND MAINTAIN TRENCH BOX TO SUPPORT EXCAVATION FOR STAGE 2 CONSTRUCTION.
7. CONSTRUCT STAGE 2 PORTION OF PROPOSED CULVERT.



STAGE CONSTRUCTION SECTION

SCALE: $\frac{3}{8}$" = 1'-0"

1'-4" 0 1'-4" 2'-8"

SCALE IN FEET

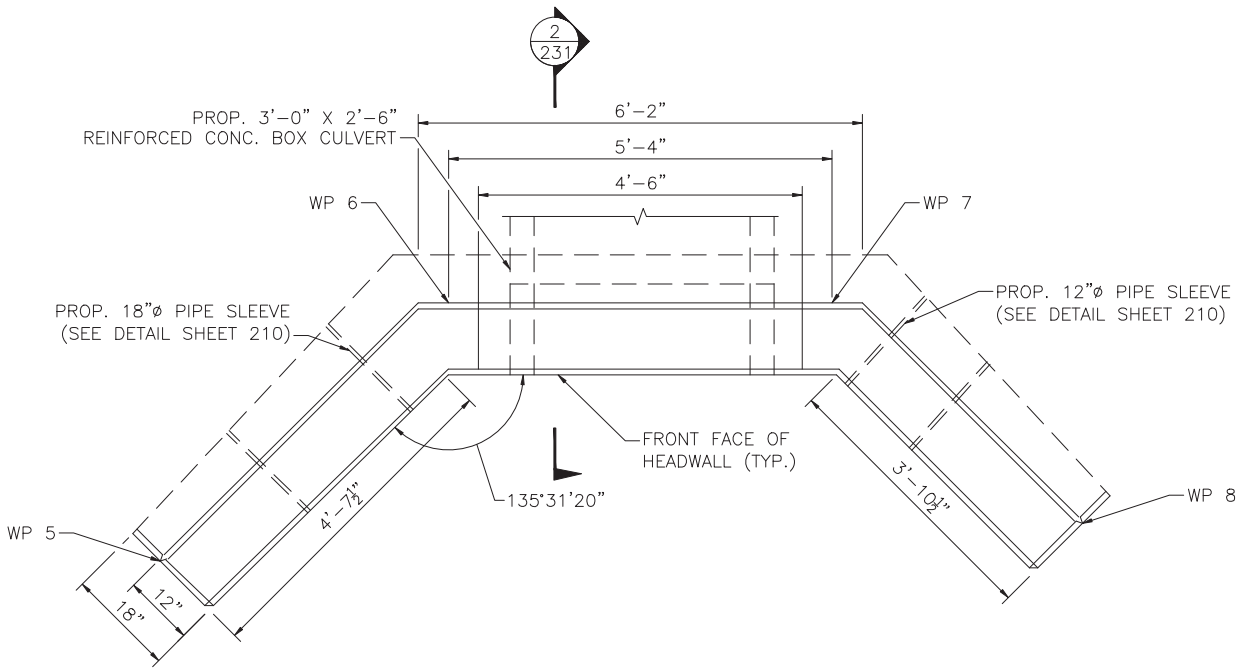
A00840 - 367

Plotted on 12-Mar-2025 3:33 PM
6080051_BR03_RECOVER.DWG
Proposal No. 608051 - 132406

WILMINGTON
ROUTE 38 (MAIN STREET)

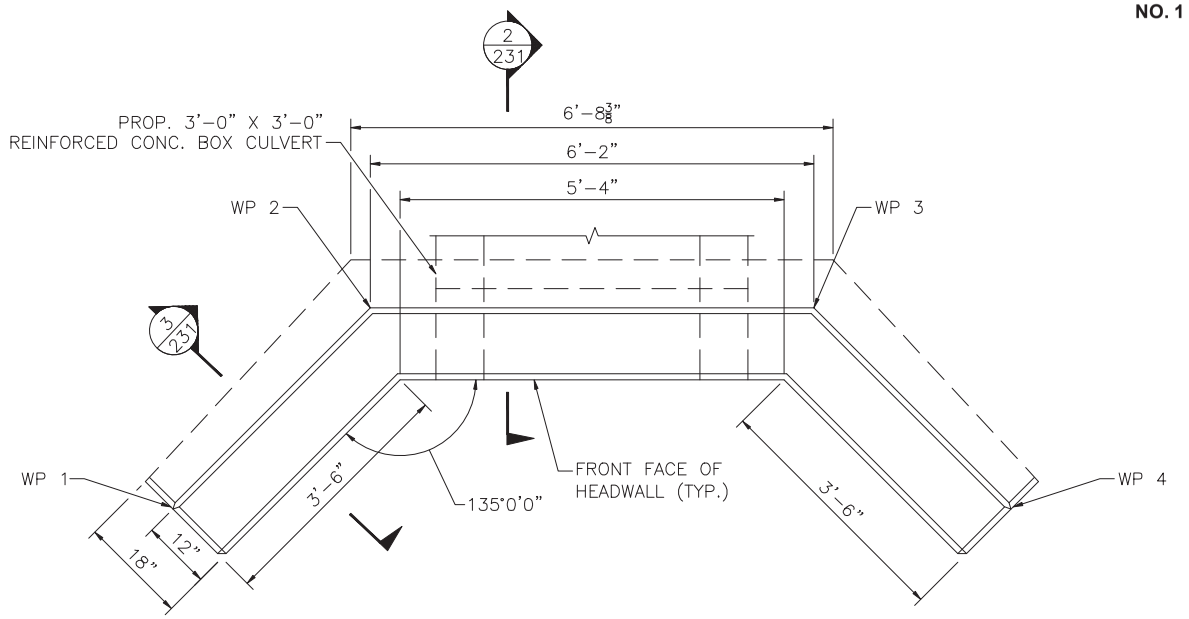
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	230	391
PROJECT FILE NO.	608051		

SPECIAL DRAINAGE STRUCTURE NO. 1 DETAILS



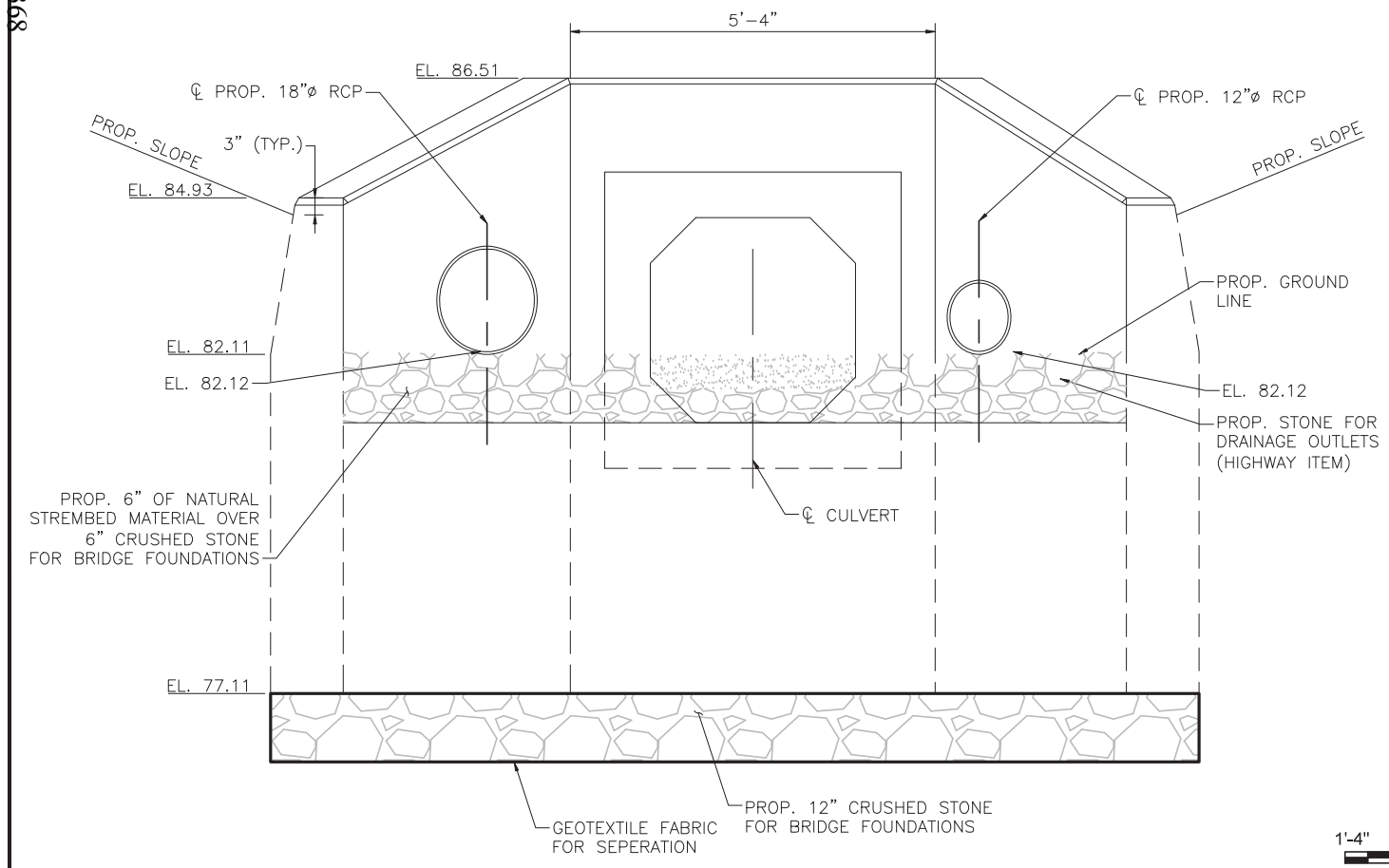
NORTH HEADWALL PLAN

SCALE: $\frac{3}{8}$" = 1'-0"



SOUTH HEADWALL PLAN

SCALE: $\frac{3}{8}$" = 1'-0"

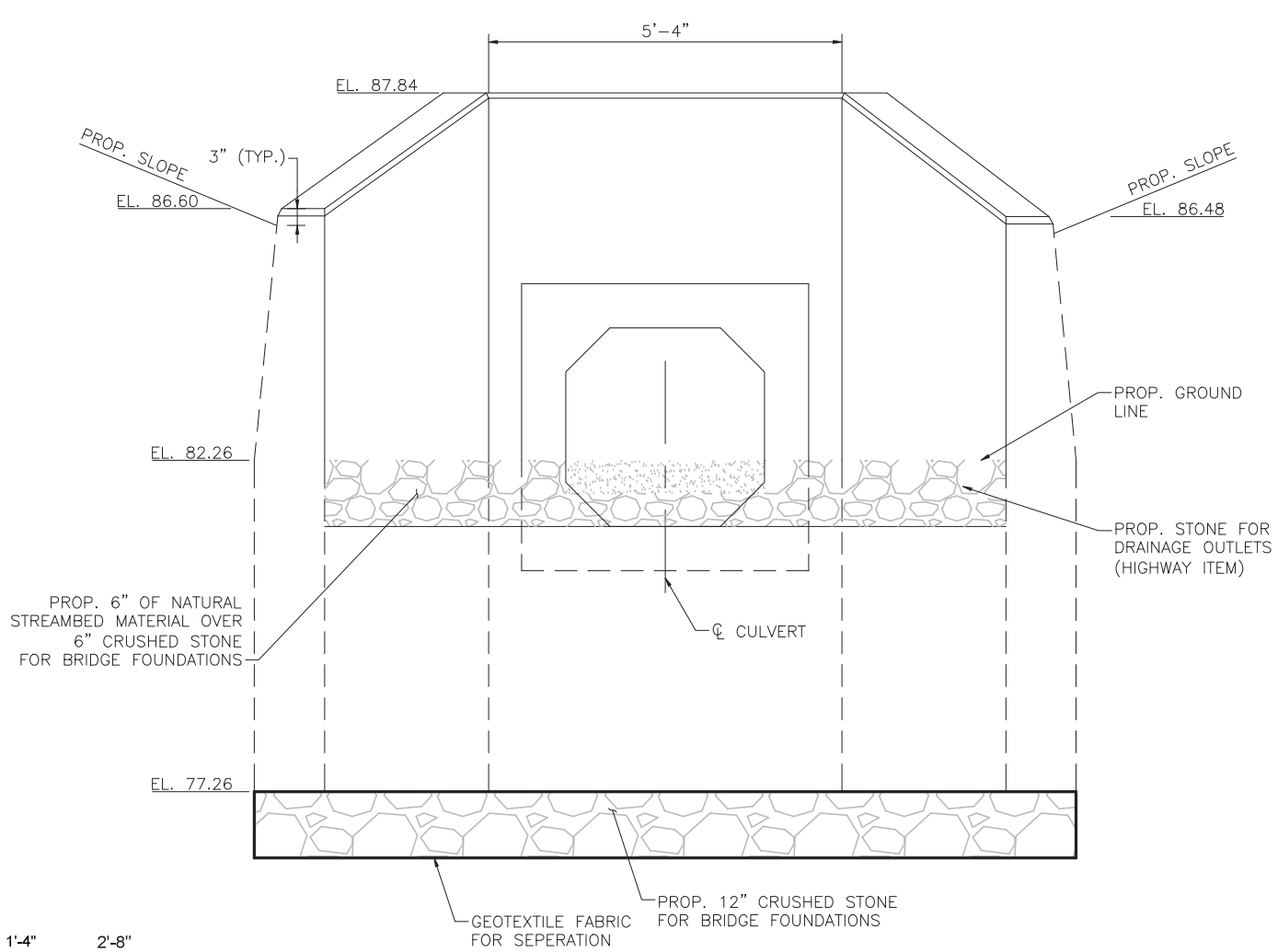


NORTH HEADWALL ELEVATION

SCALE: $\frac{3}{8}$" = 1'-0"

1'-4" 0 1'-4" 2'-8"

SCALE IN FEET



SOUTH HEADWALL ELEVATION

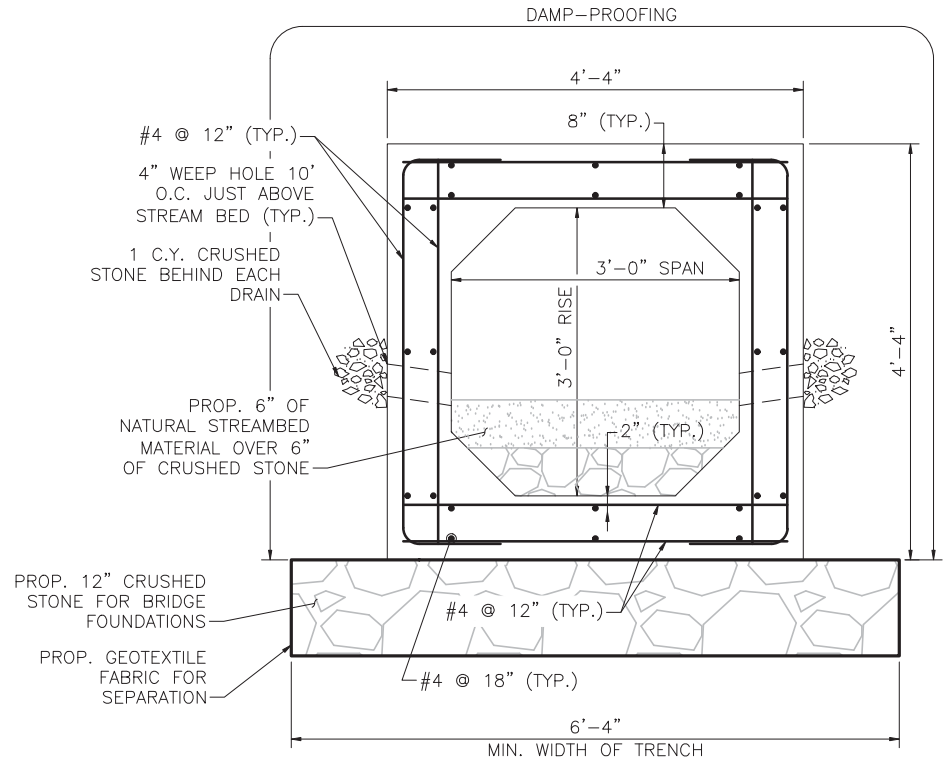
SCALE: $\frac{3}{8}$" = 1'-0"

A00840 - 368

Proposal No. 608051 - 132406

6080051_BR02.DWG Plotted on 12-Mar-2025 3:33 PM

Plotted on 12-Mar-2025 3:33 PM
6080051_BR04.DWG
Proposal No. 608051 - 132406
A008(40) - 369

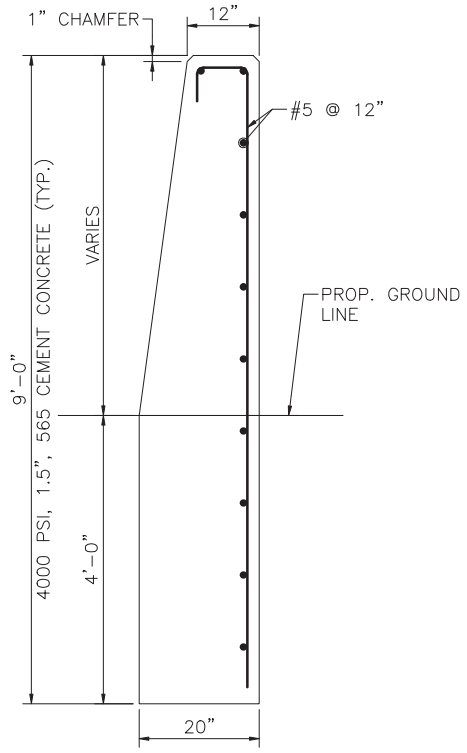


NOTES:
1. THE MAXIMUM FACTORED BEARING PRESSURE IS 2.02 KSF AS PER AASHTO LRFD BRIDGE SPECIFICATION STRENGTH 1 LOAD COMBINATION. FACTORED BEARING RESISTANCE IS 9.3 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE OF 20.7 AND A RESISTANCE FACTOR OF 0.45.
2. REFER TO GEOTECHNICAL REPORT, DATED OCTOBER 2020, PREPARED BY LAMSON ENGINEERING CORPORATION.
3. TRANSVERSE REINFORCING SHALL BE PLACED NORMAL TO THE ℄ OF THE CULVERT.
4. PRECAST CONCRETE CULVERT TO BE 5000 PSI, ¾ INCH, 686 HP CEMENT CONCRETE.

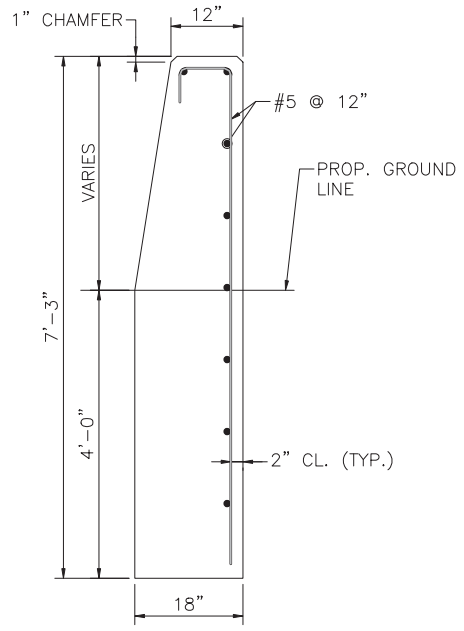
CULVERT REINFORCEMENT

SCALE: 1" = 2'-0"

1 0 1 2
SCALE IN FEET

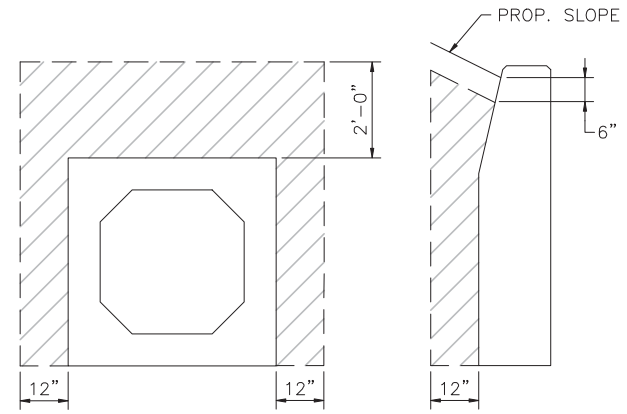


SECTION 2
SCALE: ¾" = 1'-0"



SECTION 3
SCALE: ¾" = 1'-0"

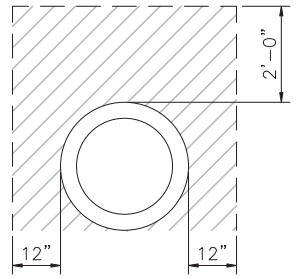
1'-4" 0 1'-4" 2'-8"
SCALE IN FEET



NOTE:
HATCHED AREA INDICATES LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES

LIMITS OF GRAVEL BORROW FOR BACK FILLING STRUCTURES AND PIPES

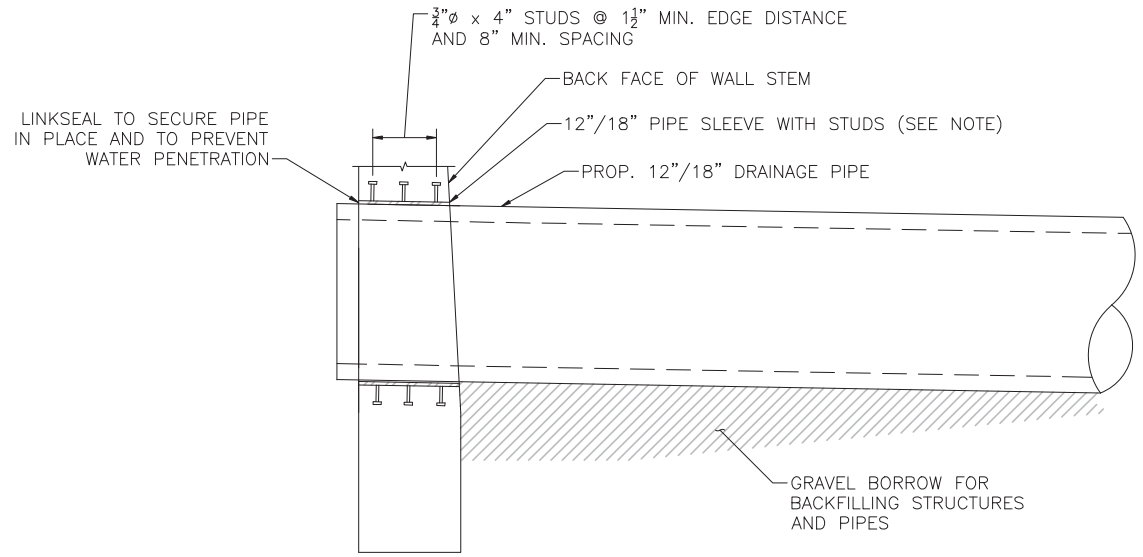
SCALE: ¼" = 1'-0"



NOTE:
HATCHED AREA INDICATES LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES.

LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES

NOT TO SCALE

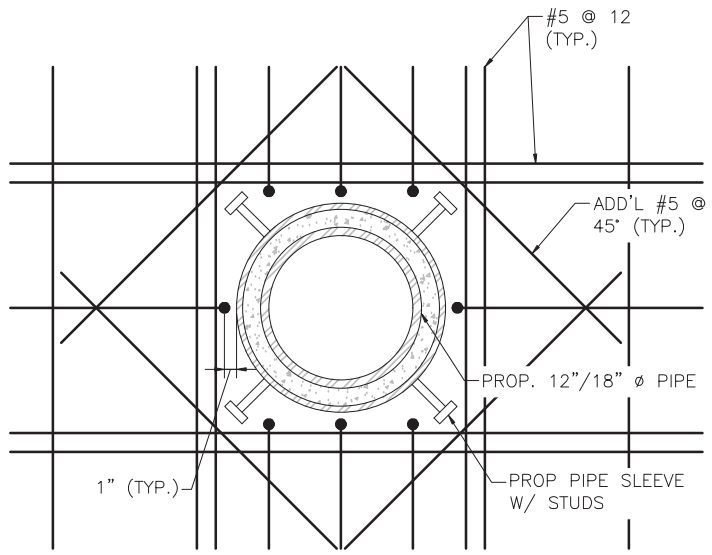


NOTE:
FOR CULVERT INVERT AND WALL ELEVATIONS, SEE SHEET 209.

TYPICAL CULVERT WALL PENETRATION DETAIL

SCALE: ¼" = 1'-0"

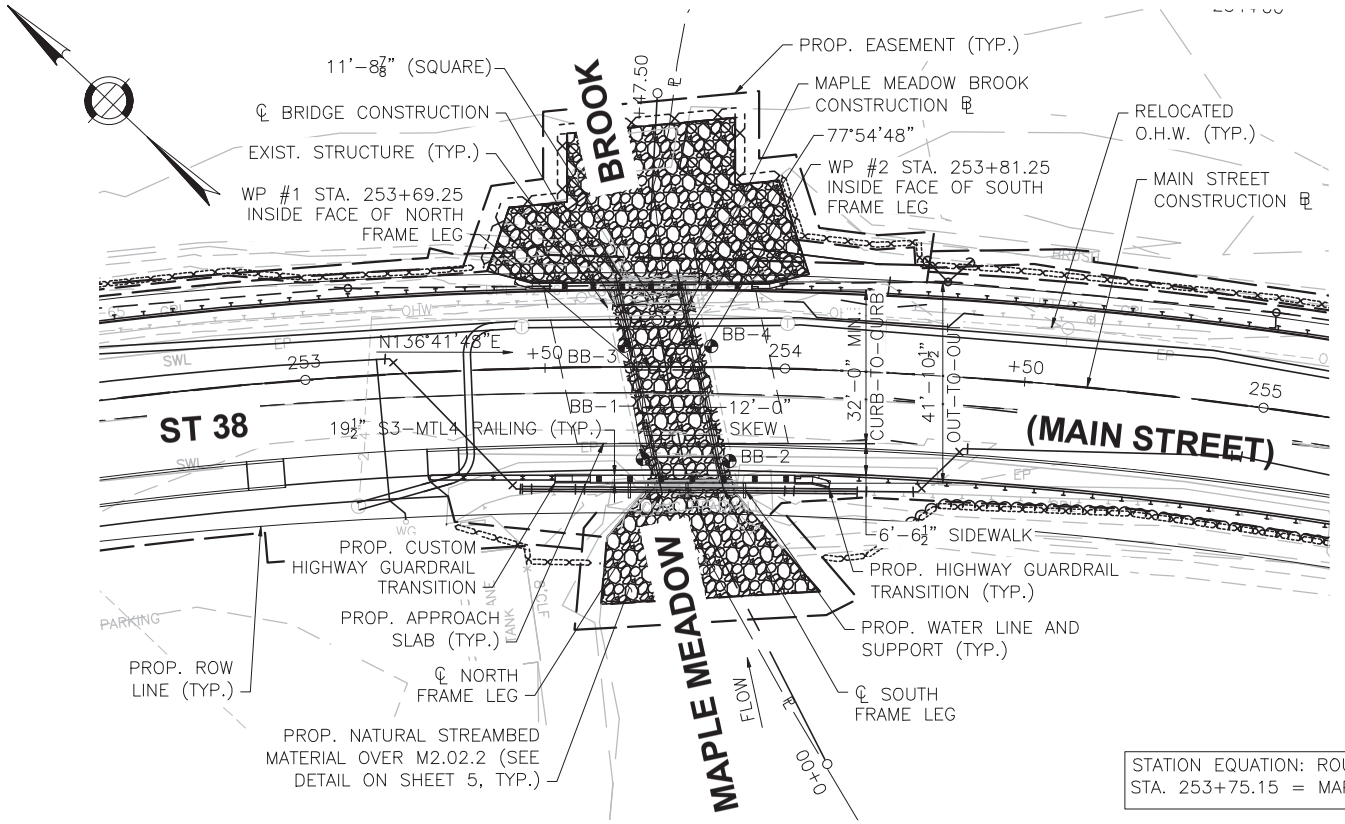
2 0 2 4
SCALE IN FEET



PIPE OPENING DETAIL

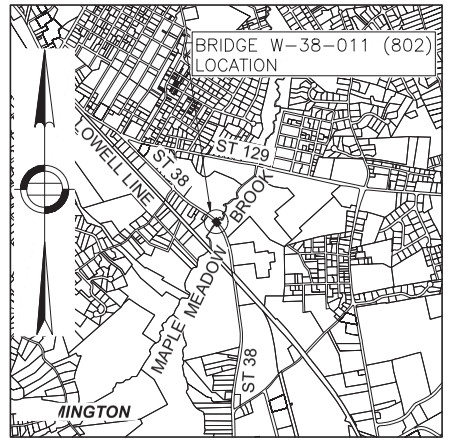
SCALE: ¾" = 1'-0"

0'-8" 0 0'-8" 1'-4"
SCALE IN FEET



KEY PLAN

SCALE: 1" = 40'



LOCUS

SCALE: 1" = 4000'

STATION EQUATION: ROUTE 38 (MAIN STREET) CONSTRUCTION ℄ STA. 253+75.15 = MAPLE MEADOW BROOK ℄ STA. 00+90.15

DESIGN:
IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION, 2020, FOR HL-93 LOADING.

NOTES:
1. APPROVAL DOES NOT INCLUDE STRUCTURAL ANALYSIS.
2. DIMENSIONS OF STRUCTURAL MEMBERS ARE APPROXIMATE AND WILL BE FINALIZED DURING FINAL DESIGN PHASE.
3. SEE GEOTECHNICAL REPORT, DATED XXX.
4. SEE HYDRAULIC REPORT, DATED XXX.
5. NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

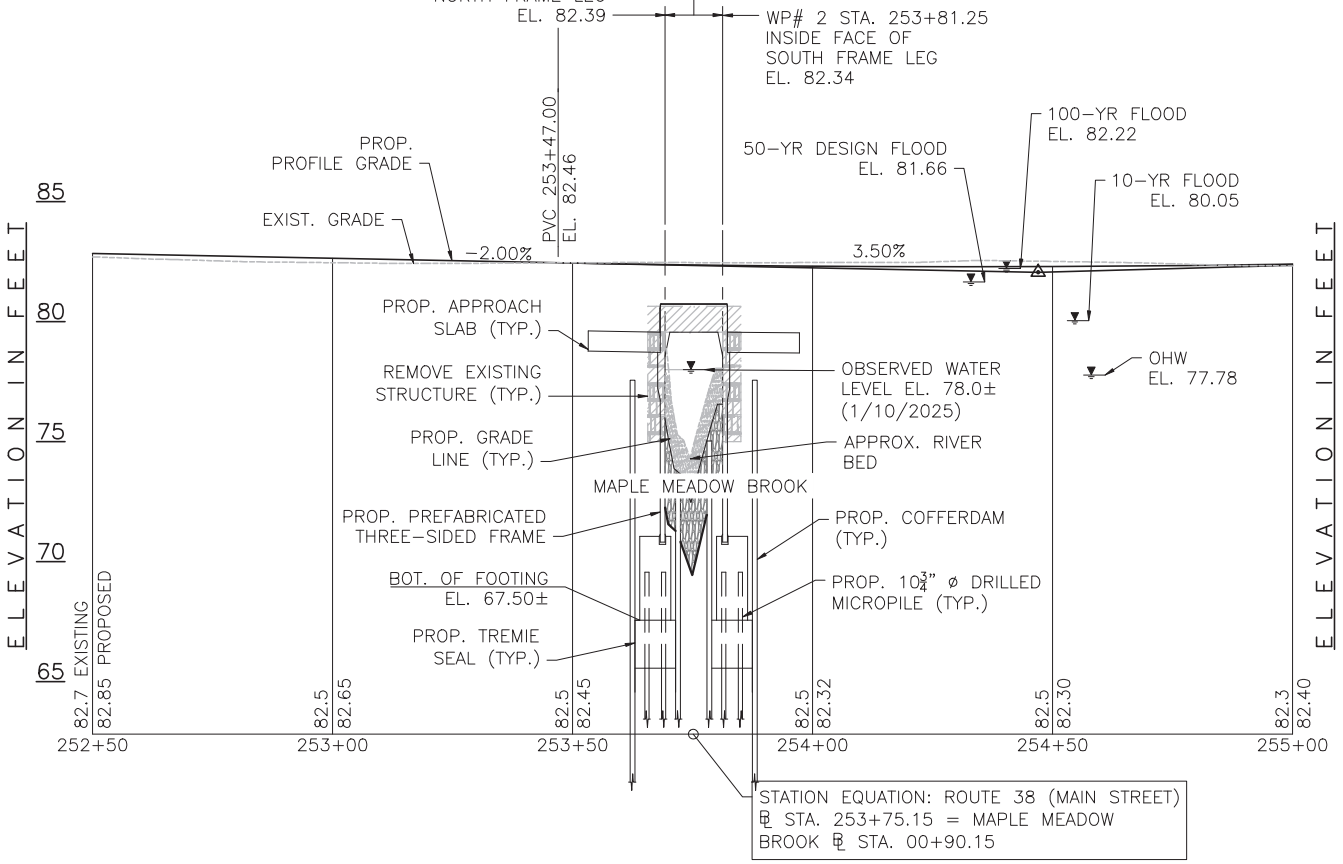
PROJECT INFORMATION
PROJECT FILE NO.: 608051
PROJECT DESCRIPTION: PROPOSED BRIDGE
BRIDGE DESIGN LOADING: HL-93
SURVEY: ELECTRONIC SURVEY BY GREEN INTL.
ELEVATION REFERENCE: NAVD OF 1988
BENCH MARK: MAG SET 2' ABOVE GRADE, UP #12-64 EL. 85.16' STA. 253+57.81 – 13.77'LT N 3021141.89 E 747603.14

TEMPORARY WATER CONTROL DESIGN DATA	
DESIGN FLOOD DISCHARGE (C.F.S.)	4011
DESIGN FLOOD FREQUENCY (YEARS)	2
DESIGN FLOOD VELOCITY (F.P.S.)	5.12
DESIGN FLOOD ELEVATION (FEET, NAVD)	689.36

TRAFFIC DATA	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	2041	
AVERAGE DAILY TRAFFIC – PRESENT	3,472	
AVERAGE DAILY TRAFFIC – DESIGN YEAR	4,236	
DESIGN HOURLY VOLUME	15.5%	
DIRECTIONAL DISTRIBUTION	53.0%	
TRUCK PERCENTAGE – AVERAGE DAY	6.4%	
TRUCK PERCENTAGE – PEAK HOUR	4.0%	
DESIGN SPEED	25MPH	
DIRECTIONAL DESIGN HOURLY VOLUME	350	

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1,000
DESIGN SPECTRA	
As	0.150g
SDs	0.325g
SD1	0.130g
SITE CLASS	E
SEISMIC DESIGN CATEGORY (SDC)	A

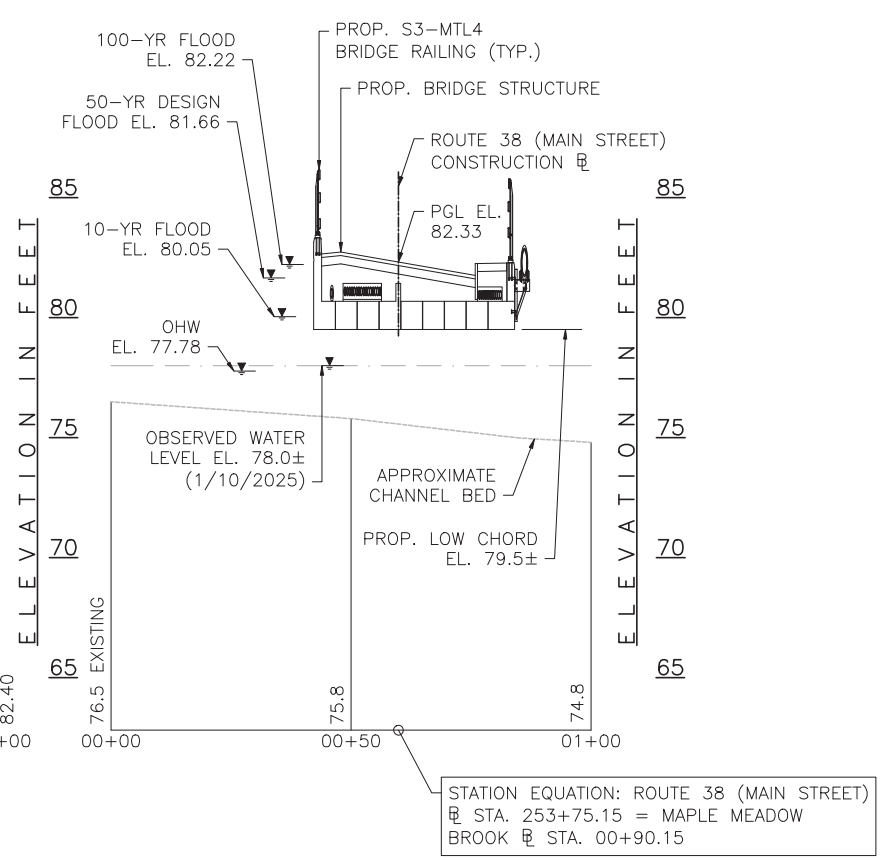
HYDRAULIC DESIGN FLOOD (HDF) DATA	
DRAINAGE AREA (SQ. MILES)	N/A
HDF DISCHARGE (C.F.S.)	N/A
HDF FREQUENCY (YEARS)	10
HDF VELOCITY (F.P.S.)	N/A
HDF ELEVATION (FEET, NAVD, UPSTREAM)	691.41
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S.)	N/A
BASE FLOOD ELEVATION (FEET, NAVD, UPSTREAM)	693.93
SCOUR DESIGN FLOOD (SDF) EVENT DATA	
SDF EVENT FREQUENCY (YEARS)	25
SDF ELEVATION (FEET, NAVD, UNDER BRIDGE)	N/A
SDF TOTAL SCOUR DEPTH AT ABUTMENT (FEET)	5.83
SDF TOTAL SCOUR DEPTH AT PIERS (FEET)	N/A
SCOUR CHECK FLOOD (SCF) EVENT DATA	
SCF EVENT FREQUENCY (YEARS)	50
SCF ELEVATION (FEET, NAVD, UNDER BRIDGE)	N/A
SCF TOTAL SCOUR DEPTH AT ABUTMENT (FEET)	6.59
SCF TOTAL SCOUR DEPTH AT PIERS (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	N/A
FREQUENCY (IF KNOWN, YEARS)	N/A
MAXIMUM ELEVATION (FEET, NAVD)	N/A
DATE (MM/YYYY)	N/A
HISTORY OF ICE FLOES	N/A
EVIDENCE OF SCOUR AND EROSION	N/A



PROFILE – ST 38 (MAIN STREET)

HORIZ. SCALE: 1" = 40'
VERT. SCALE: 1" = 8'

HOR. SCALE IN FEET
20 0 20 40
4 0 4 8
VER. SCALE IN FEET



PROFILE – MAPLE MEADOW BROOK

HORIZ. SCALE: 1" = 40'
VERT. SCALE: 1" = 8'

GREEN INTERNATIONAL AFFILIATES, INC.
100 AMES POND DRIVE, SUITE 200
TEWKSBURY, MA 01876

MassDOT Massachusetts Department of Transportation Highway Division

SKETCH PLANS OF
PROPOSED BRIDGE
WILMINGTON
ST 38 (MAIN STREET)
OVER MAPLE MEADOW BROOK

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

APPROVED BY DATE

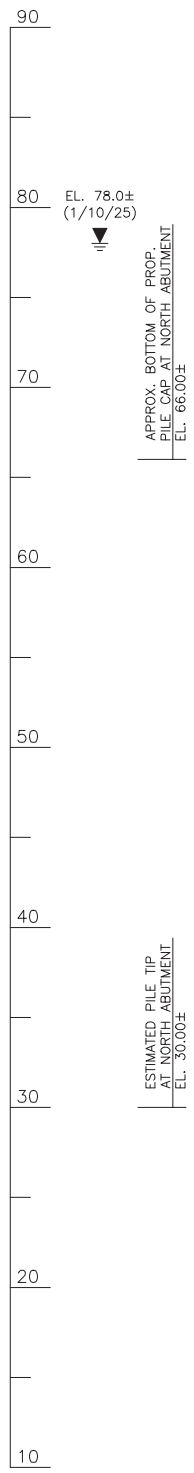
STRUCTURAL ELEMENTS:

TITLE:

HIGHWAY ELEMENTS:

TITLE:

A00840 - 370
WQC/ACOE PLANS SHEET 60 OF 68
Proposal No. 608051 - 132406
608051_BR1.DWG Plotted on 26-Mar-2025 11:46 AM
Initial Sketch Plan Submittal (SP1) 14-February-2025



massDOT Boring Log — LAMSON ENGINEERING CORPORATION, 437 Cherry Street, Suite #109, Newton, Massachusetts 02465, Phone: (617 558-0101 E-Mail: Klam@lamsonengineering.com

Boring No. BB-1 (Bridge Boring) — Page 1/2 — Scale: 1" = 5'

City/Town: Wilmington, MA | Bridge No.: W-38-011 (802) | Project File No.: 608051 | Contract No.: -

Location: ST Route 38 (Main Street) over Maple Meadow Brook | Date & Time Started: 1/12/24 11:00 AM | Total Hours: **9.5

Groundwater Depth (Feet): 2.3' Date & Time: 1/17/24 10:25 AM | Date & Time Completed: 1/17/24 2:00 PM

Coordinates: *N 3,021,112.8 *E 747,990.9 | Ground Elevation (Feet): *81.1' | Inspector's Name: James Gu

Drilling Company: New England Boring Contractors | Driller's Name: Ken Smith | Helper's Name: Rick Larhette

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery (inches)	Field Description	Strata Changes
S-1	1' - 3'	17 4 3 2	2"	Dry, loose, brown, FINE TO COARSE SAND, some fine gravel, trace inorganic silt (with ASPHALT pieces on top).	
S-2	4' - 6'	9 4 4 3	0"	Wet, no recovery.	
S-3	9' - 11'	1 3 5 4	2"	Wet, loose, brown, FINE TO COARSE SAND, trace inorganic silt.	
S-4	14' - 16'	3 6 5 3	10"	Wet, loose, brown, FINE TO COARSE SAND, trace inorganic silt.	18'
S-5	19' - 21'	2 1 1 1	9"	Wet, very loose, gray, FINE SAND AND INORGANIC SILT.	
S-6	24' - 26'	2 3 4 4	11"	Wet, loose, gray, FINE SAND AND INORGANIC SILT.	
S-7	29' - 31'	2 3 3 4	10"	Wet, loose, gray, FINE SAND AND INORGANIC SILT.	
S-8	34' - 36'	1 1 1 3	10"	Wet, very loose, gray, FINE SAND AND INORGANIC SILT.	37'
C-1	37' - 42'	3 4 11 9 2.5	20"	Hard, slightly fractured, gray, GRANITE Recovery = 20"/ 60" = 33% RQD = 12"/ 60" = 20%	
C-2	42' - 43'2"	3 6/ 2"	8"	Hard Recovery = 8"/ 14" = 33% RQD = 0"/ 14" = 0%	43'2"
				Bottom of Exploration @ 43'2"	

Notes: * Moved BB-1 4' toward drive way due to underground gas pipe.
**1/12/24 11:00 AM to 3:00 PM, 1/17/24 8:30AM to 2:00 PM
Wilmington PD: 1/12/24 Louis Martignetti #153, Paul Jepson #142.
1/17/24 Brian Moon #161, Chris Dindo #170

Arrow-Board: - Signs: 2 Cones: 11

Protective Device Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

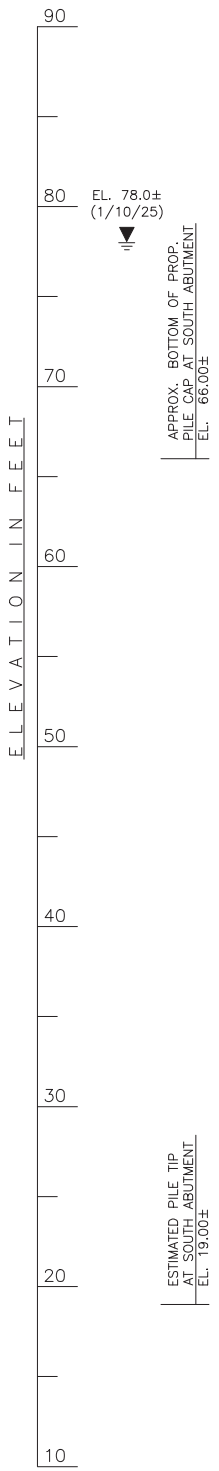
Type of Drill Rig: GT8 GtechDrill
Hammer Weight: 140 lbs Fall: 30"
Casing Types: HW NW
Size: 4" 3"
Depth: 34' 37'
Sampler Type: S/S Size: 1 3/8" ID
Automatic Hammer Weight: 140 lbs
Safety Hammer Weight:
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15" ID

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

BB–1
SCALE: 3/32" = 1'–0"



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Boring No. BB-2 (Bridge Boring) — Page 1/2 — Scale: 1" = 5'

City/Town: Wilmington, MA | Bridge No.: W-38-011 (802) | Project File No.: 608051 | Contract No.: -

Location: ST Route 38 (Main Street) over Maple Meadow Brook | Date & Time Started: 1/5/24 8:30 AM | Total Hours: **11.5

Groundwater Depth (Feet): 1.75' Date & Time: 1/12/24 9:15 AM | Date & Time Completed: 1/12/24 11:00 AM

Coordinates: *N 3,021,101.4 *E 747,605.0 | Ground Elevation (Feet): *82.0' | Inspector's Name: James Gu

Drilling Company: New England Boring Contractors | Driller's Name: Ken Smith | Helper's Name: Rick Larhette

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery (inches)	Field Description	Strata Changes
				Vacuumed and hit ground water stop at 1'-9", no utility found	
S-1	3' - 5'	6 4 1 1	2"	Wet, loose, brown, FINE TO COARSE SAND, some fine gravel, trace inorganic silt.	6.5'
				Roller bit through COBBLE/BOULDER from 6.5' to 9'.	9'
				Core through footing from 9' to 10', 7" recovery.	10'
S-2	10' - 12'	5 7 9 9	17"	Wet, medium dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine gravel. Bottom 4", gray, FINE SAND AND INORGANIC SILT.	11.5'
S-3	14' - 16'	2 2 2 4	16"	Wet, loose, gray, FINE SAND AND INORGANIC SILT.	
S-4	19' - 21'	2 2 4 3	16"	Wet, loose, gray, FINE SAND AND INORGANIC SILT.	
S-5	24' - 26'	2 2 3 4	16"	Wet, loose, gray, FINE SAND AND INORGANIC SILT.	23'
S-6	29' - 31'	34 17 25 88	10"	Wet, dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-7	34' - 36'	40 48 34 27	13"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-8	39' - 41'	29 19 42 71	9"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	44
S-9	44' - 44'2"	120/ 2"	2"	Wet, Refusal, WEATHERED BEDROCK	45
C-1	45' - 50'	2.5 2.5 2.5 2.5 3	58"	Hard, slightly fractured, white-gray, GRANITE Recovery = 58"/ 60" = 97% RQD = 30"/ 60" = 50%	
C-2	50' - 55'	2.5 2.5 2.5 2.5 3	60"	Hard, slightly fractured, white-gray, GRANITE Recovery = 60"/ 60" = 100% RQD = 50"/ 60" = 83%	55
				Bottom of Exploration @ 55'	

Notes: * Moved BB-2 8'10" toward drive way due to underground gas pipe.
**Driller: Garrett Peacock, Helper: Matt Fedan on 1/5/24 8:30 AM to 11:00 AM.
Rig step work: Driller: Ken Smith, Helper: Rick Larhette on 1/11/24 8:30 AM to 3:00 PM, 1/12/24 8:30AM to 11:00 AM.
Wilmington PD: 1/5/24 Daryl Cerucki, John Fortes, 1/11/24 Brian Moon #161, Chris Dindo #170, 1/12/24 Louis Martignetti #153, Paul Jepson #142

Arrow-Board: - Signs: 2 Cones: 11

Protective Device Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Type of Drill Rig: GT8 GtechDrill
Hammer Weight: 140 lbs Fall: 30"
Casing Types: HW NW
Size: 4" 3"
Depth: 44' 45'
Sampler Type: S/S Size: 1 3/8" ID
Automatic Hammer Weight: 140 lbs
Safety Hammer Weight:
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15" ID

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

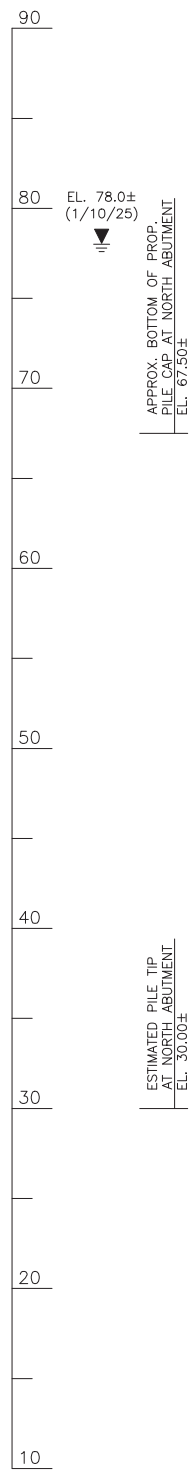
BB–2
SCALE: 3/32" = 1'–0"

5'-4" 0 5'-4" 10'-8"
SCALE IN FEET

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS: BB–#
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 3/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. BORINGS BB–1 AND BB–2 WERE MADE IN JANUARY 2024. BORINGS BB–3 AND BB–4 WERE MADE IN FEBRUARY 2025.
7. BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTORS, 40 FORDWAY STREET, DERRY, NH, 03038.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

Plotted on Mar-25 11:46 AM
608051_BR2 (BORING LOGS 1 OF 2).DWG
Proposal No. 608051 - 132406
Initial Sketch Plan Submittal (SP1) 14-February-2025
A00840 - 371



massDOT Highway

LAMSON ENGINEERING CORPORATION
437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101

Boring No. BB-3 Page 1/2

Boring Log Scale 1" = 5

City/Town: Wilmington	Bridge No.W-38-011	Project File No: 608051	Contract No.:
Location: Rt 38 over Maple Meadow Brook		Date & Time Started: 2/12/25 12:30 PM	Total Hours:
Groundwater Depth:4.25'	Date & Time: 2/14/25 1:30 PM	Date & Time Completed:2/14/25 2:00 PM	12.5
Coordinates:N3021129.015 E 747602.525	Ground Elevation (Feet):81.82	Inspector's Name: Edward Mahoney	
Drilling Company: New England Boring Contractors	Driller's Name: Mark D'Ambrosio	Helper's Name: Jack Lefebvre	

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes	Elev.
	0'-6"			ASPHALT	6"	
S-1	1'-3"	33 22 15 11	15"	Dry, dense, brown, FINE TO COARSE SAND, some fine to medium gravel (Top 6" Subbase)		
S-2	5'-7"	4 6 2 2	15"	Moist, loose, brown-dark brown, FINE SAND, some fine to medium gravel, some coarse sand	9'	
S-3	10'-12'	9 11 10 12	7"	Wet, medium dense, gray, FINE SAND, some inorganic silt		
S-4	15'-17'	3 4 4 5	12"	Wet, loose, gray, FINE SAND, some inorganic silt		
S-5	20'-21'10"	2 3 3 3	14"	Wet, loose, gray, FINE SAND, some inorganic silt		
S-6	25'-27'	3 4 3 5	13"	Wet, loose, gray, FINE SAND, some inorganic silt		
S-7	30'-32'	2 2 3 3	15"	Wet, loose, gray, FINE SAND, some inorganic silt		
S-8	35'-37'	22 24 21 17	13"	Wet, dense, gray, FINE TO COARSE SAND, some fine to medium gravel, trace of inorganic silt		
S-9	40'-42'	32 21 28 72	12"	Wet, dense, brown-black, FINE SAND, some coarse sand, trace of inorganic silt		
				Top of Weathered Bedrock	45'6"	
S-10	45'6"-45'9"	50/3	3"	Wet, very dense, gray-black, WEATHERED BEDROCK Rollerbit to 47'	47'	
C-1	47'-52'	3 4 4 4 5	55"	Moderately hard, highly fractured (angular) and core breaks, black-gray, SANDSTONE-DIORITE Recovery - 55"/60" = 92% RQD - 18"/60" = 30%		
C-2	52'-57'	3.5 3.5 3.5 7 4.5	60"	Moderately hard, highly fractured and core breaks, gray-brown, DIORITE Recovery - 60"/60" = 100% RQD - 0"/60" = 0%		
				Bottom of Exploration @ 57'	57'	

Notes: 2-Wilmington police details on 2/13/25 & 2/14/25

Arrow Board:-
Signs:-
Cones:- 10

Protective Device Stand:- Box:-
Well Depth:- Solid Pipe:-
Stick Up Pipe:- Screen Pipe:-

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and=40-50%,some=10-40%,trace=10% or less

Type of Drill Rig: GT8 (Truck)
Hammer Weight: 140 lbs Fall: 30"
Casing Types: Drive Spin
Size: 4" 3"
Depth: 40' 47'
Sampler Type: SS Size: 1 3/8" ID
Automatic Hammer Weight: 140 lbs
Safety Hammer Weight:
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

BB–3
SCALE: 3/32" = 1'–0"

massDOT Highway

LAMSON ENGINEERING CORPORATION
437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101

Boring No. BB-4 Page 1/2

Boring Log Scale 1" = 5'

City/Town: Wilmington	Bridge No.W-38-011	Project File No: 608051	Contract No.:
Location: Rt 38 over Maple Meadow Brook		Date & Time Started: 2/11/25 9:30 AM	Total Hours:
Groundwater Depth:8.25'	Date & Time: 2/12/25 12:00 PM	Date & Time Completed:2/12/25 12:30PM	8.5
Coordinates:N3021115.870 E 747615.106	Ground Elevation (Feet):82.64	Inspector's Name: Edward Mahoney	
Drilling Company: New England Boring Contractors	Driller's Name: Mark D'Ambrosio	Helper's Name: Tyler Vigeant	

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes	Elev.
	0'-6"			ASPHALT	6"	
S-1	1'-3"	74 53 26 18	16"	Moist, very dense (frozen), brown, FINE TO COARSE SAND, some fine to coarse gravel (Top 6" Subbase)		
S-2	5'-7"	3 1 2 1	19"	Wet, very loose, brown-dark brown, FINE SAND, trace of fine gravel, (Pockets of Peat and Wood)	7'	
				Peat in wash	10'	
S-3	10'-12'	4 10 11 7	17"	Wet, medium dense, gray, FINE SAND (Top 6" brown Peat)		
S-4	15'-17'	4 6 5 5	13"	Wet, medium dense, gray, FINE SAND, some inorganic silt		
S-5	20'-22'	3 4 4 4	14"	Wet, loose, gray, FINE SAND, some inorganic silt		
S-6	25'-27'	3 3 3 2	14"	Wet, loose, gray, FINE SAND, some inorganic silt		
S-7	30'-32'	2 2 6 11	10"	Wet, loose, gray, FINE SAND, some inorganic silt		
S-8	35'-37'	22 29 15 14	7"	Wet, dense, gray, FINE TO COARSE SAND, trace of fine to medium gravel, trace of inorganic silt		
S-9	40'-40'6"	38 60/0	6"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, some inorganic silt	40'6"	
				Top of Bedrock Rollerbit to 43'		
C-1	43'-48'	3.5 3.5 3.5 4 5	60"	Hard, slight angular fractures and core breaks, gray-white, DIORITE Recovery - 60"/60" = 100% RQD - 57"/60" = 95%		
C-2	48'-53'	3 2.5 3 3 5	60"	Hard, highly fractured and core breaks, gray-white, DIORITE Recovery - 58"/60" = 97% RQD - 25"/60" = 42%		
				Bottom of Exploration @ 53'	53'	

Notes: 2-Wilmington police details on 2/11/25 & 2/12/25 Helper - Garrett

Arrow Board:-
Signs:-
Cones:- 10

Protective Device Stand:- Box:-
Well Depth:- Solid Pipe:-
Stick Up Pipe:- Screen Pipe:-

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and=40-50%,some=10-40%,trace=10% or less

Type of Drill Rig: GT8 (Truck)
Hammer Weight: 140 lbs Fall: 30"
Casing Types: Drive Spin
Size: 4" 3"
Depth: 40' 43'
Sampler Type: SS Size: 1 3/8" ID
Automatic Hammer Weight: 140 lbs
Safety Hammer Weight:
Donut Hammer Weight: Fall: 30"
Core Barrel Type: NX Size: 2.15"

BB–4
SCALE: 3/32" = 1'–0"

5'-4" 0 5'-4" 10'-8"
SCALE IN FEET

BORING NOTES:
1. SEE SHEET 2 FOR BORING NOTES.

Plotted on Mai-25 11:46 AM
608051_BR3 (BORING LOGS 2 OF 2).DWG
Proposal No. 608051 - 132406
14-February-2025
Initial Sketch Plan Submittal (SP1)
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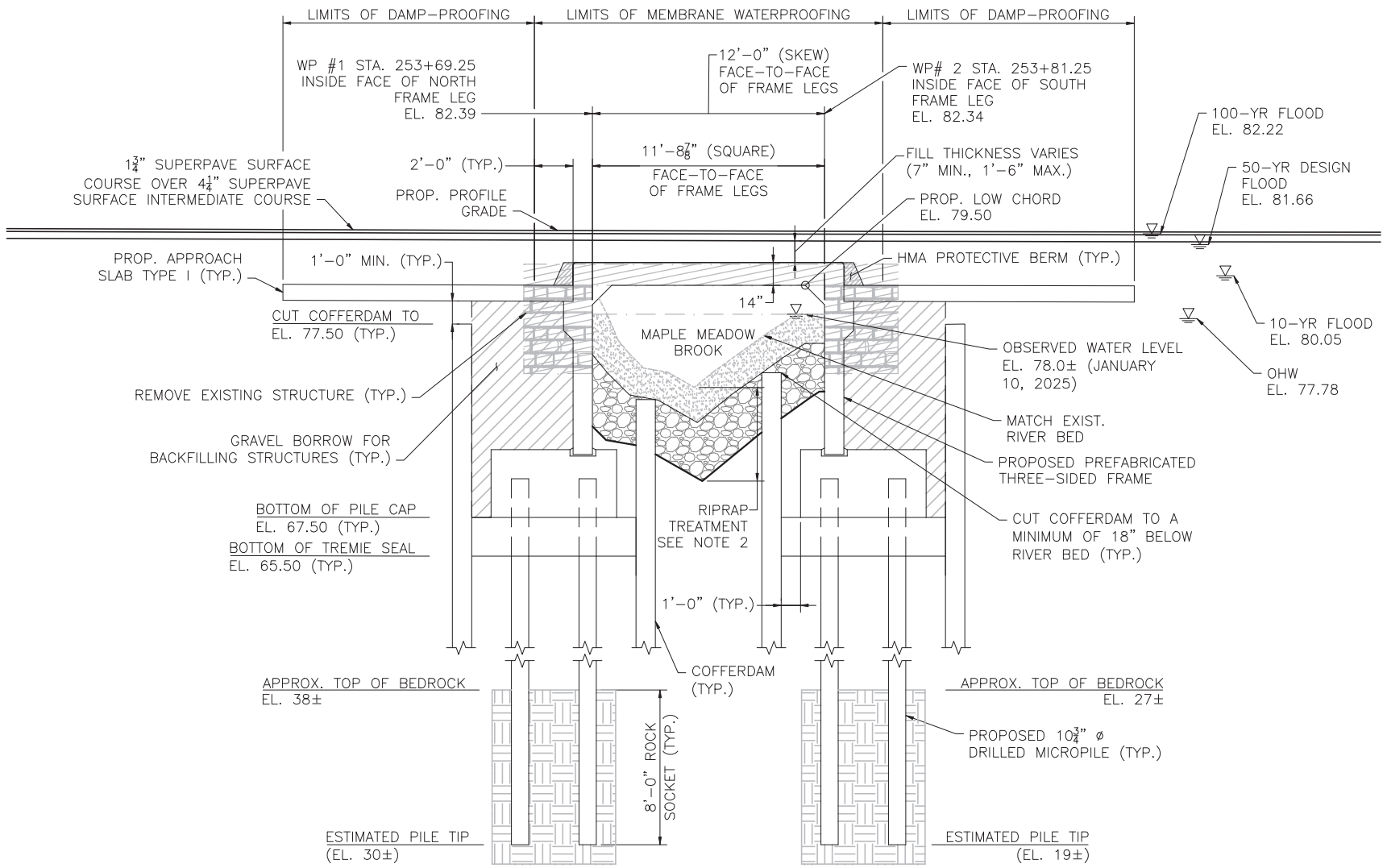
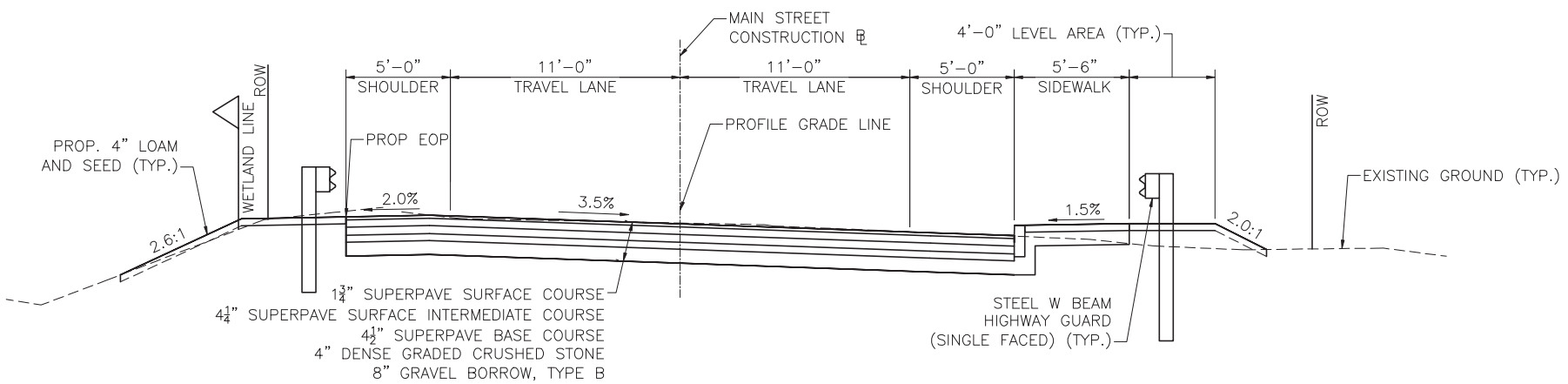


NOTES:
1. ALL HORIZONTAL DIMENSIONS PROVIDED FOR ROADWAY UNDER STRUCTURE ARE SQUARE.
2. 2'-6" DUMPED RIPRAP (M2.02.2) OVER GEOTEXTILE FABRIC. 1'-6" THICK LAYER OF NATURAL STREAMBED MATERIAL TO MATCH EXISTING STREAMBED ELEVATIONS.

TYPICAL LONGITUDINAL SECTION

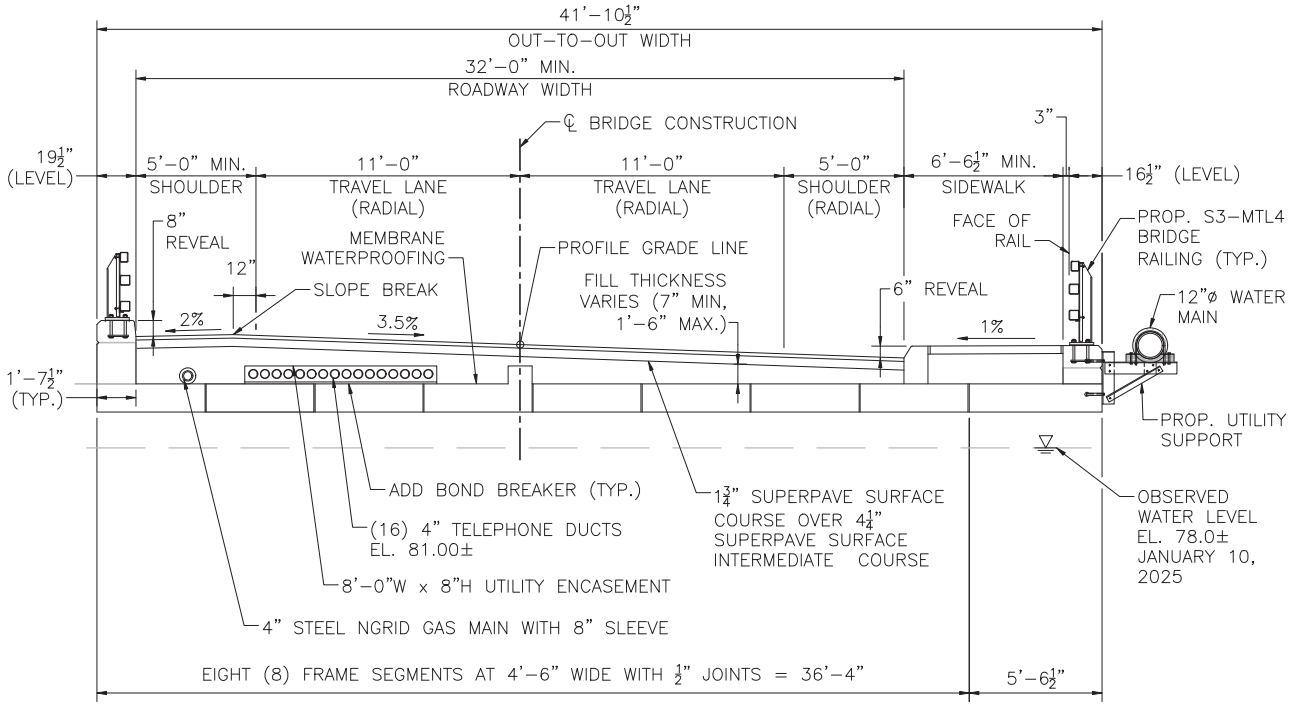
SCALE: 1" = 1'-0"



TYPICAL APPROACH SECTION

SCALE: 1" = 1'-0"

4 0 4 8
SCALE IN FEET



TYPICAL BRIDGE SECTION

SCALE: 1" = 1'-0"

GENERAL NOTES:

1. DIMENSIONS SHOWN INDICATE PRELIMINARY DESIGN DIMENSIONS. CONTRACTOR TO DETERMINE FINAL DIMENSIONS BASED UPON THEIR APPROVED DESIGN.
2. PAVEMENT SHALL CONSIST OF 1¾" SUPERPAVE SURFACE COURSE OVER 4¼" SUPERPAVE SURFACE INTERMEDIATE COURSE.

PILE NOTES:

3. FACTORED AXIAL DESIGN LOAD PER MICROPILE PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS
   - STRENGTH I LIMIT STATE
     FACTORED AXIAL DESIGN LOAD = XXX.X KIPS.
4. THE FACTORED STRUCTURAL PILE RESISTANCE IS XXX.X KIPS AND IS THE PRODUCT OF THE NOMINAL STRUCTURAL RESISTANCE OF XXX.X KIPS AND A RESISTANCE FACTOR OF 0.XX.
5. THE FACTORED GEOTECHNICAL PILE RESISTANCE IS XXX.X KIPS AND IS THE PRODUCT OF THE NOMINAL GEOTECHNICAL RESISTANCE OF XXX.X KIPS AND A RESISTANCE FACTOR OF 0.XX.
6. THE ESTIMATED PILE TIP ELEVATION VARIES (EL. XX.XX TO XX.XX FEET AT NORTH FOOTING AND EL. XX.XX TO XX.XX FEET AT SOUTH FOOTING).

WQC/ACOE PLANS SHEET 63 OF 68

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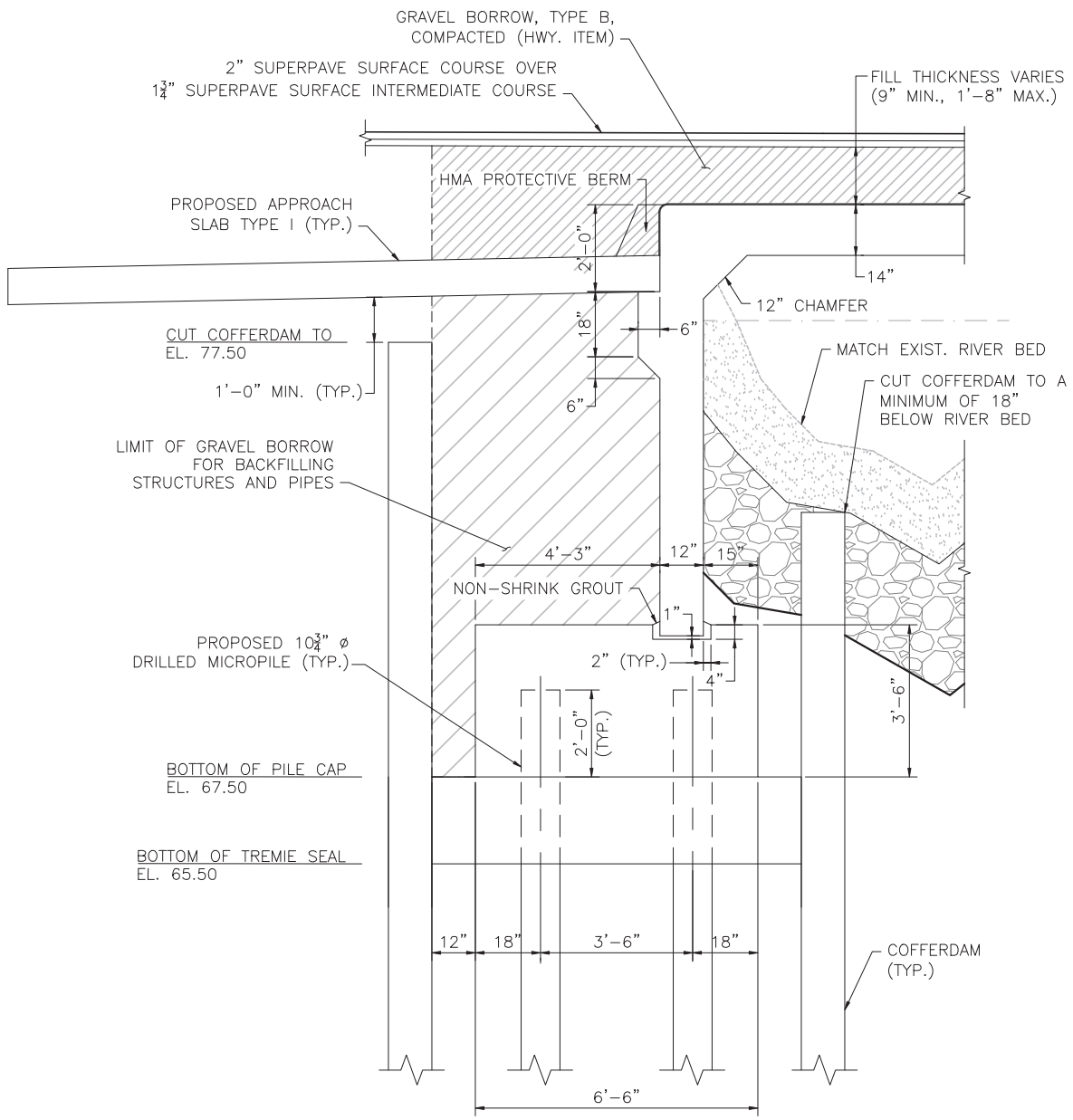
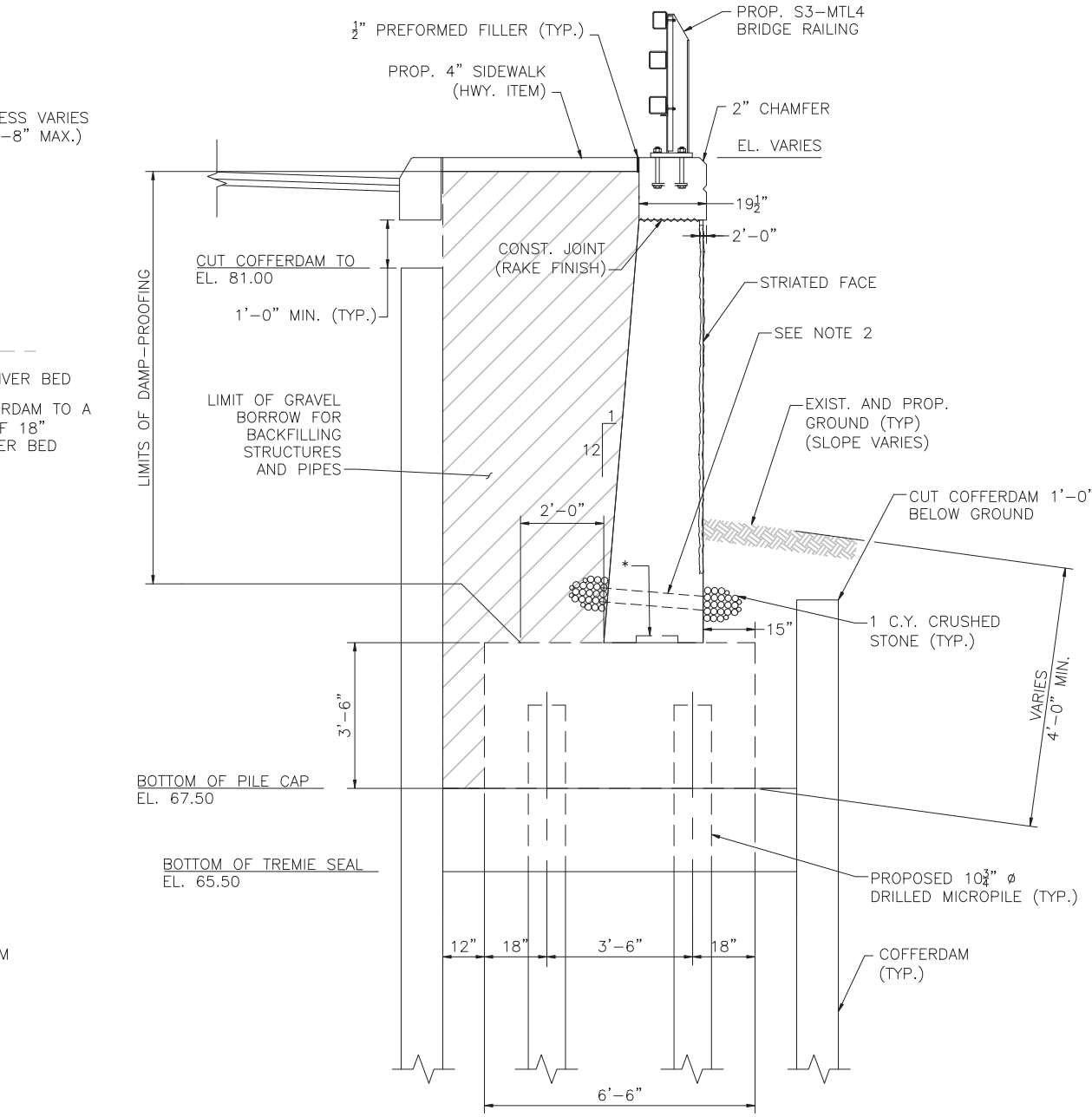


TYPICAL ABUTMENT SECTION

SCALE: 1/4" = 1'-0"



TYPICAL WINGWALL SECTION

SCALE: 1/4" = 1'-0"

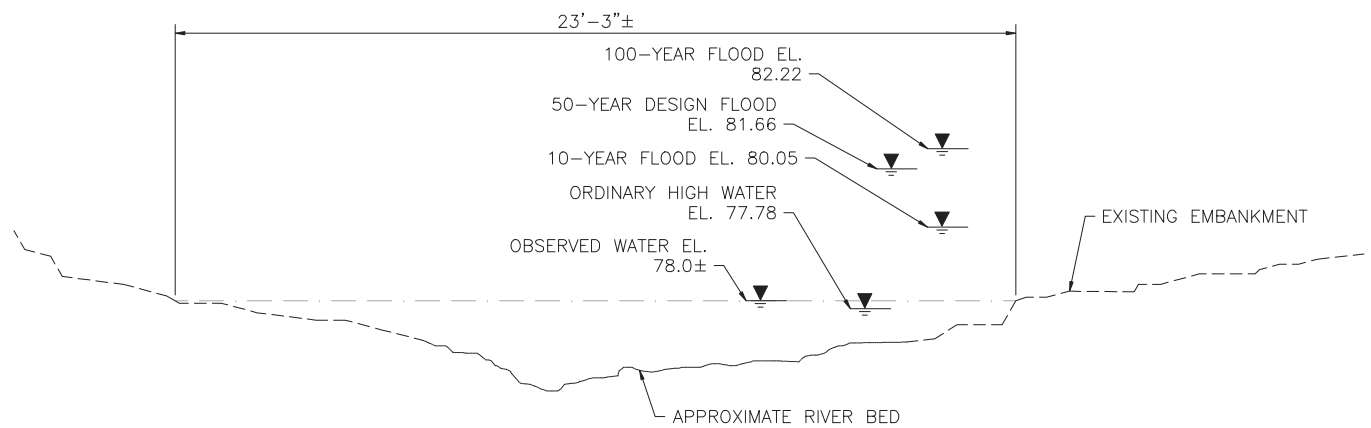
2 0 2 4

SCALE IN FEET

NOTES:

1. SEE RELATED MICROPILE NOTES ON SHEET 4.
2. 4" ø WEEP HOLES 10'-0" O.C. LOCATED 12" ABOVE THE HEEL OF THE FOOTING SLOPING 1" PER FOOT TOWARDS THE FRONT FACE. PROVICE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
3. ALL CONCRETE SHALL BE 5000 PSI HP CONCRETE.

*CONSTRUCTION JOINT WITH 12" X 2" KEY.

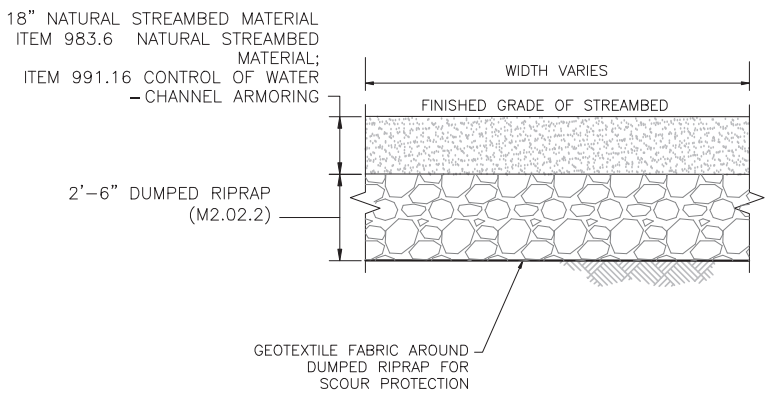


TYPICAL CHANNEL SECTION

SCALE: 3/16" = 1'-0"

2'-8" 0 2'-8" 5'-4"

SCALE IN FEET



CHANNEL ARMORING DETAIL

NOT TO SCALE

WQC/ACOE PLANS SHEET 64 OF 68

A00840 - 374
Proposal No. 608051 - 132406
608051_BR5.DWG Plotted on Mar-25 11:46 AM
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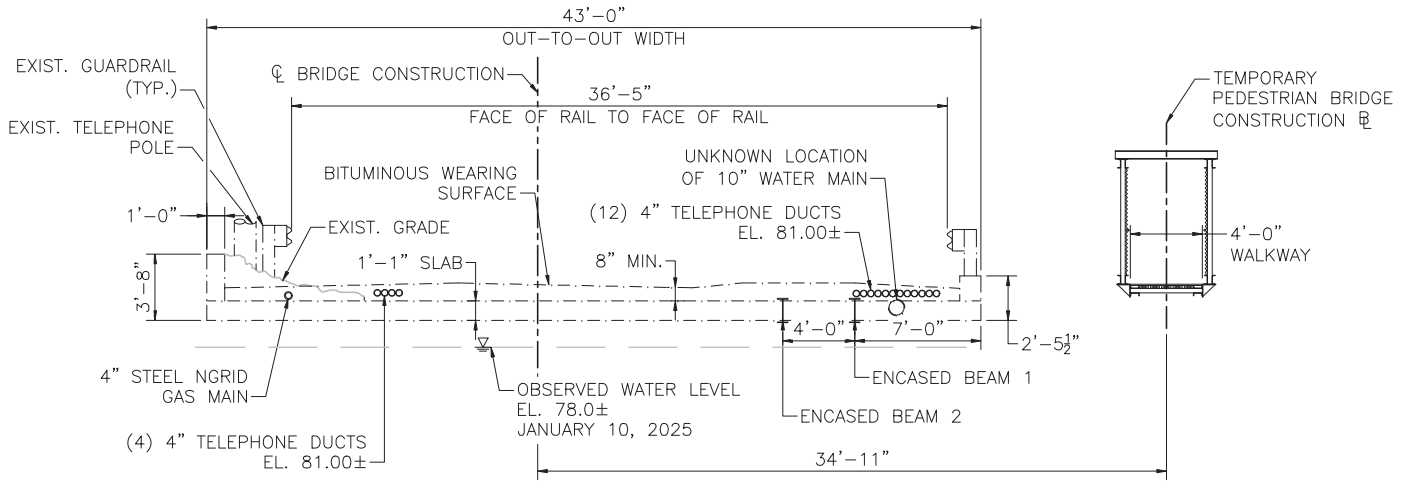
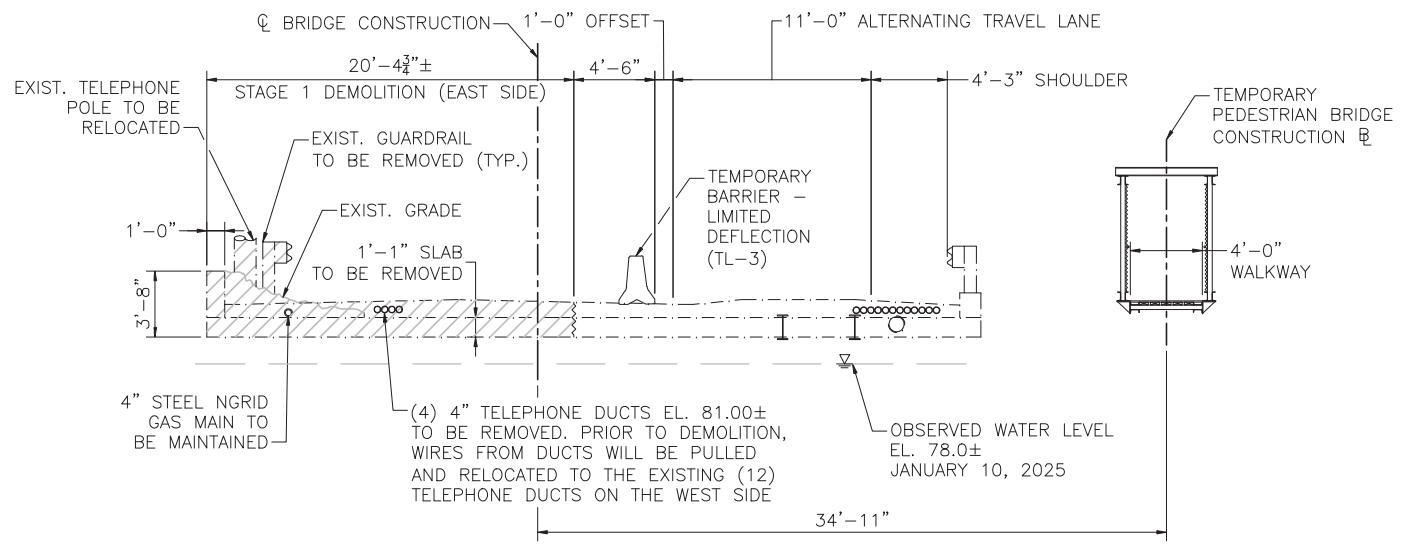


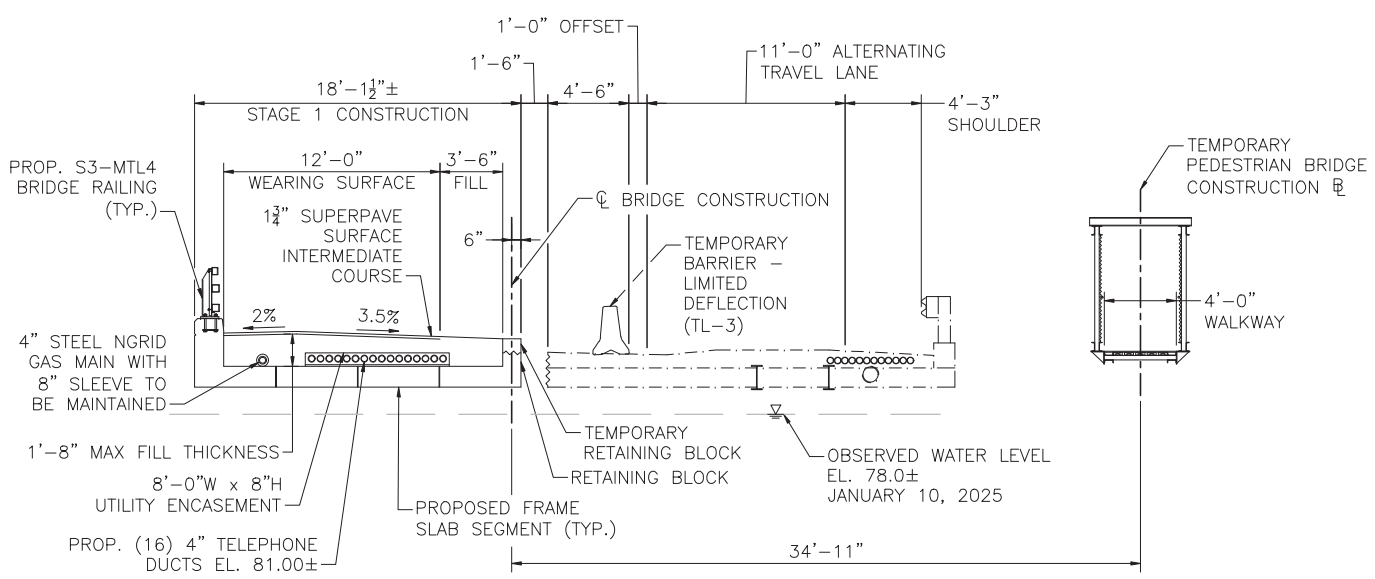
EXISTING BRIDGE SECTION



STAGE I – DEMOLITION OF EAST SIDE

STAGE 1 DEMOLITION

SCALE: 3/32" = 1'-0"



STAGE I – CONSTRUCTION OF EAST SIDE

STAGE 1 CONSTRUCTION

SCALE: 3/32" = 1'-0"

5'-4" 0 5'-4" 10'-8"
SCALE IN FEET

GENERAL STAGE CONSTRUCTION NOTES:

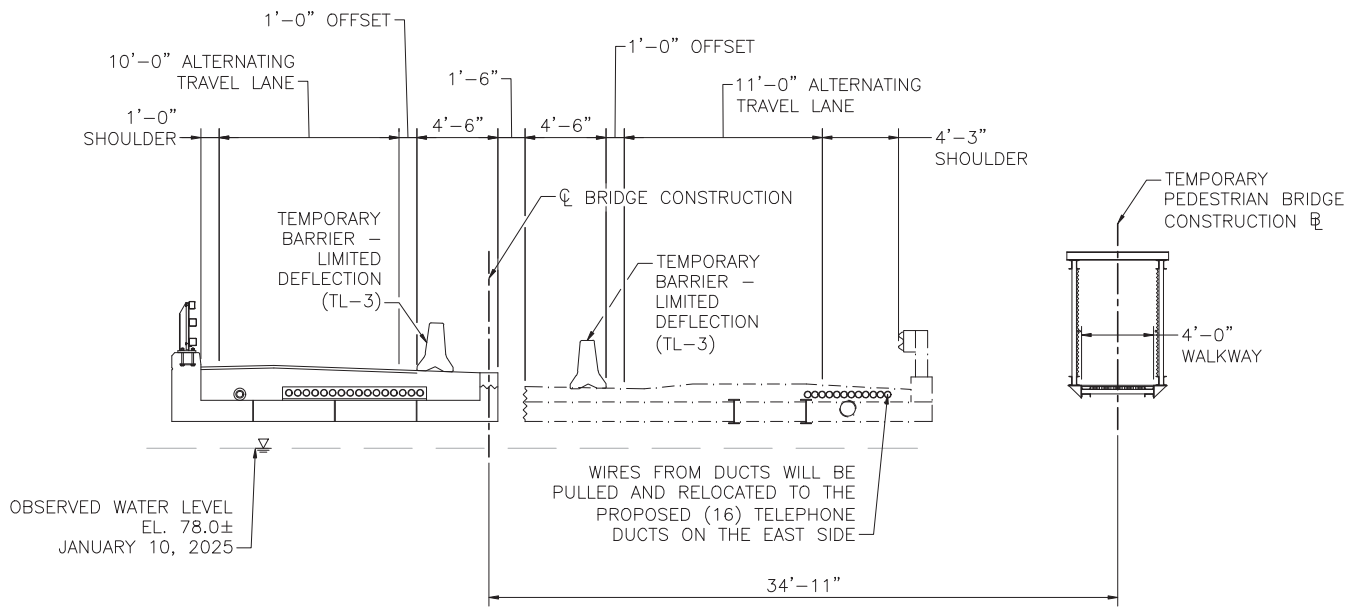
1. SEE HIGHWAY PLANS FOR ADDITIONAL TRAFFIC MANAGEMENT REQUIREMENTS.
2. ALL DIMENSIONS GIVEN ARE SQUARE, EXCEPT AS NOTED.
3. ALL TEMPORARY BARRIERS PLACED ON THE BRIDGE ARE TO BE LIMITED DEFLECTION (TL-3).
4. TEMPORARY BARRIER (TL-3) ON THE ROADWAY AND TEMPORARY BARRIER – LIMITED DEFLECTION (TL-3) ON THE BRIDGE TO MEET CRASH TEST LEVEL 3 STANDARDS.
5. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF TEMPORARY PEDESTRIAN BRIDGE, SEE SHEETS 8 AND 9 FOR DETAILS.

SUGGESTED SEQUENCE OF CONSTRUCTION – STAGE 1

1. INSTALL TEMPORARY PEDESTRIAN BRIDGE AND APPROACH WALKWAYS.
2. VERIZON TO RELOCATE WIRES FROM THE (4) 4" DUCTS TO THE EXISTING (12) TELEPHONE DUCTS ON THE WESTERN SIDE PRIOR TO DEMOLITION.
3. INSTALL TEMPORARY PROTECTIVE SHIELDING.
4. INSTALL TEMPORARY BARRIER – LIMITED DEFLECTION (TL-3) WHERE SHOWN.
5. RELOCATE EXISTING TELEPHONE POLE.
6. TRANSITION TRAFFIC TO ONE-LANE ALTERNATING TRAVEL ON THE WESTERN PORTION OF THE BRIDGE.
7. REMOVE PORTION OF EXISTING STRUCTURE TO LIMIT SHOWN.
8. INSTALL PORTION OF PROPOSED STRUCTURE TO LIMIT SHOWN, INCLUDING FRAME SLAB SEGMENTS, BRIDGE RAILING AND FILL. THIRD FRAME SEGMENT TO INCLUDE RETAINING BLOCK AND TEMPORARY RETAINING BLOCK TO HOLD FILL AS SHOWN. INSTALL PROPOSED (16) TELEPHONE DUCTS AND UTILITY ENCASEMENT ON EASTERN SIDE OF THE NEWLY CONSTRUCTED BRIDGE PORTION.
9. INSTALL 1¾" SUPERPAVE SURFACE INTERMEDIATE COURSE FOR THE LIMITS SHOWN OF THE NEWLY CONSTRUCTED PORTION OF BRIDGE UNDER STAGE 1. AFTERWARDS, INSTALL TEMPORARY BARRIER – LIMITED DEFLECTION (TL-3) AS SHOWN.
10. VERIZON TO PULL WIRES FROM DUCTS AND RELOCATE TO PROPOSED (16) TELEPHONE DUCTS ON THE EASTERN SIDE.

LEGEND

▨ LIMITS OF DEMOLITION



STAGE IA – VERIZON TELEPHONE LINES RELOCATION

WQC/ACOE PLANS SHEET 65 OF 68

A000840 3375
Proposal No. 608051 - 132406
608051_BR6-7.DWG Plotted on Mar-25 11:46 AM
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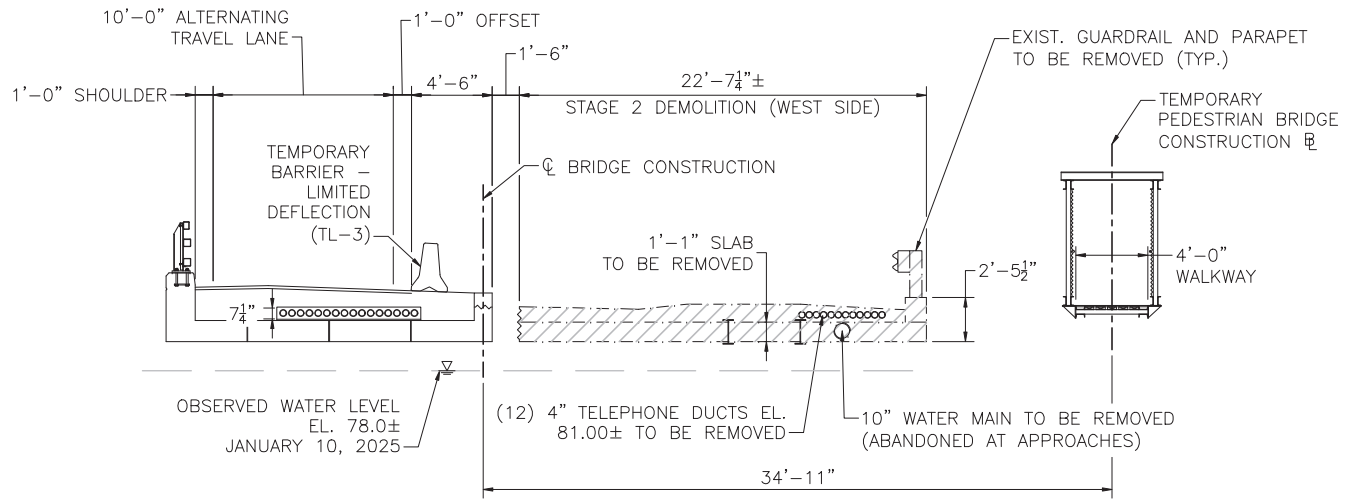
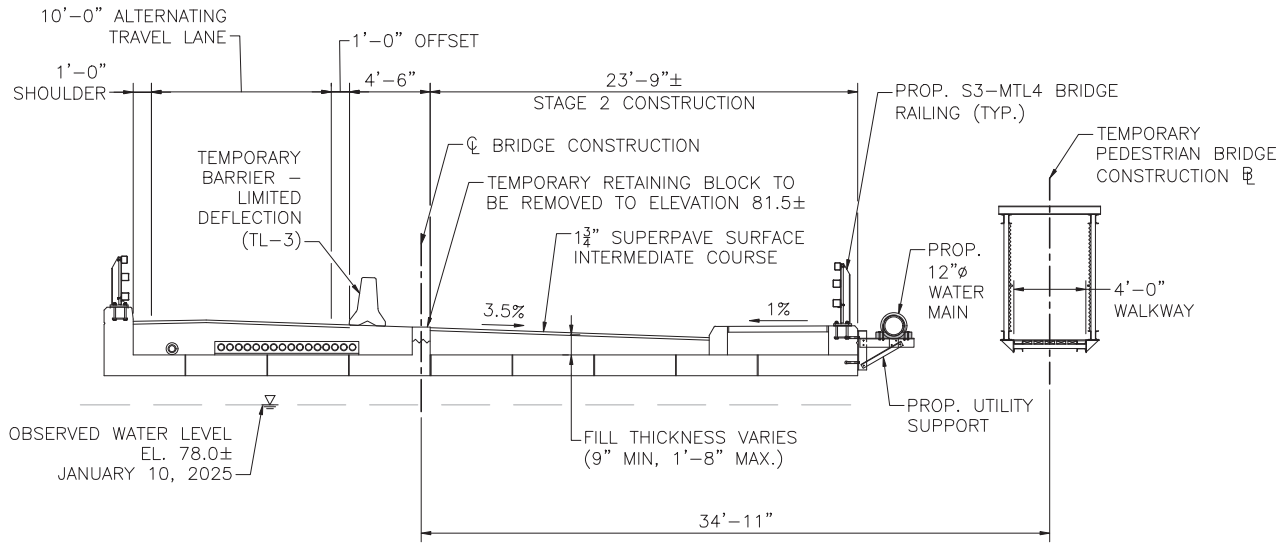
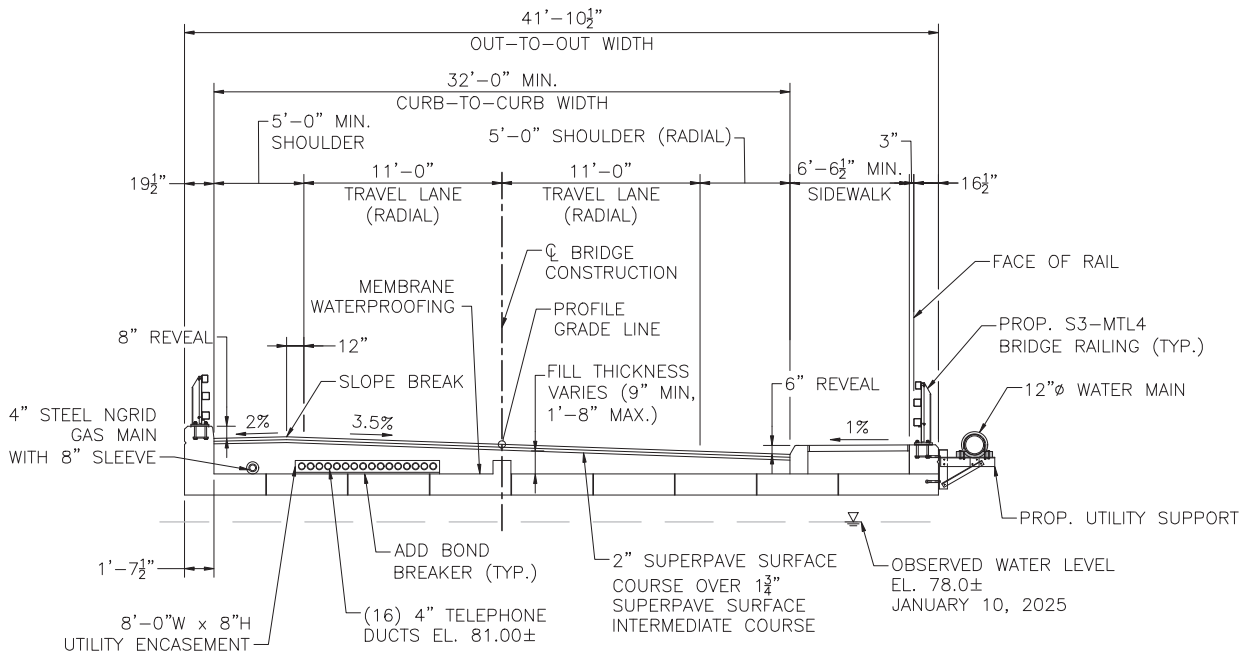


STAGE 2 – DEMOLITION OF WEST SIDE

SCALE: $\frac{3}{32}$" = 1'–0"



STAGE II – CONSTRUCTION OF WEST SIDE



FINAL SECTION

GENERAL STAGE CONSTRUCTION NOTES:

1. REFER TO SHEET 6 FOR GENERAL CONSTRUCTION NOTES.

SUGGESTED SEQUENCE OF CONSTRUCTION – STAGE 2

1. RELOCATE ST 38 (MAIN STREET) ONE–WAY ALTERNATING TRAFFIC TO EASTERN NEWLY CONSTRUCTED PORTION OF THE BRIDGE.
2. REMOVE TEMPORARY BARRIER – LIMITED DEFLECTION (TL–3) FROM THE EXISTING WESTERN PORTION OF THE BRIDGE.
3. REMOVE 10" WATER MAIN.
4. REMOVE (12) 4" TELEPHONE DUCTS.
5. REMOVE THE REMAINING PORTION OF THE EXISTING STRUCTURE FOR THE LIMITS SHOWN.
6. INSTALL REMAINING PART OF THE STRUCTURE, INCLUDING FRAME SEGMENTS, SIDEWALK, BRIDGE RAILING AND FILL TO THE THICKNESS SHOWN, AND REMOVE TEMPORARY RETAINING BLOCK.
7. INSTALL 1¾" SUPERPAVE SURFACE INTERMEDIATE COURSE FOR THE LIMITS OF THE STAGE 2 CONSTRUCTION.
8. CONSTRUCT PROPOSED UTILITY SUPPORT AND INSTALL 12" DIAMETER WATER MAIN.
9. REMOVE TEMPORARY BARRIER – LIMITED DEFLECTION (TL–3).
10. AFTER CONSTRUCTION OF THE WORK SHOWN UNDER THE STAGE 2 LIMITS, 1¾" SUPERPAVE SURFACE INTERMEDIATE COURSE SHALL BE INSTALLED OVER REMAINING WIDTH OF THE BRIDGE (4'–6"). THEN, THE FINAL 2" SUPERPAVE SURFACE COURSE SHALL BE INSTALLED FOR THE FULL WIDTH OF THE STRUCTURE. .
11. OPEN THE STRUCTURE TO TWO–WAY TRAFFIC AND TO PEDESTRIAN TRAFFIC IN THE FINAL CONDITION.
12. REMOVE TEMPORARY PEDESTRIAN BRIDGE, APPROACH WALKWAYS, AND CUT/REMOVE TEMPORARY SHEETING.

LEGEND

LIMITS OF DEMOLITION

STAGE 2 CONSTRUCTION

SCALE: $\frac{3}{32}$" = 1'–0"

5'-4" 0 5'-4" 10'-8"

SCALE IN FEET

A00840 - 376

Proposal No. 608051 - 132406

608051_BR6-7.DWG Plotted on Mar-25 11:46 AM

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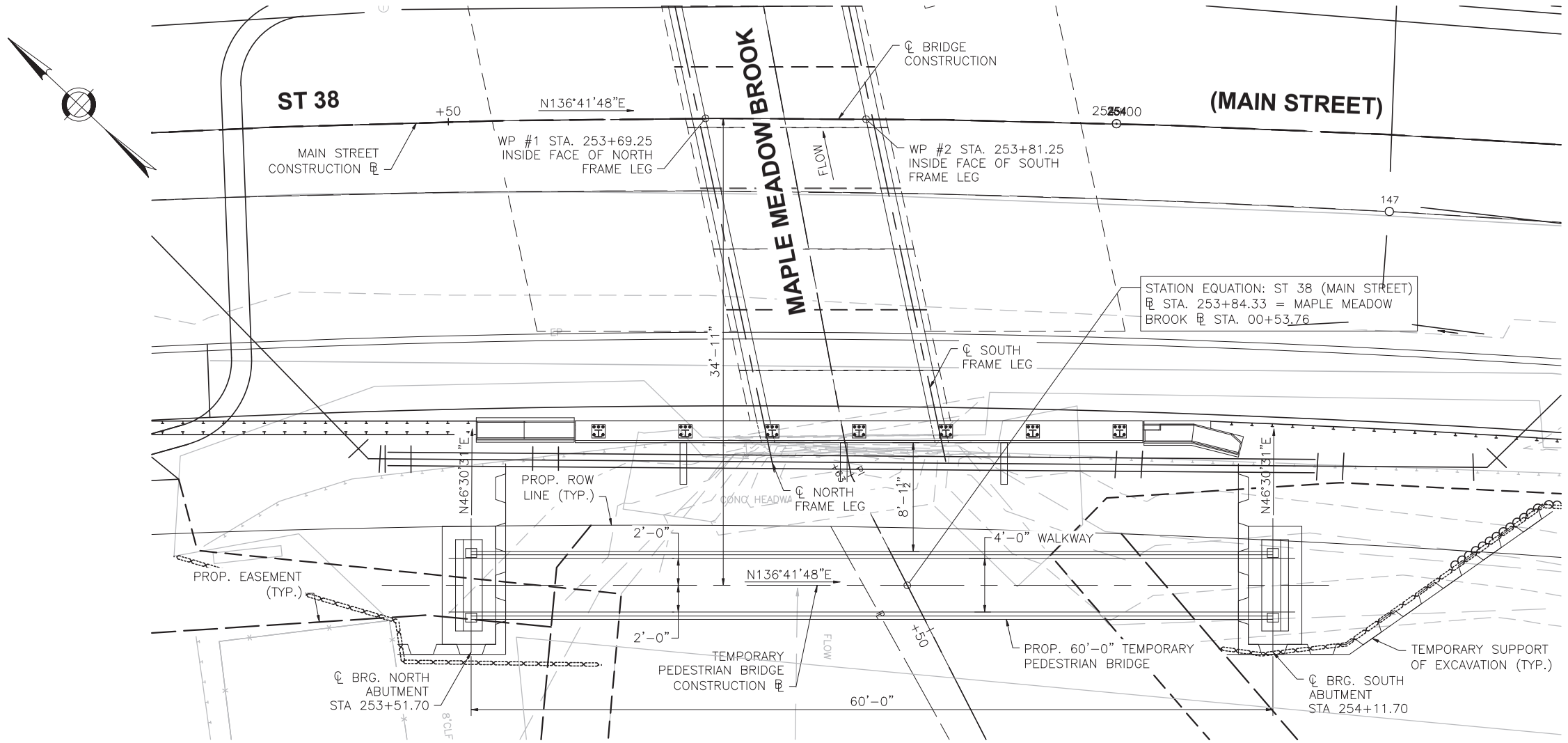
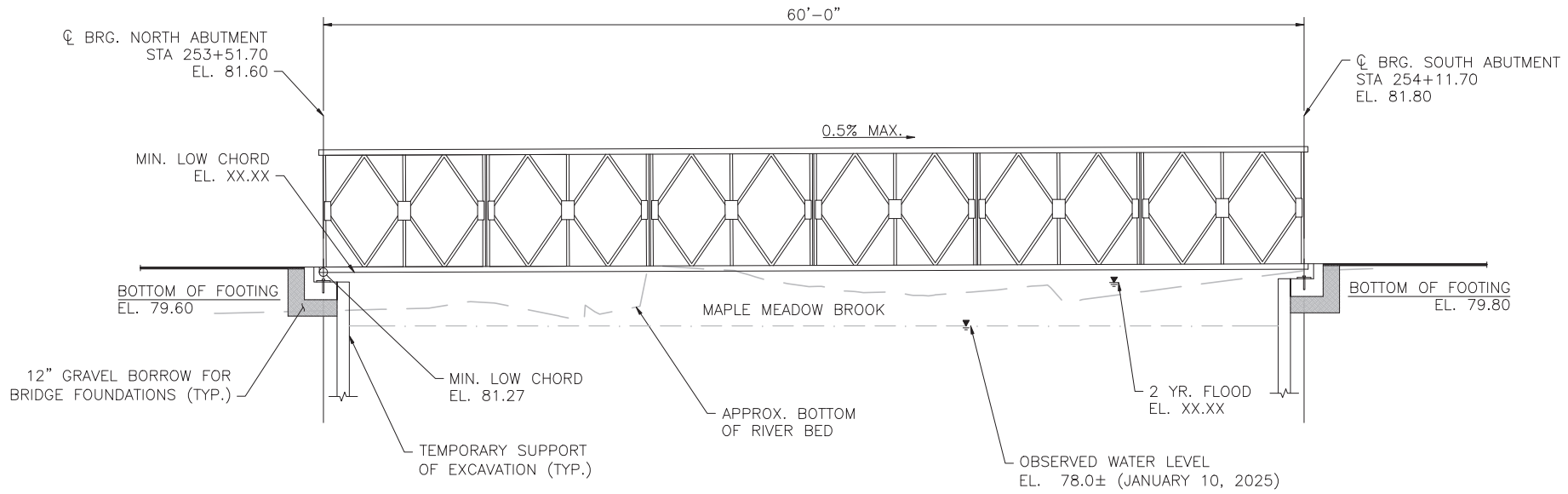


NOTE:

CHANNEL ARMORING NOT SHOWN FOR CLARITY.

TEMPORARY PEDESTRIAN BRIDGE PLAN

SCALE: 1" =10'



TEMPORARY PEDESTRIAN BRIDGE ELEVATION

SCALE: 1" = 10'

5 0 5 10

SCALE IN FEET

NOTES:

1. PRE-ENGINEERED TEMPORARY PANELIZED BRIDGE SHOWN. ACTUAL BRIDGE TYPE TO BE DETERMINED AND DESIGNED BY CONTRACTOR TO MEET SPAN, WIDTH AND LOW CHORD REQUIREMENTS.
2. THE TEMPORARY PEDESTRIAN BRIDGE SHALL BE DESIGNED ACCORDING TO THE LATEST EDITION OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, THE LATEST EDITION OF THE AASHTO GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES AND THE FOLLOWING MINIMUM DESIGN LOAD:

   PEDESTRIAN LIVE LOAD: 90 PSF
   WIND LOAD: PER ABOVE AASHTO GUIDELINES

3. CONTRACTOR TO DESIGN SUBSTRUCTURE INCLUDING TEMPORARY ABUTMENTS AND BACKWALLS.
4. AFTER THE CONSTRUCTION AND OPENING OF THE PROPOSED VEHICULAR BRIDGE, THE TEMPORARY PEDESTRIAN BRIDGE, INCLUDING ABUTMENTS AND OTHER RELATED ITEMS SHALL BE REMOVED, AND THE AREA RESTORED TO ITS EXISTING OR PROPOSED CONDITION.
5. SEE SPECIAL PROVISIONS FOR OTHER REQUIREMENTS FOR THE TEMPORARY PEDESTRIAN BRIDGE.
6. CONCRETE FOR THE SUBSTRUCTURE OF TEMPORARY BRIDGE SHALL BE 4000 PSI, ¾ IN, 610 CEMENT CONCRETE.
7. CONTRACTOR TO COORDINATE WITH DIG-SAFE FOR ANY UNDERGROUND UTILITIES TO AVOID CONFLICT BEFORE PLACEMENT OF CRUSHED STONE FOR SLOPE TREATMENT AND TEMPORARY ABUTMENT.

Proposal No. 608051 - 132406
Plotted on Mar-25 11:47 AM
608051_BR8.DWG
14-February-2025
Initial Sketch Plan Submittal (SP1)
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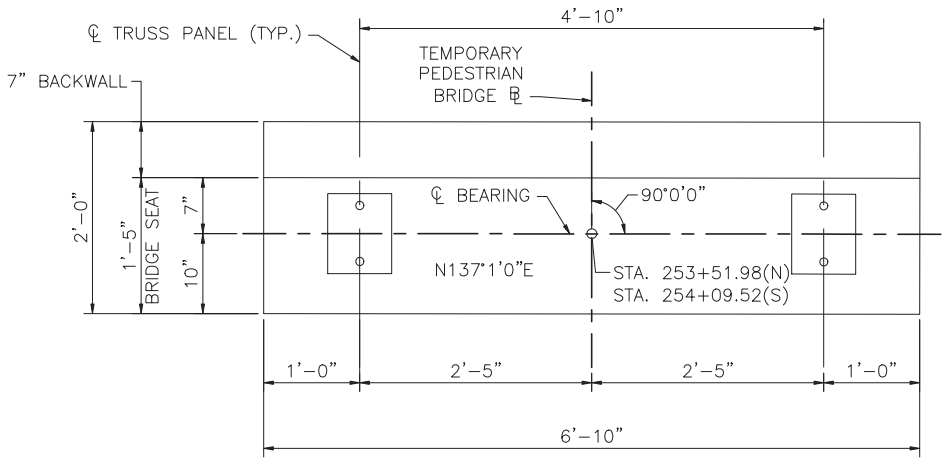
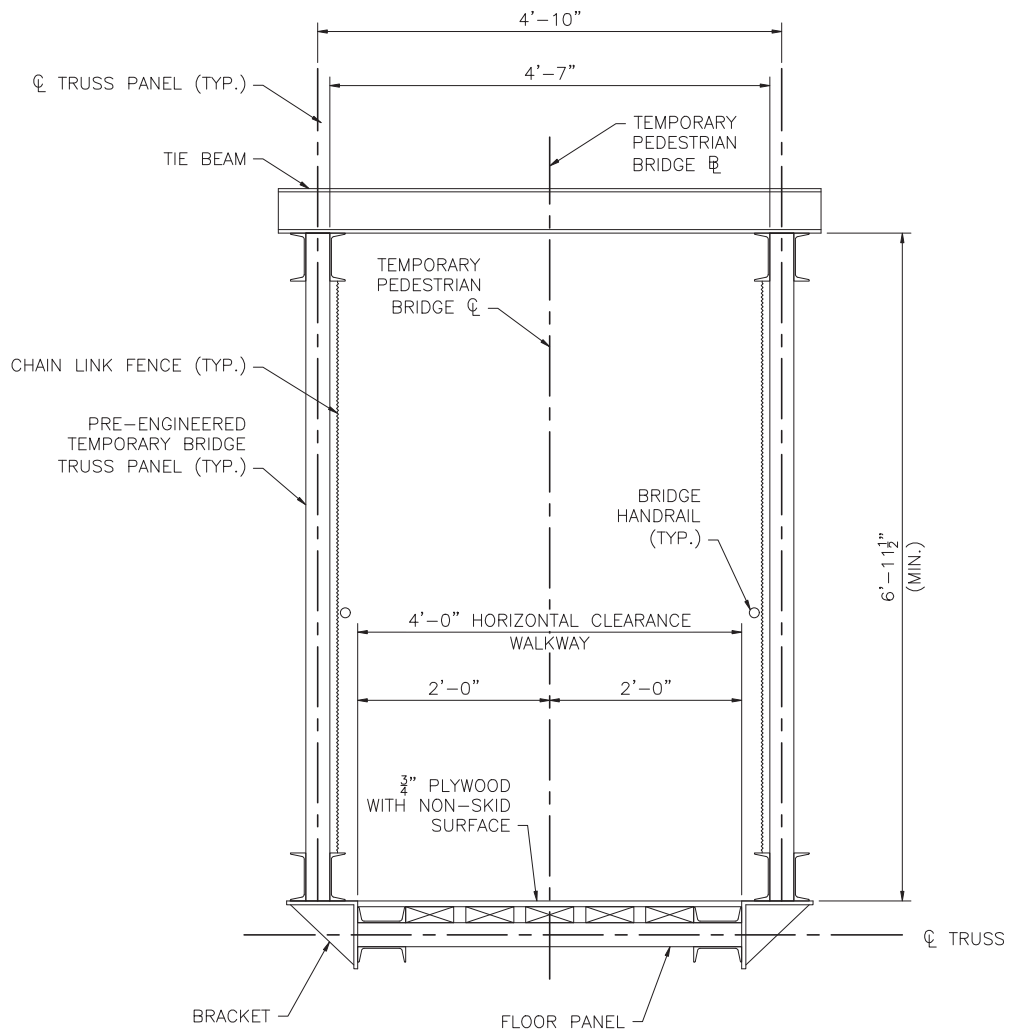


NOTE:

NORTH ABUTMENT SHOWN, SOUTH ABUTMENT SIMILAR.

TEMPORARY PEDESTRIAN BRIDGE ABUTMENT PLAN

SCALE: 1" = 2'–0"

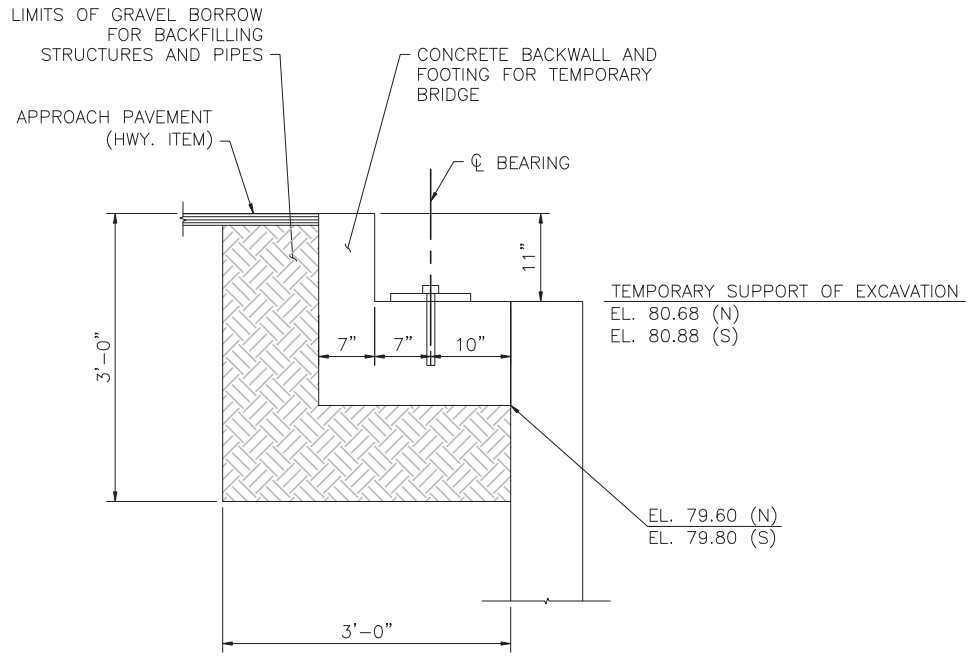


TEMPORARY PEDESTRIAN BRIDGE TRANSVERSE SECTION

SCALE: 1" = 2'–0"

1 0 1 2

SCALE IN FEET



TEMPORARY PEDESTRIAN BRIDGE ABUTMENT SECTION

SCALE: 1" = 2'–0"

TEMPORARY PEDESTRIAN BRIDGE NOTES:

1. ALL DETAILS AND DIMENSIONS SHOWN ARE CONCEPTUAL. CONTRACTOR SHALL DESIGN THE TEMPORARY PEDESTRIAN BRIDGE SUPERSTRUCTURE AND SUBSTRUCTURE IN ACCORDANCE WITH NOTES ON SHEET 8.
2. ABUTMENT ELEVATIONS ARE BASED ON AVAILABLE BRIDGE DATA AND A 2 IN. BEARING HEIGHT. THE CONTRACTOR SHALL ADJUST AS NEEDED.

A00840 378
608051_BR9.DWG Plotted on Mar-25 11:47 AM
Proposal No. 608051 - 132406
Initial Sketch Plan Submittal (SP1) 14-February-2025
WQC/ACOE PLANS SHEET 68 OF 68

ATTACHMENT I – STORMWATER REPORT

Stormwater Management Report

Reconstruction of Route 38 (Main Street)

Wilmington, MA

PREPARED FOR

massDOT

10 Park Plaza
Boston, MA 02116

PREPARED BY

Green International Affiliates
100 Ames Pond Drive, Suite 200
Tewksbury, MA 01876

January 2025

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Appendix A: MassDEP Checklist for Stormwater Report

Appendix B: Soils and FEMA Information

Appendix C: Supporting Calculations

Appendix D: Hydraulic and Hydrologic Data

Appendix E: O&M Plan and LTPPP

1

Introduction

To: MassDOT

Date: 1/23/2025

Project No: 608051

From: Green International Affiliates Inc.

Re: Reconstruction of Route 38 (Main Street)

This Stormwater Management Report has been prepared to demonstrate compliance with the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) and Water Quality Certification Regulations (314 CMR 9.00). Appendix A includes a completed Massachusetts Department of Environmental Protection (MassDEP) Checklist for Stormwater Report, stamped by a professional engineer.

The project follows the guidance presented in the MassDOT Stormwater Handbook (the Handbook), and stormwater management systems are designed in accordance with MassDEP Standards.

The following MassDOT standard methodologies are being employed in this project:

- Use of Macro Approach for Standards 2, 3, and 4 to meet requirements to the maximum extent practicable.

2

Project Summary

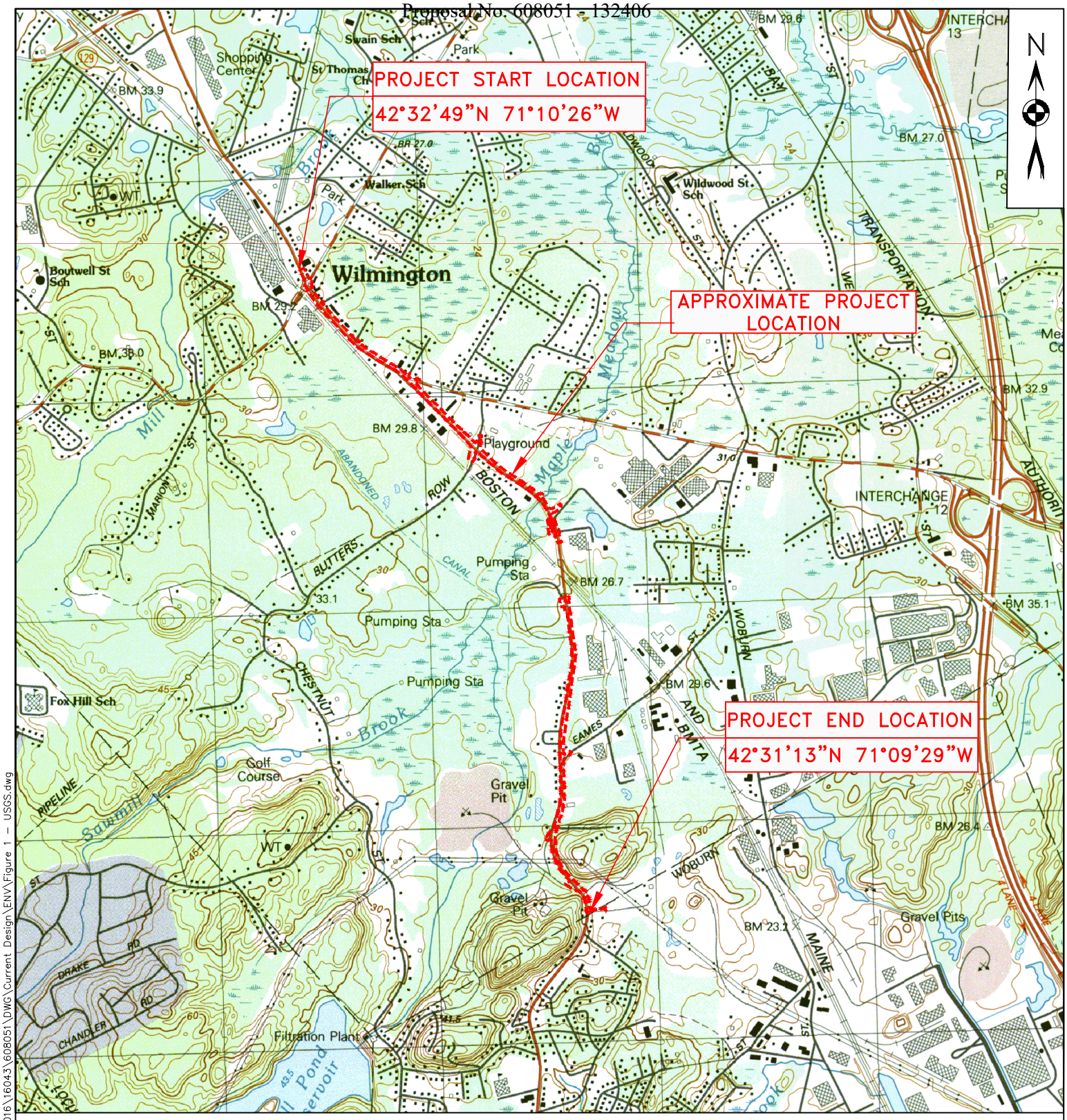
On behalf of MassDOT (Applicant), Green International Affiliates, Inc (Green) is submitting this Stormwater Management Report to accompany the Notice of Intent Application to the Wilmington Conservation Commission for roadway, safety, and drainage improvements on Route 38 (Main Street) in the Town of Wilmington.

The project MassDOT Project No. 608051 consists of the reconstruction/rehabilitation of Route 38 (Main Street) from the Woburn Town Line to the Route 62 (Burlington Avenue/Church Street) intersection (approximately 2.2 miles). The proposed roadway curb to curb width is 32 feet with sidewalk(s) along the project corridor. The proposed improvements consist of maintenance and improvement of the existing roadway. The work includes improving existing drainage systems, improving existing water system, constructing sidewalks, repaving, and minor sewer improvements. As the proposed project is a roadway project, it is therefore categorized as a "Redevelopment Project" under the Massachusetts Stormwater Management Standards. The project is required to meet only Standards 2 & 3 and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5 & 6 to the maximum extent practicable.

The combined project provides an opportunity to improve the existing drainage system and improve the quality of stormwater runoff discharged to adjacent wetlands. This project will incorporate the installation of three infiltrating Stormwater Control Measures (SCMs) located at approximate station 270+00 south of the railroad crossing bridge replacement, station 305+00 at the northern intersection of Old Main St and Main St, and 314+00 at the southern intersection of Old Main St and Main St. The goals of the proposed stormwater improvements are to improve public safety on the roadway by reducing ponding on the roadway, to control the flow of stormwater discharged to the wetlands, and to improve the water quality of discharged stormwater, to the maximum extent that it is practical.

The following report was created in accordance with the "Massachusetts Stormwater Handbook" last revised in January 2008. The report is organized into sections that correspond to the categories listed in the "Massachusetts Stormwater Report Checklist." The checklist is included in Appendix A of this report along with a "Redevelopment Checklist." The following is a more detailed description of the existing and proposed drainage areas and the design methodology for this project.

See Figure 1 for the Project Locus Map.



LEGEND:

APPROXIMATE PROJECT AREA

SCALE IN FEET

1000 0 1000 2000

1" = 2000'

ELEVATIONS IN METERS

NOTE: DATA TAKEN FROM MASSGIS

USGS LOCUS MAP

WILMINGTON – RECONSTRUCTION ON ROUTE 38 (MAIN STREET)
FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS
100 AMES POND DRIVE, SUITE 200, TEWKSBURY, MA
24 ALBION RD, LINCOLN, RI (401) 305-7895

PREPARED FOR:
massDOT
Massachusetts Department of Transportation
Highway Division

SCALE: AS NOTED	PROJECT NO. 13033.19
DATE: 01/09/2025	DRAWN BY: VR/EL
REVISED:	CHECKED BY: OF

FIGURE 1

\\EgnyteDrive\greenint\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\ENV\Figure 1 – USGS.dwg

3

Existing Conditions

The existing site can be analyzed as 27 watershed areas that contribute runoff to 21 discharge points. The existing drainage areas are delineated in Figure 6 – Existing Watershed Plan. For the purpose of this hydrologic analysis, the following assumptions were made:

- When the watershed boundary fell outside of the limit of work an arbitrary line was delineated as the watershed boundary.
- The total watershed area for the existing conditions is used as the comparison base for the watershed area in the proposed conditions.

The project on Route 38 extends from the Woburn Town Line in the south to the Route 62 (Burlington Avenue/Church Street) intersection in the north. Route 38 is a State Highway. Route 38 is located within a public right-of-way which is typically fifty (50) feet wide. The existing pavement width varies between 30 and 34 feet. The pavement width increases to approximately 50 feet at the Burlington Avenue / Church Street intersection, with a wider right-of-way at this location. There is an existing sidewalk on the east side of the road from Church Street to 579 Main Street (Heavenly Donuts). There is an existing sidewalk on both sides of the roadway from 579 Main Street to just south of the Lowell Street intersection. There are no existing sidewalks from just south of the Lowell Street intersection to the Woburn Town Line. The total length of the project is approximately 2.2 miles.

Wetlands exist on both sides of Route 38 immediately adjacent to the roadway for much of the project length. They are connected by existing culverts which cross the roadway at three locations in the northern portion of the project.

The existing drainage system on the roadways within the project limits includes portions of "country drainage" (i.e. no curb), where the runoff sheet flows off the pavement into the pervious shoulder, roadside ditches, or private front yards. There are lengths of bituminous berm gutter, where the road runoff flows as concentrated flow to catch basins, or to a point where the berm discontinues, and the runoff flows onto adjacent wetland or wooded areas as shallow concentrated flow. Vertical curb is present in the northern portion of the site (EDA 1, 2, 3, 4) and on the inside of the southernmost bend on the site near the Woburn Town line (EDA-20).

There are separate closed drainage systems spread throughout the project, servicing EDA-1 and parts of EDA-3, 4, 5, 7A, 9A, 12, 13, 14A, 16, 18A, 18B, and 20. Three of the drainage areas contribute to closed pipe networks that flow away from the project (EDA 1, 2, and EDA-20).

There is one existing stormwater basin located in EDA-18B which collects runoff from part of Old Main Road. This basin outfalls to DP-18 at Wetland H. The project does not contribute runoff to this existing basin in the proposed condition.

The existing drainage areas are described below and key statistics about each area are shown in Table 1 – Existing Drainage Areas. The landcover of all areas is predominated by impervious roadway and parking areas.

DRAINAGE AREA EDA-1

This area consists of impervious roadway and sidewalk. Stormwater runoff from this area travels via gutter flow and discharges to catch basins. These catch basins connect to an existing closed drainage network that flows north away from the project to DP-1.

DRAINAGE AREA EDA-2

This area consists mostly of impervious roadway and sidewalk. Stormwater runoff from this area travels via gutter flow eastward and discharges to DP-2, located at the project limit. Catch basins capture the runoff approximately sixty (60) ft beyond the project limit.

DRAINAGE AREA EDA-3

This area consists mostly of impervious roadway and sidewalk. At the northern end of this area the road is superelevated, pitching towards the east and south. The road transitions to crowned about 100 feet south of Kirk Street. Stormwater runoff from this area travels via gutter flow on the east side and overland flow on the west side into three catch basins as part of a closed drainage system that discharges to DP-3. This drainage system outfalls beyond the site limits but it is assumed it outfalls to Wetland A, which discharges to the same wetland as DP-4. There is a 10" PVC pipe crossing beneath the road at DP-3 location which provides a low flow connection between the Wetland southwest of the train tracks beyond our project limits at DP5 and Wetland A at DP3. This pipe connection was not included in the hydrologic analysis because it was assumed to convey a negligible flow during the events analyzed. The wetland southwest of the train tracks (DP-5) is hydraulically connected to Wetland A (DP-3, DP-4) via the existing 3.5' x 1.5' culvert at DP-6 to DP-4.

DRAINAGE AREA EDA-4

This area consists mostly of impervious roadway and sidewalk. This area includes area from Route 38, intersecting streets, and adjacent properties. Stormwater runoff from this area travels via gutter flow along the curb into existing catch basins of a closed network that discharges northeast to DP-4 at Wetland A.

DRAINAGE AREA EDA-5

This area consists mostly of woodland area alongside the train tracks and impervious roadway on the western side of Route 38. Stormwater runoff from this area travels via overland flow into two catch basins of a closed drainage system that discharges to DP-5, which outfalls to the Wetland southwest of the tracks beyond the project limits. As stated above, there is an existing 10" PVC pipe connection from DP5 to DP3 and was not modeled in the hydrologic analysis. The wetland southwest of the train tracks (DP-5) is hydraulically connected to Wetland A (DP-3, DP-4) via the existing 3.5' x 1.5' culvert at DP-6 to DP-4.

DRAINAGE AREA EDA-6

This area consists mostly of impervious roadway and impervious parking lot on the southbound side of Route 38. Stormwater runoff from this area travels via overland into a BVW at the upstream end of the existing box culvert connecting the Wetland southwest of the train tracks (DP-5) to Wetland A (DP-3, DP-4).

DRAINAGE AREA EDA-7A

This area consists mostly of impervious roadway on the northbound side of Route 38 between Lowell Street and Cross Street. Stormwater runoff from this area travels via a combination of gutter flow and country drainage. There are two catch basins that collect most of the gutter flow and outfalls at the low point to DP-7 at Wetland D. Wetland D (DP-7) is hydraulically connected to Wetland C (DP-8) via a 36" diameter culvert.

DRAINAGE AREA EDA-7B

This area consists mostly of impervious roadway on cross street and a portion of its intersection with Route 38. Cross Street is superelevated in this area and stormwater runoff from this area travels via overland flow to the adjacent forested area and eventually to DP-7 at Wetland D. Wetland D (DP-7) is hydraulically connected to Wetland C (DP-8) via a 36" diameter culvert.

DRAINAGE AREA EDA-8A

This area consists mostly of impervious roadway on the southbound side of Route 38 between Lowell Street and Butters Row. Stormwater runoff from this area travels via gutter flow and country drainage. There is a break in the bituminous berm at the low point to allow the catchment area to discharge to DP-8 at Wetland C via overland flow.

DRAINAGE AREA EDA-8B

This area consists mostly of impervious roadway on a portion of the intersection of Route 38 and Butters Row Stormwater runoff from this area travels via country drainage and discharges overland to DP-8 at Wetland C.

DRAINAGE AREA EDA-9A

This area consists mostly of impervious roadway on both sides of Route 38. Stormwater runoff from this area travels via gutter flow and country drainage. There is a small separate closed drainage system that collects the area within this sub catchment that appears to outfall to DP-9 at Wetland E. Although, the existing outfall was not found in the field and CCTV could not locate the outfall because of blockage within the pipe. The pipe travels in the direction of DP-9; therefore it is assumed to outfall to DP-9.

DRAINAGE AREA EDA-9B

This area consists mostly of impervious roadway on the east side of Route 38. Stormwater runoff from this area travels via country drainage and discharges overland east to DP-9 at Wetland E.

DRAINAGE AREA EDA-10A

This area mostly consists of impervious roadway on both sides of Route 38. Stormwater runoff from this area travels via gutter flow and country drainage. The stormwater on the east side of roadway uses a natural berm and the west side of roadway sheet flows off the roadway. The roadway is mostly superelevated discharging stormwater from both sides of the roadway south to DP-10 at Wetland G. Wetland G (DP-10) is hydraulically connected to Wetland E (DP-9) via a 144" box culvert.

DRAINAGE AREA EDA-10B

This area mostly consists of impervious roadway on the western side of Route 38 that is part of both MassDOT Projects No. 608051 and 607327. Stormwater runoff from this area travels via a combination of gutter flow and country drainage. The stormwater discharges west via overland flow to DP-10 at Wetland G. Wetland G (DP-10) is hydraulically connected to Wetland E (DP-9) via a 144" box culvert.

DRAINAGE AREA EDA-11

This area mostly consists of impervious roadway on the eastern side of Route 38 that is part of both MassDOT Projects No. 608051 and 607327. Stormwater runoff from this area travels via a combination of gutter flow and country drainage. The stormwater discharges east via overland flow to DP-11 at Wetland I.

DRAINAGE AREA EDA-12

This area mostly consists of impervious roadway on the eastern side of Route 38 that is part of both MassDOT Projects No. 608051 and 607327. Stormwater runoff from this area travels via gutter flow. This area discharges to the east via overland flow and a catch basin outfalling at DP-12.

DRAINAGE AREA EDA-13

This area mostly consists of previous grass and bituminous driveways on the eastern side of Route 38. Stormwater runoff from this area travels via overland flow to a grassed depression at DP-13. There is a record headwall and culvert at DP-13 that outfalls across Route 38 to DP-14.

DRAINAGE AREA EDA-14A

This area mostly consists of impervious roadway on the southbound side of Route 38 that is part of both MassDOT Projects No. 608051 and 607327. Stormwater runoff from this area travels via gutter flow. Runoff sheet flows off the road at the Dog Park parking lot and travels overland to DP-14.

DRAINAGE AREA EDA-14B

This area mostly consists of impervious roadway on both sides of Route 38. Stormwater runoff from this area travels via gutter flow. At the low point, the east side enters a catch basin and outfalls across the street to the west at DP-14. At the low point, the west side has a break in the bit berm where it sheet flows off the road to west at DP-14.

DRAINAGE AREA EDA-15

This area mostly consists of impervious roadway on the northbound side of Route 38. Stormwater runoff from this area travels via country drainage into a wooded depression area at DP-15.

DRAINAGE AREA EDA-16

This area mostly consists of impervious roadway on the northbound side of Route 38. Stormwater runoff from this area travels via country drainage into a wooded depression area at DP-16. There is an existing catch basin with no visible outlet pipe at the time of survey.

DRAINAGE AREA EDA-17

This area mostly consists of impervious roadway and driveways on the southbound side of Route 38. Stormwater runoff from this area travels via country drainage and discharges to the west at DP-17.

DRAINAGE AREA EDA-18A

This area mostly consists of impervious roadway on both sides Route 38, Eames Street, and Cook Avenue. This area also includes a large offsite area south of Cook Ave consisting mostly of woods and gravel roads. Stormwater runoff travels via a combination of gutter flow, country drainage, and overland flow. There is a closed drainage system that outfalls to DP-18 at Wetland H.

DRAINAGE AREA EDA-18B

This area mostly consists of a small section of impervious roadway from Old Main St and the adjacent property. Stormwater runoff travels via sheet flow into a closed drainage system within the adjacent property. The closed drainage system enters an existing infiltration SCM that overflows to DP-18 at Wetland H.

DRAINAGE AREA EDA-19

This area mostly consists of impervious roadway on Old Main Street and a portion of wooded land between Route 38 and Old Main Street. Stormwater runoff from this area travels via country drainage and overland flow. This area discharges to the south on Old Main Street at DP-19.

DRAINAGE AREA EDA-20

This area mostly consists of impervious roadway on Route 38 and Old Main Street. This area also includes two large offsite areas: south of Cook Ave, consisting mostly of woods and gravel roads and properties across from Florence Ave on the west side of Route 38 containing woods, roof, and impervious parking. Stormwater runoff from this area travels via a combination of overland flow and gutter flow. There is a bituminous berm or natural berm throughout that conveys stormwater to a closed drainage system. The drainage system bucks grade and outfalls on Breed Avenue at DP-20.

DRAINAGE AREA EDA-21

This area mostly consists of a small portion of impervious roadway on Route 38 northbound and the intersection of Border Road that discharges to a vegetated area east of the Route 38 at DP-21.

Table 1 presents the existing drainage areas and their characteristics. See Figure 2 for existing drainage areas and existing SCMs by design point.

Table 1 Existing Drainage Areas

Drainage Area	Design Point	Area (acres)	Curve Number
EDA-1	*DP-1*	*0.64*	*97*
EDA-2	*DP-2*	*0.26*	*95*
EDA-3	*DP-3*	*1.21*	*89*
EDA-4	*DP-4*	*2.84*	*90*
EDA-5	*DP-5*	*0.52*	*77*
EDA-6	*DP-6*	*0.61*	*92*
EDA-7A	*DP-7*	*0.93*	*81*
EDA-7B	*DP-7*	*0.26*	*70*
EDA-8A	*DP-8*	*0.86*	*85*
EDA-8B	*DP-8*	*0.12*	*55*
EDA-9A	*DP-9*	*1.12*	*78*
EDA-9B	*DP-9*	*0.10*	*76*
EDA-10A	*DP-10*	*0.87*	*84*
EDA-10B	*DP-10*	*0.58*	*79*
EDA-11	*DP-11*	*0.50*	*94*
EDA-12	*DP-12*	*0.33*	*87*
EDA-13	*DP-13*	*0.26*	*60*
EDA-14A	*DP-14*	*0.27*	*85*
EDA-14B	*DP-14*	*1.37*	*83*
EDA-15	*DP-15*	*0.20*	*80*
EDA-16	*DP-16*	*0.27*	*74*
EDA-17	*DP-17*	*0.39*	*84*
EDA-18A	*DP-18*	*6.13*	*73*
EDA-18B	*DP-18*	*0.12*	*72*
EDA-19	*DP-19*	*0.18*	*73*
EDA-20	*DP-20*	*4.99*	*89*
EDA-21	*DP-21*	*0.10*	*82*

Table 2 lists the existing SCMs and provides a description of each.

Table 2 Existing SCMs

SCM	Description
EDA-18B SCM	*Existing infiltration basin*

Wetlands exist on both the eastern and western sides of the roadway. There are three culvert crossings that connect upper and low waterbodies (wetlands) and convey water from the west to the east side of Route 38. These culverts are to be retained and are located; just south of the Dublin Ave intersection (near DP-4 and DP-6), just north of Cross Street (near DP-8 and DP-7) and where Maple Meadow Brook crosses the roadway (near DP-10). The highest point of the site is at the northern end, at the intersection of Main Street and Church Street, where the elevation is 111 ft. The lowest point on the roadway within the site is at Maple Meadow Brook where the road elevation is 82 ft and a culvert conveys the brook across the roadway. See Figure 6 - Existing Watershed Plan showing the existing drainage patterns and key features.

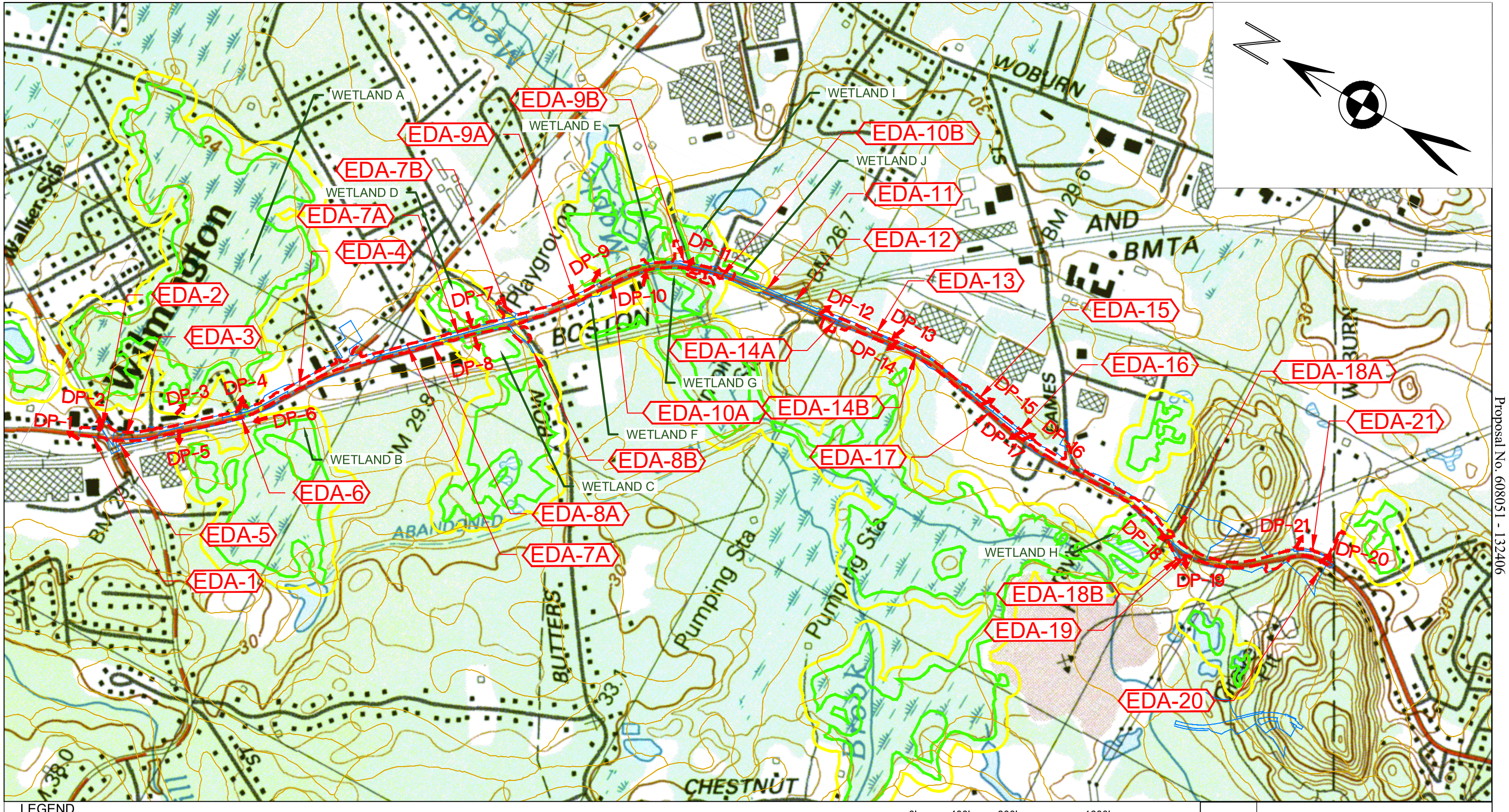
Per the Flood Insurance Rate Maps (FIRM) for the Town of Wilmington, Massachusetts, Middlesex County, Panels 25017C0291E, 25017C0292E, 25017C0293E, and 25017C0294E, dated 06/04/2010, a portion of the project that includes the Route 38 crossing over Maple Meadow Brook, is located within the 100-year flood plain. The flood plain areas are shown on Figure 4 – FEMA Map. The Flood Insurance Study, by the Federal Management Agency and last revised on July 6, 2016, includes a detailed study of the project area, showing the 100-year floodplain elevations in the project vicinity. Maple Meadow Brook has a 100-year flood elevation of 82.9 feet upstream and 81.5 feet downstream of Route 38 (NAVD 88).

Review of the NRCS Soil Survey map of the Project area identified the following hydrologic soil groups (HSG): Scarboro mucky fine sandy loam (HSG A/D), Swansea Muck (HSG B/D), Freetown muck (HSG B/D), Charlton-Hollis-Rock outcrop complex (HSG A), Charlton-Hollis-Rock outcrop complex (HSG B), Hollis-Rock outcrop-Charlton complex (HSG D), Rock outcrop-Hollis complex, Hinckley loamy sand (HSG A), Windsor loamy sand (HSG A), Deerfield loamy fine sand (HSG A), Montauk fine sandy loam (HSG C), Canton fine sandy loam (HSG B), Urban land, Urban land wet substratum, Charlton-Urban land-Hollis complex (HSG A), Udorthents sandy, Udorthents wet substratum, and Udorthents-Urban land complex. For areas where the soil designation does not have an associated HSG (e.g. 602), the HSG was adopted from the nearest neighboring soil with a designated HSG.

Geotechnical investigation was undertaken by Lamson Engineering Corporation between the 7th and 12th August 2020 and presented in the Data Report dated 8/26/2020. The purpose of the investigation was to establish the ground conditions at the locations of the proposed SCMs. Specifically, to determine the depth to groundwater and to bedrock or ledge and the type of material. Where there were two tests, the more conservative result was adopted as the design constraint at that location. These values are included in the Geotechincal Report included in Appendix B and include 2' separation where groundwater is the constraint.

A00840 - 393

Proposal No. 608051 - 132406



LEGEND

- LIMIT OF WORK
- WETLANDS
- 100-FT WETLAND BUFFER
- NRCS SOIL SURVEY BOUNDARY
- EXISTING WATERSHED BOUNDARY
- EXISTING WATERSHED NUMBER — EDA-1
- DESIGN POINT — DP-1

0' 400' 800' 1600'

1" = 800 FEET

NOTE: DATA TAKEN FROM MASSGIS

DATE	REVISIONS

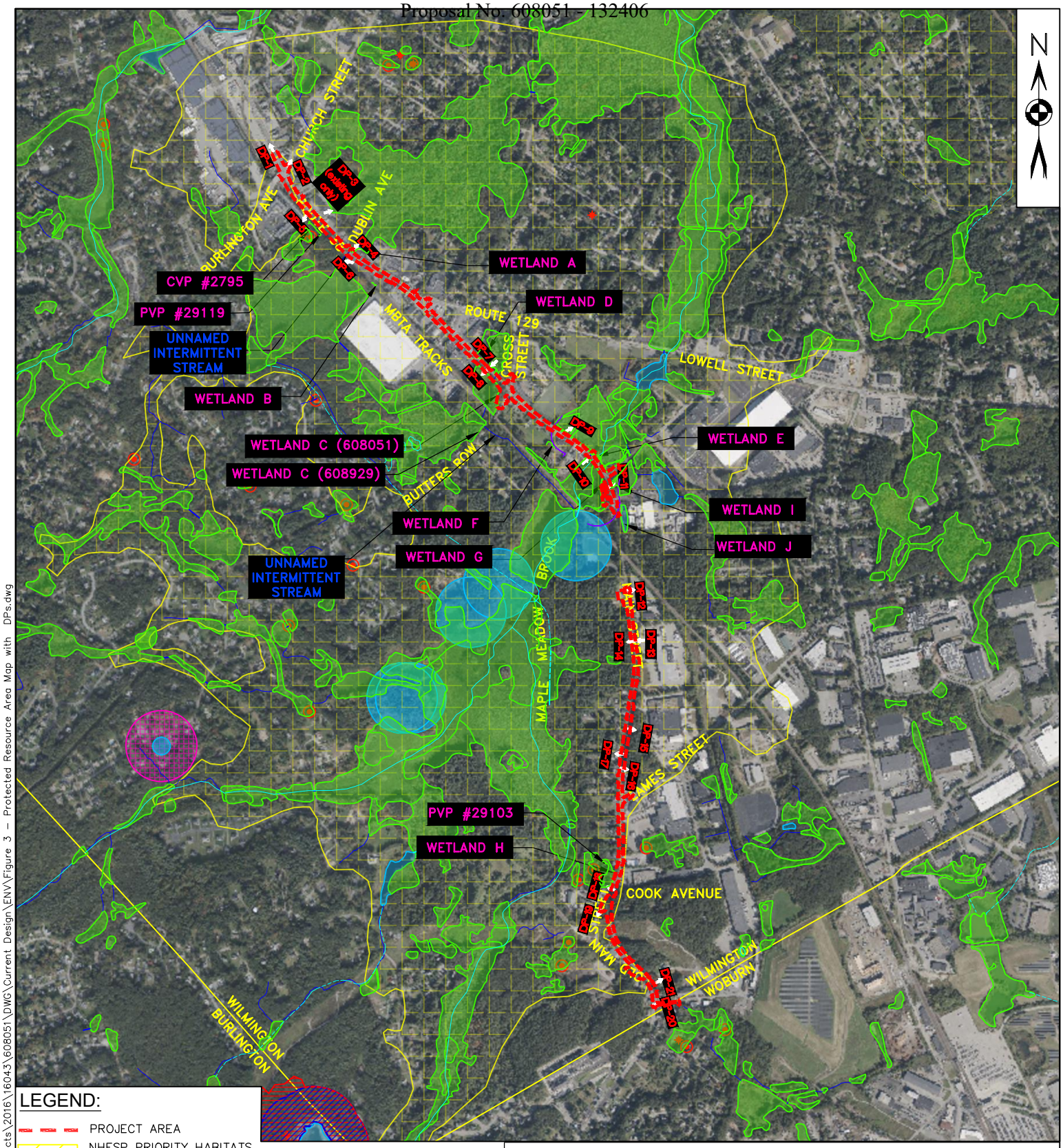
EXISTING WATERSHED PLAN

WILMINGTON, MASSACHUSETTS
ROUTE 38

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS
100 AMES POND DR, SUITE 200,
TEWKSBURY, MA (978) 923-0400

PREPARED FOR:
massDOT
Massachusetts Department of Transportation
Highway Division

SCALE 1" = 800'	DATE: 1/5/2024	PROJECT NO. 13033.19XX
APPROVED: _____	DESIGNED BY: JT/BV DRAWN BY: BV CHECKED BY: JT	FIGURE NO. 6



LEGEND:

- PROJECT AREA
- NHESP PRIORITY HABITATS OF RARE SPECIES
- NHESP ESTIMATED HABITATS OF RARE WILDLIFE
- OUTSTANDING RESOURCE WATER (ORW)
- AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACEC)
- INTERIM WELLHEAD RPROTECTION AREAS (IWPAs)
- DEP APPROVED WELLHEAD PROTECTION AREAS (ZONE I)
- APPROVED WELLHEAD PROTECTION AREAS (ZONE II)
- SURFACE WATER PROTECTION AREAS (ZONE A)
- SURFACE WATER PROTECTION AREAS (ZONE B)
- DEP/SURVEYED WETLANDS
- DEP HYDROLOGIC CONNECTIONS
- MAHW/BANK/PERENNIAL INTERMITTENT STREAM
- CERTIFIED VERNAL POOLS
- POTENTIAL VERNAL POOLS

SCALE IN FEET

750 0 750 1500

1" = 1500'

NOTE: DATA TAKEN FROM MASSGIS

ENVIRONMENTAL CONSTRAINTS MAP

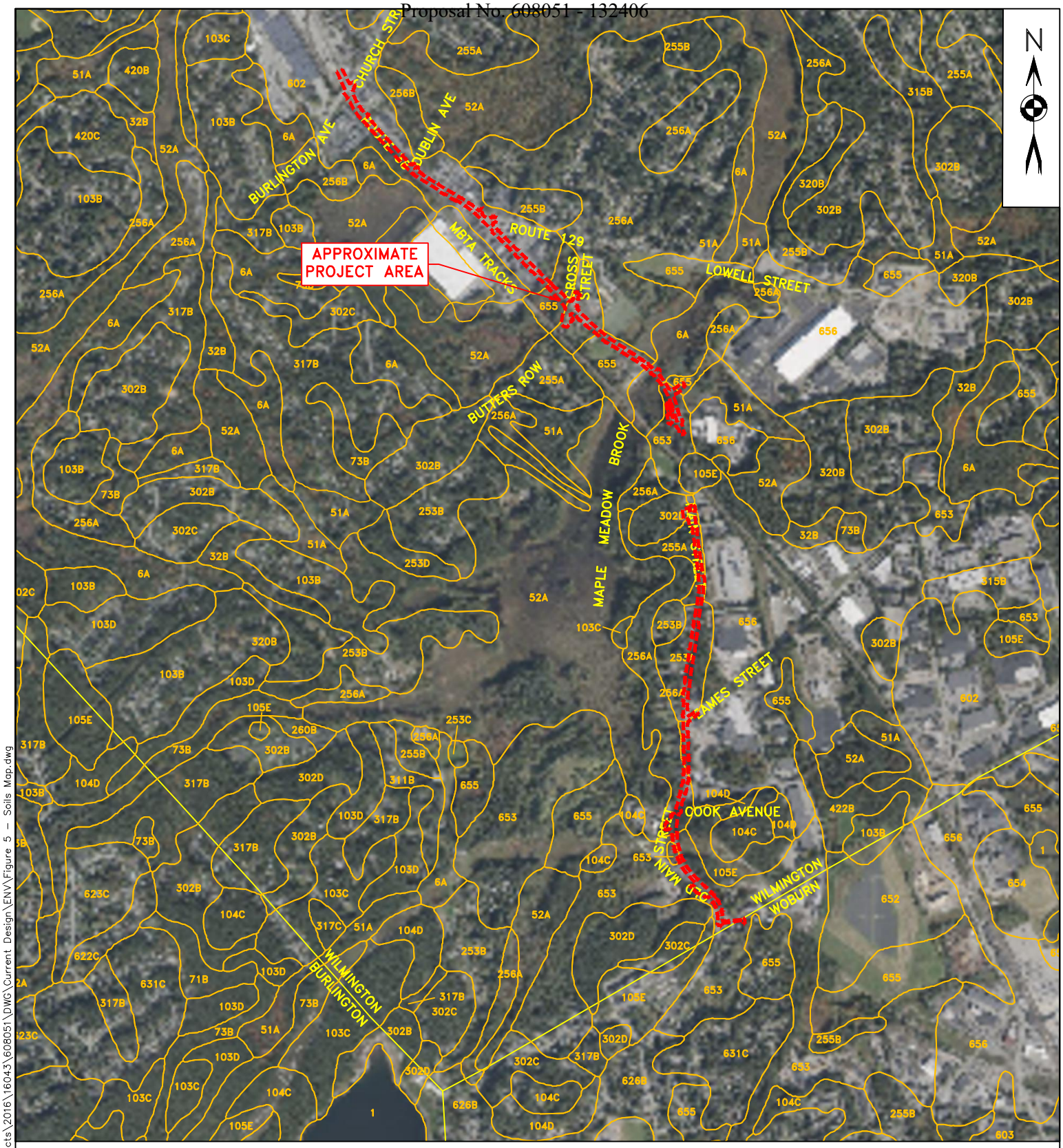
WILMINGTON – RECONSTRUCTION ON ROUTE 38 (MAIN STREET)
FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS
100 AMES POND DR. SUITE 200, TEWKSBURY, MA
24 ALBION RD, LINCOLN, RI (401) 305-7895

PREPARED FOR:
massDOT
Massachusetts Department of Transportation
Highway Division

SCALE: AS NOTED	PROJECT NO. 13033.19	FIGURE 3
DATE: 01/09/2025	DRAWN BY: VR/EL	
REVISED:	CHECKED BY: OF	

\\EgnyteDrive\greenintl\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\ENV\Figure 3 – Protected Resource Area Map with DPs.dwg



LEGEND:

- APPROXIMATE LIMIT OF WORK
- NRCS SOIL SURVEY BOUNDARY
- 103C NRCS SOIL SURVEY SYMBOL

NOTE: MAP INFORMATION TAKEN FROM MASSGIS AND SOILS INFORMATION TAKEN FROM NRCS WEB SOIL SURVEY FOR MIDDLESEX COUNTY, MA.

SCALE IN FEET

750 0 750 1500

1" = 1500'

SOILS MAP

WILMINGTON – RECONSTRUCTION ON ROUTE 38 (MAIN STREET)
FROM ROUTE 62 TO THE WOBURN CITY LINE, PROJECT #608051

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
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24 ALBION RD, LINCOLN, RI (401) 305-7895

PREPARED FOR:
massDOT
Massachusetts Department of Transportation
Highway Division

SCALE: AS NOTED	PROJECT NO. 13033.19	FIGURE 5
DATE: 01/09/2025	DRAWN BY: VR/EL	
REVISED:	CHECKED BY: OF	

\\EgnyteDrive\greenintl\Shared\Engineering\Projects\2016\16043\608051\DWG\Current Design\ENV\Figure 5 – Soils Map.dwg

4

Proposed Conditions

The proposed stormwater management analysis can be analyzed as twenty-nine watershed areas contributing runoff to twenty-one discharge points, which are the same under existing conditions. The limits of the overall watershed and discharge points of analysis are the same in proposed and existing conditions. The proposed drainage areas are delineated in Figure 7 - Proposed Watershed Plan.

The project proposes to reconstruct the existing two-lane two-way road to achieve generally two 11-foot lanes and two 5-foot bike lanes along the project corridor. The 5'-6" sidewalk will be added on one, or both sides of the roadway depending on location. There will be two 11-foot southbound travel lanes and a 2-foot shoulder for 900 feet south of the Route 62 and Route 38 intersection. The project will also incorporate improvements to the existing closed drainage system, including headwall and culvert replacement, a new water system along Route 38 from Route 62 to Eames Street. The project also proposes to add bicycle accommodations, improve pedestrian accommodations, and install traffic signal improvements along the Route 38 (Main Street) corridor. The project will upgrade the signage and pavement markings to improve driver safety along the project corridor. New signage and pavement markings also will be provided to enhance safety for bicyclists on the widened roadway. Bicycle access and pedestrian access will be improved along the entire project corridor to and from the MBTA Wilmington commuter rail station and the recently constructed Yentile Farm recreational facility. This roadway upgrade will require full-depth reconstruction of the existing Route 38 pavement from Route 62 to Eames Street. Micromilling and resurfacing will be proposed along Route 38 from Eames Street to the Woburn City Line.

Improvements at the intersection of Route 38 and Route 62 (Burlington Avenue and Church Street) will include re-striping to provide additional turning lanes for the northern, southern, and western legs of the intersection, adding bicycle detection, and reconstructing the traffic signal, as well as a new retaining wall along the MBTA tracks south of this intersection. These improvements will result in less congestion along the corridor, and significantly lower delays and queues at the intersection. The project will only include pavement resurfacing and minor pavement widening and drainage improvements at the intersection of Route 129 (Lowell Street) because this section of Route 38 was reconstructed approximately 15 years ago. The project will also include a traffic signal at the intersection of Route 38 with Cross Street and Butters Row. This signalization will provide more orderly traffic control for vehicles, pedestrians, and bicyclists. The side street approaches at this intersection are proposed to be realigned to provide improved sight distances and geometry. The improvements will add a left turn lane from northbound Route 38 to Butters Row.

Realignments of Eames Street and Old Main Street are also proposed to improve safety. In all, these improvements will result in enhanced safety of roadway for all roadway users including bicyclists, pedestrians, and vehicles.

To improve bicycle and pedestrian safety and accommodation, 5' bike lanes and 5.5' sidewalks will be proposed on both side of Butters Row for the length of the project.

The project also provides a modified drainage collection system to address the changes caused by the proposed road improvements as well as protecting the nearby downstream watershed and the environment. The proposed drainage improvements include installation of new deep sump catch basins with hoods, new drain manholes, replacement of existing drainage outfalls, as well as three proposed infiltration Stormwater Control Measures (SCMs) to mitigate the increase in peak rates of runoff within the project limits. While curbing will be added in sections of the roadway that used to sheet flow away from the project, the new drainage systems will maintain the historic drainage patterns, distributing runoff to the existing discharge points.

Each of the watershed areas were analyzed as a Discharge Point during the hydrologic analysis, as indicated on the attached Watershed Plan. The stormwater approach maintains existing drainage and grading patterns to the maximum extent possible.

DRAINAGE AREA PDA-1

This drainage area will not change under the proposed conditions. This area consists of impervious roadway and sidewalk. Stormwater runoff from this area travels via gutter flow and discharges to catch basins. These catch basins connect to an existing closed drainage network that flows north away from the project to DP-1.

DRAINAGE AREA PDA-2

This drainage area will not change under the proposed conditions. This area consists mostly of impervious roadway and sidewalk. Stormwater runoff from this area travels via gutter flow eastward and discharges to DP-2, located at the project limit. Catch basins capture the runoff approximately sixty (60) ft beyond the project limit.

DRAINAGE AREA PDA-3

This drainage area is rerouted to DP-4 under proposed conditions via a new closed drainage system in order to increase the efficiency of stormwater runoff along the roadway.

DRAINAGE AREA PDA-4

This drainage area will increase under the proposed conditions by incorporating area that was originally discharging to DP-3, DP-5, and DP-6, due to new curbing and an improved closed drainage system. This area consists mostly of impervious roadway and sidewalk. This area includes Route 38, intersecting streets, and adjacent properties. The road is superelevated at the northern end of this area, pitching the east and south. The road transitions to crowned grading about 100 feet south of Kirk Street. Stormwater runoff from this area travels via gutter flow into multiple catch basins on both sides of the road. There are two improved closed drainage networks that both outfall to DP-4 at Wetland A near an existing outfall and the outlet of the 3.5'x1.5' box culvert. The box culvert is being retained.

The wetland southwest of the train tracks (DP-5) is hydraulically connected to Wetland A (DP-3, DP-4) via the existing 3.5' x 1.5' culvert at DP-6 to DP-4. Therefore, rerouting this area from DP-5 and -6 to DP-4 maintains existing drainage patterns.

DRAINAGE AREA PDA-5

This proposed drainage area will be reduced from the existing drainage area. This area consists mostly of woodland area alongside the train tracks on the western side of Route 38. Stormwater runoff from this area travels via overland flow and into two catch basins of a closed drainage system that discharges to DP-5 which outfalls to the Wetland southwest of the tracks beyond the project limits. As stated above, there is an existing 10" PVC pipe connection that will be upsized from DP-5 to DP-3 and was not modeled in the hydrologic analysis. The wetland southwest of the train tracks (DP-5) is hydraulically connected to Wetland A (DP-3, DP-4) via the existing 3.5' x 1.5' culvert at DP-6 to DP-4.

DRAINAGE AREA PDA-6

This area will be reduced to a small pervious surface which will flow overland to the upstream end of the existing 3.5' x1.5' box culvert, which outfalls to DP-6.

DRAINAGE AREA PDA-7A

This area consists mostly of impervious roadway on the northbound side of Route 38 between Lowell Street and Cross Street. Stormwater runoff from this area travels via a combination of gutter flow and overland flow. There are multiple catch basins which collect most of the gutter flow and outfalls at the low point to DP-7 at Wetland D. Wetland D (DP-7) is hydraulically connected to Wetland C (DP-8) via a 36" diameter culvert.

DRAINAGE AREA PDA-7B

This area is larger in the proposed condition due to a slightly larger contributing area from Route 38. This area consists mostly of impervious roadway of Cross Street and a portion of its intersection with Route 38. Cross Street is superelevated in this area and stormwater runoff from this area travels via overland flow to the adjacent forested area and eventually to DP-7 at Wetland D. Wetland D (DP-7) is hydraulically connected to Wetland C (DP-8) via a 36" diameter culvert.

DRAINAGE AREA PDA-8A

This area consists of pervious slopes adjacent to the southbound side of Route 38 from Lowell Street to the bridge on Butters Row. Stormwater runoff from this area travels via overland flow to DP-8 at Wetland C.

DRAINAGE AREA PDA-8B

This area consists of impervious roadway of Route 38 between Lowell Street and Cross Street. Stormwater runoff from this area travels via gutter flow into a closed drainage system that discharges southwest to DP-8 at Wetland C. The outfall is located near the existing culvert and is near the existing low point in the roadway where there is an existing natural discharge point.

DRAINAGE AREA PDA-9

This area consists mostly of impervious roadway on both sides of Route 38 for the northern portion and only the southbound side on the southern portion. Stormwater runoff from this area travels via gutter flow into a closed drainage system that discharges southwest to DP-9 at Wetland E. There are three new outfalls that are located near the existing low point in the roadway and existing culvert outlet. The roadway is mostly superelevated similar to existing conditions, but due to the proposed curbing and new closed drainage system, stormwater that was discharging to DP-10 at Wetland G will be rerouted to discharge to DP-9 at Wetland E. Wetland G (DP-10) is hydraulically connected to Wetland E (DP-9) via a 144" box culvert. Therefore, rerouting area from DP-10 to DP-9 maintains existing drainage patterns.

DRAINAGE AREA PDA-10A

This area mostly consists of pervious surface on the southbound side of Route 38. Stormwater runoff from this area travels via overland flow to DP-10 at Wetland G. Wetland G (DP-10) is hydraulically connected to Wetland E (DP-9) via a 144" box culvert.

DRAINAGE AREA PDA-10B

This area mostly consists of pervious surface on the southbound side of Route 38. Stormwater runoff from this area travels via overland flow to DP-10 at Wetland G. Wetland G (DP-10) is hydraulically connected to Wetland E (DP-9) via a 144" box culvert.

DRAINAGE AREA PDA-11

This area mostly consists of impervious roadway on the eastern side of Route 38 that is part of both MassDOT Projects No. 608051 and 607327. Stormwater runoff from this area travels via gutter flow. The stormwater discharges east via overland flow to DP-11 at Wetland I.

DRAINAGE AREA PDA-12

This area is routed to DP-14 under existing conditions with the addition of a new closed drainage system in order to increase the efficiency of stormwater runoff along the roadway.

DRAINAGE AREA PDA-13

This area mostly consists of pervious grass area and bituminous driveways on the eastern side of Route 38. Stormwater runoff from this area travels via overland flow to a grassed depression at DP-13. There is a record headwall and culvert at DP-13 that outfalls across Route 38 to DP-14. The culvert and headwall at DP-14 is being replaced.

DRAINAGE AREA PDA-14A

This area mostly consists of impervious roadway on both sides of Route 38 that is part of both MassDOT Projects No. 608051 and 607327. Stormwater runoff from this area travels via gutter flow, which enters a closed drainage system that is pretreated by isolator rows, then captured and treated by a subsurface infiltration system (SCM-1). The chambers overflow into the closed drainage system within Route 38 and outfalls to DP-14. There is an existing outfall at DP-14 that will be replaced.

DRAINAGE AREA PDA-14B

This area mostly consists of impervious roadway on both sides of Route 38. Stormwater runoff from this area travels via gutter flow into a closed drainage system that will outfall southwest to DP-14. At the low point, the east side enters a catch basin and outfalls across the street to the west at DP-14. There is an existing outfall at DP-14 that will be replaced.

DRAINAGE AREA PDA-15

This drainage area will not change under the proposed conditions. This area mostly consists of impervious roadway on the northbound side of Route 38. Stormwater runoff from this area travels via country drainage into a wooded depression area at DP-15.

DRAINAGE AREA PDA-16

This area mostly consists of impervious roadway on the northbound side of Route 38. Stormwater runoff from this area travels via country drainage into a wooded depression area at DP-16.

DRAINAGE AREA PDA-17

This area mostly consists of pervious surface and driveways on the southbound side of Route 38. Stormwater runoff from this area travels via overland flow and discharges to the west at DP-17.

DRAINAGE AREA PDA-18A

This area mostly consists of pervious surface and driveways on the southbound side of Route 38. Stormwater runoff from this area travels via overland flow and discharges to the west at DP-18.

DRAINAGE AREA PDA-18B

This area mostly consists of impervious roadway on both sides Route 38 and Eames Street. Stormwater runoff travels via gutter flow into a closed drainage system that outfalls to DP-18 at Wetland H. The proposed outfall is replacing the existing outfall.

DRAINAGE AREA PDA-18C

This area mostly consists of impervious roadway on both sides Route 38 and Cook Avenue. This area also includes a large offsite area south of Cook Ave consisting of mostly woods and gravel roads. Stormwater runoff travels via a combination of gutter flow and overland flow. There is a closed drainage system that outfalls to DP-18 at Wetland H. The proposed outfall is replacing the existing outfall.

DRAINAGE AREA PDA-18D1

This area mostly consists of impervious roadway on both sides Route 38 and a large offsite area south of Cook Ave, which consists mostly of woods and gravel roads. Stormwater runoff travels via a combination of gutter flow and overland flow. There is a closed drainage system that discharges to an infiltration basin (SCM-2) that has a sediment forebay for pretreatment. The infiltration basin has an outlet control structure that connects back into

the closed drainage system within Route 38. The closed drainage system outfalls to DP-18 at Wetland H. The proposed outfall is replacing the existing outfall.

DRAINAGE AREA PDA-18D2

This area mostly consists of a small section of impervious driveway of an adjacent property. Stormwater runoff travels via sheet flow into a closed drainage system within the adjacent property. The closed drainage system outfalls to DP-18 at Wetland H.

DRAINAGE AREA PDA-19

This area mostly consists of impervious roadway on Old Main Street and a portion of wooded land between Route 38 and Old Main Street. Stormwater runoff from this area travels via gutter flow and overland flow. This area discharges to the south on Old Main Street at DP-19.

DRAINAGE AREA PDA-20A

This area mostly consists of impervious roadway on Route 38 and a large offsite area in between Cook Ave and Berwick Ave that consists mostly of woods and gravel roads. Stormwater runoff from this area travels via a combination of overland flow and gutter flow into a closed drainage system. The closed drainage system outlets to a subsurface infiltration system (SCM-3) that is pretreated by isolator rows. The chambers have an outlet control structure that connects back into the closed drainage system within Route 38. The drainage system follows existing conditions by bucking grade and outfalls to DP-20, adjacent to Breed Avenue. The existing outfall will be replaced.

DRAINAGE AREA PDA-20B

This area mostly consists of impervious roadway on Route 38 and Old Main Street. This area also includes one large offsite area and properties across from Florence Ave on the west side of Route 38 containing woods, roof, and impervious parking. Stormwater runoff from this area travels via a combination of overland flow and gutter flow to a closed drainage system. The drainage system bucks grade and outfalls on Breed Avenue at DP-20. The existing outfall will be replaced.

DRAINAGE AREA PDA-21

This area mostly consists of a small portion of impervious roadway on Route 38 northbound and the intersection of Border Road that discharges to a vegetated area east of the Route 38 at DP-21.

Table 3 provides a breakdown of the impervious area for the Project.

Table 3 Impervious Area

Condition	Impervious Area (sq. ft)
Existing	*506,710*
Proposed	*567,432*
Net	*+60,722*

Table 4 presents the proposed drainage areas and their characteristics under proposed conditions. Figure 5 shows proposed drainage patterns and drainage area delineations by design point.

Table 4 Proposed Drainage Areas

Drainage Area	Design Point	Area (acres)	Curve Numbers
PDA-1	*DP-1*	*0.64*	*97*
PDA-2	*DP-2*	*0.26*	*95*
PDA-3	*DP-3*	*0*	*0*
PDA-4	*DP-4*	*4.85*	*91*
PDA-5	*DP-5*	*0.33*	*81*
PDA-6	*DP-6*	*0.01*	*98*
PDA-7A	*DP-7*	*1.14*	*94*
PDA-7B	*DP-7*	*0.37*	*87*
PDA-8A	*DP-8*	*0.35*	*80*
PDA-8B	*DP-8*	*0.30*	*90*
PDA-9	*DP-9*	*2.11*	*92*
PDA-10A	*DP-10*	*0.37*	*68*
PDA-10B	*DP-10*	*0.18*	*70*
PDA-11	*DP-11*	*0.50*	*91*
PDA-12	*DP-12*	*0*	*0*
PDA-13	*DP-13*	*0.24*	*60*
PDA-14A	*DP-14*	*0.72*	*89*
PDA-14B	*DP-14*	*1.57*	*92*
PDA-15	*DP-15*	*0.19*	*95*
PDA-16	*DP-16*	*0.25*	*76*
PDA-17	*DP-17*	*0.11*	*62*
PDA-18A	*DP-18*	*0.37*	*64*
PDA-18B	*DP-18*	*2.20*	*85*
PDA-18C	*DP-18*	*1.92*	*66*
PDA-18D1	*DP-18*	*1.80*	*69*
PDA-18D2	*DP-18*	*0.03*	*94*
PDA-19	*DP-19*	*0.11*	*87*
PDA-20A	*DP-20*	*1.92*	*89*
PDA-20B	*DP-20*	*3.08*	*87*
PDA-21	*DP-21*	*0.09*	*85*

See Figure 5 for proposed drainage areas and proposed SCMs by design point.

The entire project corridor was analyzed for potential SCMs. The SCM alternatives and feasibility analysis was focused at each of discharge points, including the system that discharges to Maple Meadow Brook. The SCMs considered along the project corridor include water quality swales, infiltration trenches, subsurface chamber systems, qualified pervious areas, and leaching basins. The following is a summary of all the areas and SCMs that were considered, as well as a description of whether an SCM was feasible or not:

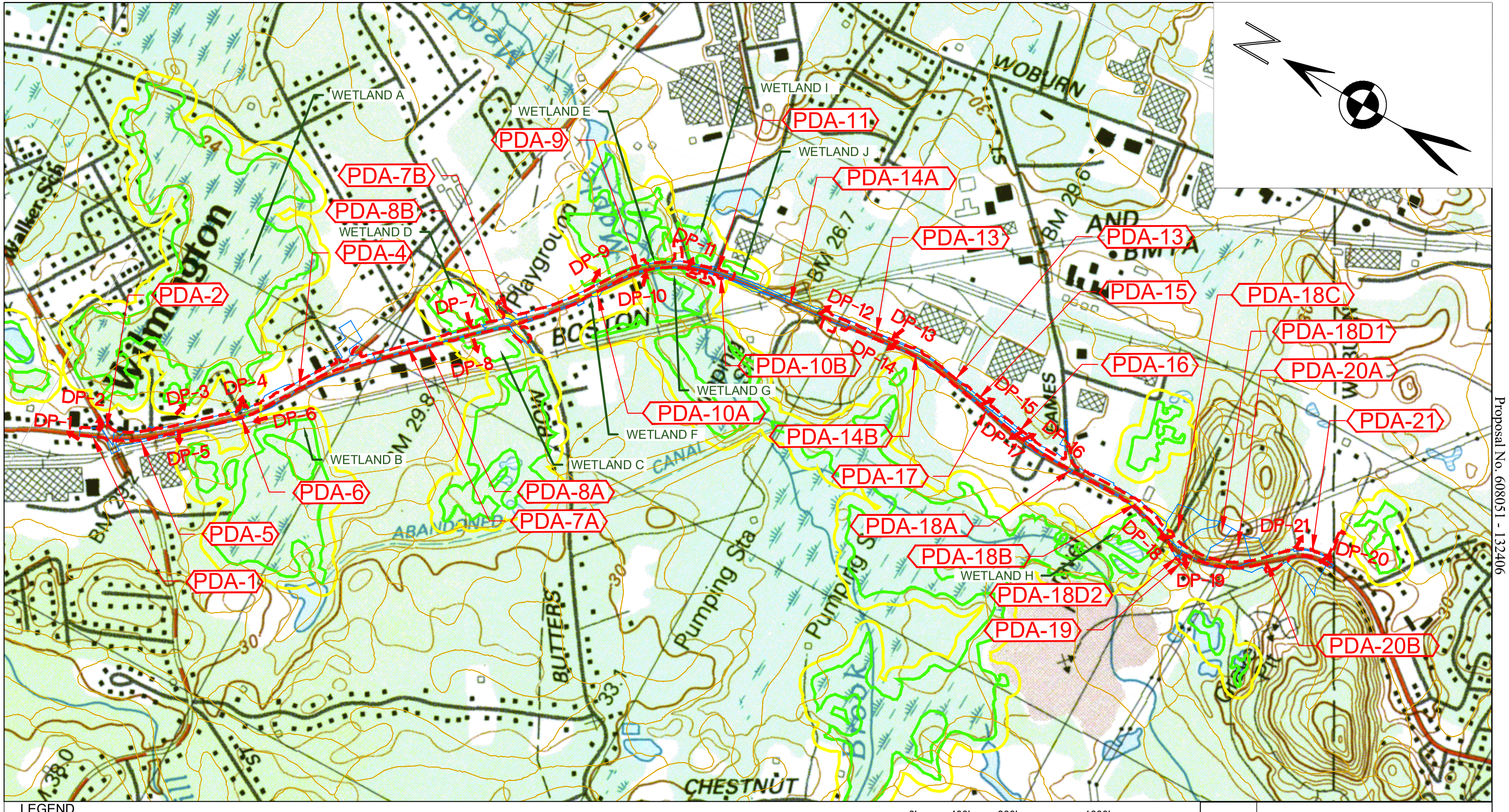
- Gutter flow away from project site at DP-1, STA. 203: No SCM feasible due to limited ROW and adjacent private properties.
- Gutter flow away from project site at DP-2, STA. 11: No SCM feasible due to limited ROW and adjacent private properties.
- Closed drainage system outfall to DP-4 at Wetland A near an existing outfall and the outlet of the 3.5'x1.5' box culvert, STA. 217+75 (L): No SCM feasible due to presence of existing resource areas, limited ROW, and adjacent private properties.
- Closed drainage system outfall at DP-5 to the Wetland southwest of the tracks beyond the project limits, STA. 104 (R): This area consists mostly of woodland area alongside the train tracks on the western side of Route 38. No SCM feasible due to limited ROW and presence of existing train tracks.
- Overland flow to upstream end of existing box culvert at DP-6, STA. 218 (R): No SCM feasible due to limited ROW and presence of existing train tracks.
- Gutter flow and closed drainage system to DP-7 at Wetland D, STA. 238+50 (L): No SCM feasible due to Wetland D directly abutting the roadway and adjacent private property.
- Closed drainage system outfall to DP-8 at Wetland C, STA. 238+50 (R): No SCM feasible due to Wetland C directly abutting the roadway.
- Closed drainage system at DP-9 to Wetland E, STA. 250 (L): No SCM feasible due to Wetland E directly abutting the roadway.
- Overland flow to DP-10 at Wetland G, STA. 253+75 (R): No SCM feasible due to Wetland G directly abutting the roadway.
- Overland flow to DP-11 at Wetland I, STA. 258 (L): No SCM feasible due to limited ROW and adjacent private properties.
- Overland flow to DP-13, STA. 275+75 (L): No SCM feasible due to limited ROW and adjacent private properties.
- Closed drainage system outfall at DP-14, STA. 275+75 (R): One SCM is feasible in this location, a subsurface infiltration basin (SCM-1). Stormwater runoff from this area travels via gutter flow, which enters a closed drainage system that is pretreated by isolator rows, then captured and treated by the subsurface infiltration system.
- Country drainage to wooded depression area at DP-15, STA. 285+70 (L): No SCM feasible due to limited ROW and adjacent private properties.
- Country drainage to wooded depression area at DP-16, STA. 290+30 (L): No SCM feasible due to limited ROW and adjacent private properties.

- Overland flow to DP-17, STA. 285+60 (R): No SCM feasible due to limited ROW and adjacent private properties.
- Closed drainage system outfall at DP-18, STA. 304 (R): One SCM is feasible in this location. The closed drainage system discharges to an infiltration basin (SCM-2) that has a sediment forebay for pretreatment. The infiltration basin has an outlet control structure that connects back into the closed drainage system within Route 38.
- Closed drainage system outfall at DP-20, STA. 318 +75 (L): One SCM is feasible in this location, a subsurface infiltration system (SCM-3). Stormwater runoff from this area travels via a combination of overland flow and gutter flow into a closed drainage system. The closed drainage system outlets to a subsurface infiltration system (SCM-3) that is pretreated by isolator rows.
- Overland flow to vegetated area at DP-21, STA. 316+50 (L): No SCM feasible due to limited ROW and adjacent private properties.

Table 5 lists the proposed SCMs and provides a description of each.

Table 5 Proposed SCMs

SCM	Description
SCM-1	Stormwater runoff from PDA-14A is directed to this subsurface infiltration system, which discharges offsite to a wooded area at DP-14.
SCM-2	Stormwater runoff from PDA-18D1 is directed to this infiltration basin, which discharges to Wetland H at DP-18.
SCM-3	Stormwater runoff from PDA-20A is directed to this subsurface infiltration system, which discharges at DP-20.



LEGEND

- LIMIT OF WORK
- WETLANDS
- 100-FT WETLAND BUFFER
- NRCS SOIL SURVEY BOUNDARY
- PROPOSED WATERSHED BOUNDARY
- PROPOSED WATERSHED NUMBER (PDA-1)
- DESIGN POINT (DP-1)

0' 400' 800' 1600'

1" = 800 FEET

NOTE: DATA TAKEN FROM MASSGIS

DATE	REVISIONS

PROPOSED WATERSHED PLAN

WILMINGTON, MASSACHUSETTS
ROUTE 38

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
CIVIL AND STRUCTURAL ENGINEERS
100 AMES POND DR, SUITE 200,
TEWKSBURY, MA (978) 923-0400

PREPARED FOR:
massDOT
Massachusetts Department of Transportation
Highway Division

SCALE 1" = 800'	DATE: 1/5/2024	PROJECT NO. 13033.19XX
APPROVED: _____	DESIGNED BY: JT/BV DRAWN BY: BV CHECKED BY: JT	FIGURE NO. 7

5

Impaired Waters and TMDLs

As described under the Proposed Conditions section, the Project will discharge to Bordering Vegetated Wetlands (BVWs), Land Under Water (LUW), Inland Bank, and Bordering Land Subject to Flooding (BLSF) resulting from permanent construction and temporary work taking place along Route 38. There are several wetland resource areas adjacent to the roadway within a project corridor. Maple Meadow Brook is a perennial stream that crosses the project at approximate Sta. 253+70 and has LUW associated with it. There is one intermittent stream and one perennial stream crossing the Route 38 project area that have an associated Bank. These streams include Unnamed Intermittent Stream at Sta. 218+00 and Maple Meadow Brook. Resource area impacts are described in more detail in the Notice of Intent (NOI).

Table 6 lists the receiving water bodies that are impaired, if the water body is covered by a TMDL, and the TMDL's Waste Load Allocation (WLA) for MassDOT property.

Table 6 Impaired Waters and TMDL Information

Water Body	303(d) Category	303(d) Impairments	TMDL	TMDL Pollutant	TMDL Report Name
Maple Meadow Brook	*5*	*(Dewatering) Dissolved Oxygen*	*No*	*N/A*	*N/A*

Table 7 lists each water body and the proposed SCMs within its watershed. It also provides each SCM's estimated amount of removal per year, the MassDOT pollutant load before the project, and the MassDOT pollutant load after the project is constructed.

Table 7 Nutrient Removal for Project

Water Body	SCM	*Nutrient* Removal (lbs/yr)
N/A		
	N/A	***N/A***
	Total Provided by SCMs	***N/A***

Stormwater from the proposed project does not discharge to any perennial or intermittent streams or waterbodies with a TMDL, so TMDL removal calculations were not performed. See Standard 4 for more detailed water quality calculations and discussion.

6

Stormwater Management Standards

As demonstrated below, the proposed Project complies with MassDEP Stormwater Management Standards (the Standards). The Project is considered a redevelopment project and only meets Standards 3 and 4 to the maximum extent practicable.

The Project utilized the MassDOT Macro Approach[1] (a methodology that allows the design to provide peak rate control, recharge, and/or water quality treatment holistically on a project-wide scale to overcome site constraints) for the entire project due to constraints at the project site. The Macro Approach was employed due to several constraints within the project site limiting the opportunity to implement more infiltration SCMs, including limited space in the ROW, existing utilities, and close proximity to wetlands.

By implementing the Macro Approach, the Project achieves compliance with the given Standard on a project-wide scale. The approach was utilized for Standards 2, 3, and 4. Implementation of the Macro Approach for these Standards is described in the following sections.

[1] Authorized by MassDEP per the Massachusetts Stormwater Handbook, Vol. 1 Ch. 1.

Standard 1: No New Untreated Discharges

No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The Massachusetts Stormwater Handbook, Standard 1, requires that the project demonstrates that there are no new untreated discharges and that new discharges will not cause erosion or scour to downstream wetlands.

The project has been designed to comply with Standard 1. All new outfalls are designed with flared end sections and rip rap protection to prevent erosion to the existing wetland systems. Appendix C provides supporting calculations for the outlet protection design. Stormwater runoff will be treated by deep sump hooded catch basins, two subsurface infiltration systems with isolator rows for pretreatment (at DP-14 and DP-20), and an above ground infiltration basin with a forebay to provide additional treatment (at DP-18). See Standard 4 for the water quality treatment provided by the Project.

There are no new untreated point source discharges created as a result of this project. This standard is fully met.

Standard 2: Peak Rate Attenuation

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

Standard 2 requires that the rates of flow be attenuated for the proposed development condition. This project is a redevelopment project and is required to meet Standard 2 to the maximum extent practicable.

The peak flow rates were calculated for the 2-, 10-, and 100-year storm events under proposed conditions and compared to the existing peak flow rates. The realignment of the roadway and construction of a typical 32-foot pavement width results in an overall increase of 60,722 square feet in impervious area within the project limits. While there is a net increase in impervious area, the proposed project will implement three proposed SCMs to help mitigate the increase in peak rates.

Though there is an increase in peak flow rates for DP-4, DP-7, DP-9, DP-11, DP-14, DP-15, DP-16, DP-18, and DP-19 for some or all storm events, the corresponding increase in peak volume translates to a small impact to the corresponding downstream wetland or waterbody. The following is a summary of each DP that has a peak rate increase and how the project will mitigate this increase:

Area from DP-3 has been rerouted to DP-4 under proposed conditions, which discharges to Wetland A and has an approximate area of 55.33 acres. While there is an increase in peak rates for all storm events at DP-4 (Wetland A), the total peak volume for the 100-year storm event will result in a net increase of 0.586 af, which results in a net rise of approximately 0.13 inches, which is negligible.

DP-7 discharges to Wetland D, which has an approximate area of 2.80 acres and will see an increase in peak rates for all storm events. The total peak volume for the 100-year storm event will result in a net increase of 0.341 af, which results in an increased depth of approximately 1.46 inches within the wetland. The increase in peak rates is mainly due to rerouting of the roadway runoff from the upstream area (DP-8) to the downstream area (DP-7). Wetland D (DP-7) is hydraulically connected to Wetland C (DP-8) though a 36" culvert and has a total area of 4.78 acres. Since Wetland D and C are hydraulically connected, when combining volumes for DP-7 (Wetland D) and DP-8 (Wetland C), Wetland C/D will see an increase of 0.241 af, resulting in a net rise of approximately 0.60 inches, which is negligible.

DP-9 discharges to Wetland E, which has an approximate area of 14.72 acres and will see an increase in peak rates for all storm events. The total peak volume for the 100-year storm event will result in a net increase of 0.693 af, which results in an increased depth of approximately 0.57 inches, which is negligible.

DP-11 discharges to Wetland I, which has an approximate area of 1.35 acres and will see an increase in peak rates for all storm events. The total peak volume for the 100-year storm event will result in a net increase of 0.029 af, which results in an increased depth of approximately 0.26 inches, which is negligible.

DP-14 discharges at an existing outfall that will be replaced as part of this project and stormwater travels via overland flow to the west into wooded property. There is an increase in peak rates for 2-, 10- and 100-year storm events at DP-14. The increase in peak rates is due to site constraints along the roadway corridor that limit where a proposed Stormwater Control Measure (SCM) can be constructed. The proposed project includes a new subsurface infiltration system (SCM-1) within a parking lot owned by the Town; however, it is in a location that only captures the upstream stormwater runoff from this area (PDA-14A). Runoff downstream from this SCM (PDA-14B) is not able to be captured and treated with a SCM. The proposed SCM will provide significant mitigation; however, this discharge point will have a minor increase in peak rates consisting of 0.48 cfs, 0.05 cfs, and 0.10 cfs for the 2-, 10-, and 100-year storm events respectively, which are negligible.

DP-15 discharges overland flow to the east and will see an increase in peak rates for all storm events. The increase in peak rates are 0.23 cfs, 0.23 cfs, and 0.19 cfs for the 2-, 10-, and 100-year storm events respectively, which are negligible.

DP-16 discharges overland flow to the east and will see an increase in peak rates for 2- and 10-year storm events. The increase in peak rates are 0.04 cfs and 0.03 cfs for the 2- and 10-year storm events respectively, which are negligible.

DP-18 discharges to Wetland H, which has an approximate area of 2.42 acres and will see an increase in peak rates for all storm events. An aboveground infiltration basin (SCM-2) is proposed to treat a portion of the watershed area (PDA-18D1) to help mitigate peak rates; however, due to site constraints it is not feasible to treat the entire area discharging to DP-18. The total peak volume for the 100-year storm event will result in a net increase of 0.161 af, which results in an increased depth of approximately 0.80 inches, which is negligible.

DP-19 discharges overland flow and gutter flow to the east and will see an increase in peak rates for for all storm events. The increase in peak rates are 0.18 cfs, 0.18 cfs, and 0.14 cfs for the 2-, 10-, and 100-year storm events respectively, which are negligible.

Per MassDOT Requirements, a proposed stormwater SCM must hold peak volumes up to the 10-year storm event. The proposed SCMs meet this requirement to the maximum extent practicable. Therefore, this standard is met to the maximum extent practicable.

Table 8 Rainfall Depths (in)

Design Storm Event	Rainfall Depth (in)
2-year	*3.30*
10-year	*5.20*
25-year	*6.39*
100-year	*8.23*

Table 9 provides a summary of peak rates for each design point under existing and proposed conditions. Appendix D provides computations and supporting information regarding the hydraulic and hydrologic modeling.

Table 9 Peak Discharge Rates (cfs)

Design Point	Existing			Proposed		
	2-year	10-year	100-year	2-year	10-year	100-year
DP-1	*1.97*	*3.15*	*5.02*	*1.96*	*3.14*	*5.00*
DP-2	*0.77*	*1.27*	*2.04*	*0.77*	*1.27*	*2.04*
DP-3	*2.98*	*5.30*	*8.97*	*0*	*0*	*0*
DP-4	*5.81*	*10.20*	*17.12*	*10.61*	*18.07*	*29.79*
DP-5	*0.68*	*1.50*	*2.95*	*0.25*	*0.70*	*1.55*
DP-6	*1.66*	*2.83*	*4.65*	*0.03*	*0.05*	*0.08*
W-D (DP-7)	*1.92*	*4.02*	*7.55*	*4.02*	*6.82*	*11.24*
W-C (DP-8)	*1.71*	*3.21*	*5.71*	*1.05*	*1.91*	*3.41*
W-E (DP-9)	*1.84*	*4.01*	*7.70*	*5.31*	*9.17*	*15.24*
W-G (DP-10)	*2.69*	*5.39*	*9.83*	*0.44*	*1.27*	*2.83*
W-I (DP-11)	*1.29*	*2.26*	*3.78*	*1.52*	*2.45*	*3.92*
DP-12	*0.58*	*1.20*	*2.21*	*0*	*0*	*0*
DP-13	*0.08*	*0.38*	*1.02*	*0.07*	*0.36*	*0.95*
DP-14	*2.88*	*5.91*	*10.93*	*3.36*	*5.96*	*11.03*
DP-15	*0.34*	*0.71*	*1.32*	*0.57*	*0.94*	*1.51*
DP-16	*0.32*	*0.77*	*1.55*	*0.36*	*0.80*	*1.55*
DP-17	*0.79*	*1.52*	*2.71*	*0.05*	*0.19*	*0.48*
W-H (DP-18)	*4.03*	*9.91*	*20.50*	*5.00*	*10.82*	*21.18*
DP-19	*0.12*	*0.37*	*0.81*	*0.30*	*0.55*	*0.95*
DP-20	*8.94*	*16.22*	*27.78*	*6.34*	*15.42*	*26.94*
DP-21	*0.19*	*0.38*	*0.70*	*0.19*	*0.37*	*0.67*
W-A (DP-3 + DP-4)	*8.79*	*15.50*	*26.09*	*10.61*	*18.07*	*29.79*
W-C/D (DP-7 + DP-8)	*3.65*	*7.93*	*15.44*	*5.09*	*9.5*	*16.73*

Standard 3: Recharge

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 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.

Standard 3 requires that three computations or demonstrations be fulfilled in order to satisfy the stormwater recharge requirements. They are as follows:

- Impervious Area
- Required Recharge Volume
- Bottom Area Sizing for Infiltration Basins

As stated previously, this project is a redevelopment project and is required to meet Standard 3 to the maximum extent practicable. This project has 506,710 square feet of total existing impervious area and 567,432 square feet of total proposed area within the limit of work. The required recharge volume for the total proposed impervious and the net increase in impervious area is 28,175 cubic feet (CF) and 2,990 CF, respectively. There is a net increase in impervious area of 60,722 square feet under proposed conditions, so there is a recharge volume requirement.

The project has implemented three SCMs to maximize recharge at all feasible locations within the project limits. These SCMs will provide an improvement to existing conditions as there are presently no stormwater mitigation practices within the project limits.

The Soil Survey Analysis is included in Section 1.1 of this report, Figure 3 Soils Map, and Appendix B Soil Information. Multiple test pits were performed by Lamson Engineering Corporation in August 2020 near the proposed SCMs (see Appendix B for Geotech report). TP #2 and BH #2 is associated with SCM-1, TP #4 and #5 are associated with SCM-2, and BH #3 is associated with SCM-3. Groundwater was not encountered in TP #2, TP #4, or TP #5. The inverts of the proposed SCM's were set at or above the design constraint except for SCM-2.

Within SCM-1, TP #2 groundwater was not encountered. However, excavation did not extend below the bottom elevation of the SCM. BH #2, which is in close proximity to SCM-1 extended 15' below the surface at elevation 79.4' and no groundwater was encountered, which is more than 2' below the bottom of SCM-1.

Due to utility conflicts, the bottom of SCM-2 had to be located at elevation 85 which is 1.2' above the bottom of the test pit (TP #4) taken in the basin. There was no groundwater encountered from the test pits taken within the basin. Also, boring BH #3 was taken approximately 900 feet away which encountered groundwater at an elevation of 80.7 feet.

This is more than 4 feet below the bottom of the infiltration basin; therefore SCM-2 exceeds the minimum separation to groundwater requirements.

Groundwater was encountered 9' below the surface in BH #3. The surface elevation is 89.7' at the boring, meaning groundwater was located at approximately elevation 80.7'. The bottom of SCM-3 is located at elevation 83.30'. Therefore, the bottom of the SCM-3 will have more than a minimum of 2-feet separation to ledge and/or seasonal high groundwater.

Based on the NRCS Soil information, SCM-1 and -2 are located within A soils and SCM-3 is located in C soils. Therefore, the required recharge calculations were made using A soils for SCM-1 and -2, and C soils for SCM-3. The recharge calculations are included in Appendix C of this report.

The contributing impervious areas and underlying Hydrologic Soil Group were used to estimate the recharge volume lost by development, which was used to calculate the required recharge volume for each SCM. The required recharge volume for the net increase in impervious area is 2,990 CF which corresponds to 1,167 CF, 462 CF, and 260 CF for SCM-1, -2, and -3, respectively. The recharge required based on the total impervious area within the limit of work is 28,135 CF. The recharge storage volume provided is 3,511 CF, 955 CF, and 2,453 CF for SCM-1, -2, and -3, respectively. Therefore, each SCM provides adequate volume for the impervious area that is routed to them. In addition, the combination of recharge volume provided by all three SCMs provides adequate storage for the required net increase of proposed impervious area for the project, but not for the required total proposed impervious area within the site. Therefore, Standard 3 is met to the maximum extent practicable.

The SCMs were designed using the static method, so that the storage available below the first overflow is equivalent or larger than the required recharge volume. Drawdown calculations were performed to show that the infiltration basin will drain within 72 hours. For this calculation, the RAWLs infiltration rates were used to estimate the recharge potential of the SCM.

Table 10 provides the required recharge volume for the Project, and Table 11 provides the recharge volumes proposed for each design point.

Table 10 Required Recharge Volume for Project

	HSG A	HSG B	HSG C	HSG D	Total
Existing Impervious (sq. ft.)	*503,081*	*0*	*0*	*3,629*	*506,710*
Proposed Impervious (sq. ft.)	*562,704*	*0*	*0*	*4,728*	*567,432*
Net Impervious Area (sq. ft.)	*59,623*	*0*	*0*	*1,099*	*60,722*
Target depth, F (in)	0.60	0.35	0.25	0.10	-
Required Recharge Volume, ReV (cf)					*28,175*

Table 11 Provided Recharge Volumes at Each Design Point

	HSG A	HSG B	HSG C	HSG D	Total
DP-14 (PDA-14A)					
Net Impervious Area (sf)	*23,330*	*0*	*0*	*0*	*23,330*
Required Recharge Volume, ReV (cf)	*1,167*	*0*	*0*	*0*	*1,167*
Provided Recharge Volume (cf)	*3,511*	*0*	*0*	*0*	*3,511*
DP-18 (PDA-18D1)					
Net Impervious Area (sf)	*9,006*	*0*	*0*	*0*	*9,006*
Required Recharge Volume, ReV (cf)	*462*	*0*	*0*	*0*	*462*
Provided Recharge Volume (cf)	*955*	*0*	*0*	*0*	*955*
DP-20 (PDA-20A)					
Net Impervious Area (sf)	*0*	*0*	*12,491*	*0*	*12,491*
Required Recharge Volume, ReV (cf)	*0*	*0*	*260*	*0*	*260*
Provided Recharge Volume (cf)	*0*	*0*	*2,453*	*0*	*2,453*

The infiltration SCMs are designed to drain completely within 72 hours.

Appendix B provides soil evaluation information (including the geotechnical report) and Appendix C provides computations, drawdown calculations, and supporting information regarding recharge.

The Macro Approach is being used for compliance with this standard due to constraints at the project site. Infiltration SCMs were considered for the project, but only three locations were feasible due to limited space in the ROW, existing utilities, and close proximity to wetlands. Drywells were considered but provide very little stormwater treatment volume, and the large number of drywells required would be impractical for all design points. Another option was to use proprietary devices at each discharge point for stormwater treatment volume, but due to high cost and the conflicts stated above were not practical for this project. This standard is met to the maximum extent practicable.

Standard 4: Water Quality Treatment

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:

- *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained.*
- *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook.*
- *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

As stated previously, this project is a redevelopment project and is required to meet Standard 4 to the maximum extent practicable. As mentioned in Standard 3, there is a net increase in impervious area and three SCMs are proposed as part of this project. It has been designed to provide water quality treatment for the area of impervious surface that it captures. The treatment practices are:

- (1) Aboveground Infiltration Basin
- (2) Subsurface infiltration chamber systems

This standard is met to the maximum extent practicable.

Massachusetts Stormwater Regulations require a "Water Quality Depth" of 1 inch when the project site is located within a "critical area". This project is located within a Zone II, which is considered a critical area; therefore, a depth of 1" was used for the Water Quality calculations. This project is considered a redevelopment project; one of the objectives of the proposed stormwater improvements is to improve the quality of discharged stormwater.

The proposed design aims to improve the water quality by installing three new infiltration SCMs. The required water quality volume for the total impervious area is 58,400 CF. The required water quality volume for the net increase in impervious area is 5,060 CF. The required water quality volume for the impervious area that SCM-1, SCM-2, and SCM-3 receives is 1,944 CF, 751 CF, and 1,041 CF, respectively. The combined storage volume of the three proposed SCMs is 6,919 CF, which provides enough volume for the net increase in impervious area, but not the total proposed impervious area. The SCMs also exceed the water quality volume requirement for the area they are designed to hold, by providing 3,511 CF, 955 CF, and 2,453 CF of storage for SCM-1, SCM-2, and SCM-3, respectively. Therefore, this standard will be met to the maximum extent practicable. See Appendix C for required water quality volume calculations.

The Project has been designed to comply with Standard 4. A Stormwater control measure has been sized to treat the required water quality volume and remove required pollutant load to the maximum extent practicable.

The TSS calculations were completed based on the removal rates per the Massachusetts State Standards for each SCM.

The project has been designed to include a minimum of 25% TSS removal for areas where SCM's were not feasible. Where SCM's are able to be installed, more than 80% TSS removal will be achieved. Since the project is located within a stormwater critical area, pretreatment of 44% TSS removal is required prior to an infiltration basin. All three SCM's include a combination of deep sump catch basins with either a forebay or isolator row that provide 44% TSS removal before the infiltration basins.

Table 12 shows the WQV to be treated for both new and existing impervious area within each drainage area, organized by design point.

Table 12 WQV at Each Design Point

Design Point	WQV for New IA (cf)	WQV for Existing IA (cf)	Total WQV (cf)
DP-14			
PDA-14A	*175*	*1,770*	*1,944*
Total	175	1,770	1,944
DP-18			
PDA-18D1	*0*	*751*	*751*
Total	0	751	751
DP-20			
PDA-20A	149	*892*	*1,041*
Total	149	892	1,041
Project Total	324	3,413	3,736

Table 13 shows the WQV provided by the SCMs at each design point.

Table 13 WQV Provided by the SCMs at Each Design Point

Design Point	Pretreatment (y/n)	WQV Provided (cf)	Meets Total WQV	Meets Required WQV for New IA
DP-18 (PDA-18D1)				
Infiltration Basin	*Y*	*3,511*	*no*	*yes*
Total		3,511		
DP-14 (PDA-14A)				
Subsurface Infiltration System	*Y*	*955*	*no*	*yes*
Total		955		
DP-20 (PDA-20A)				
Subsurface Infiltration System	*Y*	2,453	*no*	*yes*
Total		2,453		
Project Total		**6,919**	***no***	***yes***

Appendix C provides the MassDEP TSS Removal Calculation Worksheets.

For MassDOT facilities, Long-Term Pollution Prevention Plans (LTPPPs) are implemented at a statewide, programmatic level through the State's highway operation and maintenance program. Appendix E includes the LTPPP for this project.

The Macro Approach is being used for compliance with this standard due to constraints at the project site. Three infiltration SCMs have been included where feasible within the project limits.

Water quality treatment provided is calculated by design point and an area-weighted average is calculated to obtain the overall water quality treatment provided by the Project. Specifically, the percent reduction for TSS provided by the SCMs for each design point is multiplied by the drainage area to that design point, summed for all design points, and divided by the entire drainage area of the project to obtain the Project's provided pollutant reduction. The Project's water quality treatment provides a minimum of 25% removal where closed drainage only is proposed, and more than 80% of removal where the infiltration basin is provided. Overall, the project will provide more than 25% TSS removal and meets Standard 4 to the maximum extent practicable.

Standard 5: Land Uses with Higher Potential Pollutant Loads

For Land Uses with Higher Potential Pollutant Loads (LUHPPLs), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all LHPPLs cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from LUHPPLs shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Standard 5 does not apply to the Project. There are no land uses with higher pollutant loads within the Project area.

Standard 6: Critical Areas

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "stormwater discharge" as defined in 314 CMR 3.04(2)(a)1 or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

This site discharges within a Zone II, which is considered a "critical area." This standard applies and the project must meet the 1" water quality requirement.

Standard 6 requires that all stormwater management systems within a critical area be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS) prior to discharge and that the treatment train shall provide for at least 44% TSS removal prior to discharge to the infiltration structure. The water quality standards for the proposed stormwater system have been addressed in Standard 4 of this report.

Catch Basins with plastic hoods and 4 foot sumps are proposed throughout portions of the project. In these areas, the hoods will provide some volume to capture floatable oil, grease, and petroleum hydrocarbons if a spill occurs.

In addition, MassDOT follows established Best Management Practices (BMPs) and operational procedures and has implemented a range of strategies statewide to reduce the amount of road salt used and minimize its environmental impact. Such strategies include the increased use of liquid deicers to pre-wet dry material in order to reduce bounce and scatter and for pre-treating roadways prior to storms when conditions allow. Both techniques have been shown to reduce the overall application of sodium chloride. In addition, the use of closed loop controllers, pavement sensors and other equipment allow for more efficient operations.

Additional measures required for stormwater management systems in critical areas are the installation of shut-off valves at all outlets to a critical area. For areas where there is a closed drainage system, the risk of potential tampering by the public with the shut-off valves and the required response time by a town official to operate the valve in case of an emergency outweigh the benefits of installing the shut-off valves; therefore, they are not included in the design. This standard is met to the maximum extent practicable.

Standard 7: Redevelopment

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 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.

The improvements to Route 38 are considered a Redevelopment; therefore, Standard 7 is applicable to this project. Standard 7 requires a redevelopment project to meet Standards 2, 3 and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5 and 6 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.

This project provides an opportunity to improve the quality of stormwater runoff discharged to adjacent wetlands. The proposed stormwater enhancements are summarized below:

- There are three SCMs proposed as part of this project. A portion of the proposed drainage system has been designed to convey runoff to the SCMs for water quality treatment, and attenuation prior to discharge to the surrounding environment. The proposed SCMs are two subsurface infiltration systems and an infiltration basin.

- The new drainage system will follow existing drainage patterns by discharging at natural existing discharge points.

While the project includes striping a new lane between Sta. 206 and Sta. 216, it does not include adding a new lane of pavement. The maximum section between Sta. 206 and Sta. 216 is adding 7.5' of pavement from the existing edge to the edge of shoulder. Therefore, this project meets the Redevelopment as well as Limited Project Provisions under the WPA. A Redevelopment Stormwater Checklist is provided in Appendix A of this report which illustrates which standards have been met to the maximum extent practicable.

Below is a bulleted summary of project compliance to the standards:

- Standard 1 (Untreated Discharges) – Fully Met
- Standard 2 (Peak Rate Control and Flood Prevention) – Maximum Extent Practicable
- Standard 3 (Recharge to Groundwater) – Maximum Extent Practicable
- Standard 4 (80% TSS Removal) – Maximum Extent Practicable
- Standard 5 (Higher Potential Pollutant Loads) – N/A
- Standard 6 (Critical Areas) – Maximum Extent Practicable
- Standard 8 (Erosion Sediment Control) – Fully Met
- Standard 9 (Operations and Maintenance) – Fully Met
- Standard 10 (Illicit Discharges) – Fully Met

Standard 8: Erosion and Sediment Control

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.

The implementation of erosion and sediment controls (ESC) during construction is considered a standard practice for all MassDOT projects. ESC will be installed before any land disturbance begins for the Project and will remain in place for the duration of the project. Construction period pollution prevention and erosion and sedimentation control measures will be implemented at the project site to control construction related impacts during construction and land disturbance activities. The General Contractor for the project will be responsible for implementation of the construction period controls.

The project will disturb more than one acre of land during the construction process and will require a NPDES Construction General Permit issued by the Environmental Protection Agency. As a result, the General Contractor will be required to prepare a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP document will satisfy the requirements of the Construction General Permit and the construction period erosion, sedimentation and pollution prevention plan requirements outlined in Standard 8 of the Massachusetts Stormwater Handbook. A SWPPP has not been prepared for inclusion with this stormwater report; however, one will be prepared prior to any construction activities at the site by the General Contractor.

Erosion and sedimentation controls will be employed to prevent the erosion and transport of sediment into resource areas during the earthwork and construction phases of the project. Erosion and sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period.

Below is a description of some of the erosion and sediment control measures that will be employed at the project and that will be included in the SWPPP.

Minimize Disturbed Area and Protect Natural Features and Soil

The most important aspects of controlling erosion and sedimentation are limiting the extent of disturbance and limiting the size and length of the tributary drainage areas to the worksite and drainage structures. These fundamental principles will be the key factors in the Contractor's control of erosion on the project site. If appropriate, the Contractor will construct temporary diversion swales and settling basins or use a settling tank. If additional drainage or erosion control measures are needed, they will be located up-gradient from the compost filter tubes and sedimentation fences when possible.

The Contractor is responsible for the maintenance and repair of all on-site erosion control devices. All erosion control devices will be regularly inspected. At no time will silt-laden water be allowed to enter sensitive areas (wetlands, streams, and drainage systems). Any runoff from disturbed surfaces will be directed through a sedimentation process prior to being discharged to the existing on-site drainage system.

The contractor will establish a staging area(s) on areas to be disturbed for the overnight storage of equipment and stockpiling of materials.

In the staging area, the Contractor will have a stockpile of materials required to control erosion on-site to be used to supplement or repair erosion control devices. These materials will include, but are not limited to, compost filter tubes, sedimentation fence, erosion control matting and crushed stone. As mentioned previously, erosion and sedimentation controls will be employed to minimize the erosion and transport of sediment into resource areas during the earthwork and construction phases of the project. Erosion and sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period.

The Contractor is responsible for erosion control on the site and will utilize erosion control measures where needed, regardless of whether the measures are specified on the construction plans or in supplemental plans prepared for the Stormwater Pollution Prevention Plan (SWPPP).

Primary erosion control techniques proposed include compost filter tubes, sedimentation fence barriers, and a stabilized construction entrance. A detailed description of each technique is discussed below.

Best Management Practices (BMPs)

COMPOST FILTER TUBES

Erosion control barriers (such as compost filter tubes and/or sedimentation fence) will be installed where required prior to the start of construction. These barriers will remain in place until all tributary surfaces have been fully stabilized.

Compost filter tube barriers will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site. In areas where high runoff velocities or high sediment loads are expected, sedimentation fencing may be installed adjacent to the compost filter tubes. This semi-permeable barrier made of a synthetic porous fabric will provide additional protection. The sedimentation fences and compost filter tube barrier will be replaced as determined by periodic field inspection. Compost filter tubes and sedimentation fences will be maintained and cleaned until the tributary area is fully stabilized.

DRAINAGE SYSTEM PROTECTION

Sediment filters (silt sacks) will be installed at all existing and proposed drainage structures and maintained and cleaned as required to maintain their effectiveness. Catch basins, drainage manholes and storm drain pipes will be cleaned of sediment and debris after the completion of construction. Sediment collected in structures will be disposed of properly and covered, if stored on-site. The following construction measures will be implemented to prevent the transport of sediment through the drainage system.

- Any proposed drainage system will be installed from the downstream end to the upstream end.

- Until tributary areas are stabilized, catch basin inlets will be filtered with a silt sack. If intense rainfall is predicted before all tributary areas are stabilized, erosion control measures will be reinforced for the duration of the storm. Downstream areas will be inspected, and any sediment removed at the end of the storm.
- Unfiltered water will not be allowed to enter pipes from unstabilized surfaces.
- Trench excavation will be limited to the minimum length required for daily pipe installation. All trenches will be backfilled as soon as possible. The ends of pipes will be closed nightly with plywood.
- Silt-laden waters will be intercepted prior to reaching catch basins during construction. Any gross depositions of materials on paved surfaces will be removed.
- Catch basins will be inspected monthly and cleaned in anticipation of the winter season in November.

UTILITY CONSTRUCTION

The Contractor will construct utility trenches in a manner that will not direct runoff toward wetlands resources or to drainage system structures.

STABILIZATION ACTIVITIES

All disturbed surfaces will be stabilized a maximum of 14 days after construction on any portion of the project site that is completed or is temporarily halted, unless additional construction is intended to be initiated within 21 days. The Contractor will not disturb more area than can be stabilized within 14 days unless the area is to remain active. The Contractor will not disturb more area than can be stabilized within the same construction season.

SLOPE STABILIZATION

The smallest practicable area of land will be exposed at a time. Slopes greater than three-to-one (horizontal to vertical) will be stabilized with seed, organic mulch, jute fabric, or rip-rap, as appropriate, to prevent erosion during construction. After disturbed areas have been stabilized, the temporary erosion control measures will be removed, and accumulated sediment will be removed and disposed of in an appropriate location. Disturbed areas will be stabilized with appropriate ground cover as soon as possible. After the removal of temporary erosion control measures, disturbed areas will receive a layer of topsoil for stabilization.

STABILIZED CONSTRUCTION ENTRANCE

Temporary stabilized construction entrances may be installed at the project site. The purpose of the stabilized construction entrance is to remove sediment attached to vehicle tires and to minimize sediment transport and deposition onto public road surfaces. The construction entrances will be composed of beds of crushed stone which will be replenished as necessary to maintain their proper function.

Construction Period Pollution Prevention

GOOD HOUSEKEEPING BMPS

The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only enough product required to do the job.
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure proper use and disposal of materials.
- The contractor will be required in the Contract documents to control dust.

Material Handling & Waste Management

HAZARDOUS PRODUCTS

These practices will be used to reduce the risks associated with hazardous materials. Material Safety Data Sheets (MSDSs) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained in the SWPPP file at the job site construction office. Since work is located adjacent to wetland resource areas, hazardous fuels or other potential contaminants shall not be stored on site. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product they are using, particularly regarding spill control techniques.

- Products will be kept in original containers unless they are not re-sealable.
- Original labels and material safety data will be retained, as they contain important product information.
- Manufacturer, local state, and/or federal recommended methods for proper disposal will be followed if surplus product must be disposed of.

HAZARDOUS WASTE

All hazardous waste material will be disposed of by the Contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed.

SOLID AND CONSTRUCTION WASTES

All waste materials will be collected and stored in accordance with state and federal law in an appropriately covered container and/or securely lidded metal dumpster.

All trash and construction debris from the site will be deposited in the dumpster. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal.

All waste dumpsters and roll-off containers will be located in an area where the likelihood of the containers contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

SANITARY WASTES

All sanitary waste will be collected from the portable units as required to maintain proper operation and sanitary conditions of these units. All maintenance work on portable sanitation units shall be performed by a licensed portable facility provider in complete compliance with local and state regulations.

All sanitary waste units will be located in an area where the likelihood of the unit contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

Spill Prevention & Control Plan

The Contractor will train all personnel in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the job site superintendent to properly train all personnel in spill prevention and clean up procedures.

In order to minimize the potential for a spill of hazardous materials to come into contact with storm water, the following steps will be implemented:

- All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

- During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials.

- The minimum practical quantity of all such materials will be kept on the job site.

- A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.

- Manufacturers recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

In the event of a spill, the following procedures should be followed:

- All spills will be cleaned up immediately after discovery.

- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.

- The project manager and the Engineer of Record will be notified immediately.

- Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill.

- If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to prevent the recurrence of such releases and to respond to such releases.

The job site superintendent will be the spill prevention and response coordinator. He/She will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the office trailer on-site.

Allowable Non-Stormwater Discharge Management

Certain types of discharges are allowed under the NPDES General Permit for Construction Activity and it is the intent of this project to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come into contact with the water prior to or after its discharge. The control measures that have been outlined previously in this report will be strictly followed to ensure that no contamination of these non-stormwater discharges takes place. The following non-stormwater discharges that may occur from the job site include:

- Discharges from fire-fighting activities

- Fire hydrant flushing

- Waters used to wash vehicles where detergents are not used

- Water used to control dust in accordance with off-site vehicle tracking

- Potable water including uncontaminated water line flushing

- Routine external building wash down that does not use detergents

- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used
- Uncontaminated air conditioner compressor condensate
- Uncontaminated ground water or spring water
- Foundation or footing drains where flows are not contaminated with process materials such as solvents
- Uncontaminated excavation dewatering
- Landscape irrigation

The Project disturbs one or more acres of land; therefore, the project contractor will request coverage under the NPDES Construction General Permit (CGP) and develop a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP follows the requirements of this standard and is in compliance with the NPDES CGP. This standard is fully met.

Standard 9: Operation and Maintenance Plan

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

MassDOT O&M plans are addressed at a statewide, programmatic level through the State's highway operation and maintenance program. Each MassDOT district office is responsible for providing operation and maintenance for the MassDOT stormwater management systems within their respective jurisdictions. Appendix E includes the O&M Plan for this project. This standard is fully met.

Standard 10: Prohibition of Illicit Discharges

All illicit discharges to the stormwater management system are prohibited.

Standard 10 of the Massachusetts Stormwater Handbook prohibits illicit discharges to stormwater management systems. As stated in the handbook, "The stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including stormwater Stormwater Control Measures and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater."

Proponents of projects within Wetlands jurisdiction must demonstrate compliance with this requirement by submitting to the issuing authority an Illicit Discharge Compliance Statement verifying that no illicit discharges exist on the site and by including in the pollution prevention plan measures to prevent illicit discharges to the stormwater management system.

Standard 10 also states that "The Illicit Discharge Compliance Statement must be accompanied by a site map that is drawn to scale and that identifies the location of any systems for conveying stormwater on the site and shows that these systems do not allow the entry of any illicit discharges into the stormwater management system. The site map shall identify the location of any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater management systems and the location of any measures taken to prevent the entry of illicit discharges into the stormwater management system." Included with the Notice of Intent Submission are construction plans that displays the location of all stormwater management components as well as other utilities (existing and proposed) on the project site and conforms to requirements of a "site map" to accompany the Illicit Discharge Compliance Statement.

An Illicit Discharge Compliance Statement is included in Appendix E – Illicit Discharge Compliance Statement of this Report.

Where a new closed drainage system will be constructed, there will be no connections to sanitary sewer. In other areas, stormwater runoff discharges via overland flow.

The design plans submitted with this report have been designed in full compliance with Standard 10. The project area does not have any known illicit connections. Any illicit connections to the stormwater management system found in the project limit of work during construction will be removed and/or resolved through MassDOT's Illicit Discharge Detention and Elimination (IDDE) Program. The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges. Appendix E includes the LTPPP for this project. This standard is fully met.

Appendix A: MassDEP Checklist for Stormwater Report

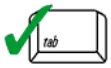
Insert a completed checklist, stamped by a registered professional engineer.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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): Infiltration Basin, Subsurface Infiltration Chambers

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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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;

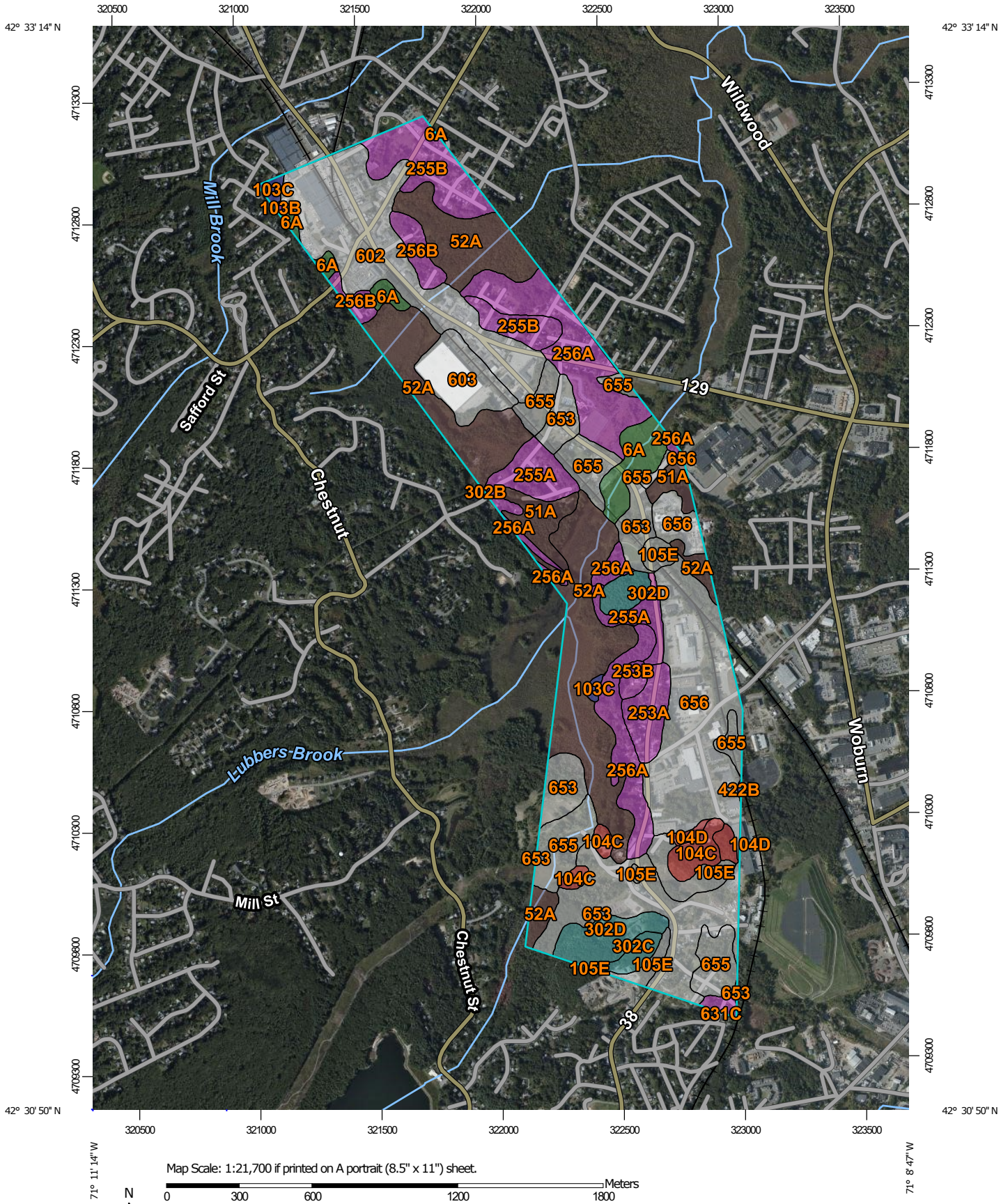
☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Appendix B: Soils and FEMA Information

- NRCS Soil Survey Information
- On-Site Subsurface Investigations
- FEMA Flood Insurance Rate Map (FIRM)

Hydrologic Soil Group—Middlesex County, Massachusetts
(Wilmington Route 38 Hydrologic Soil Group)



Map Scale: 1:21,700 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 13, 2019—Oct 5, 2019

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

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Proposal No. 608051 - 132406

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	20.0	2.8%
51A	Swansea muck, 0 to 1 percent slopes	B/D	16.8	2.4%
52A	Freetown muck, 0 to 1 percent slopes	B/D	137.2	19.4%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	0.5	0.1%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	3.0	0.4%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	D	12.0	1.7%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	D	4.3	0.6%
105E	Rock outcrop-Hollis complex, 3 to 35 percent slopes		17.9	2.5%
253A	Hinckley loamy sand, 0 to 3 percent slopes	A	12.9	1.8%
253B	Hinckley loamy sand, 3 to 8 percent slopes	A	3.5	0.5%
255A	Windsor loamy sand, 0 to 3 percent slopes	A	22.1	3.1%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	35.6	5.0%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	70.9	10.0%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	A	11.8	1.7%
302B	Montauk fine sandy loam, 0 to 8 percent slopes, extremely stony	C	0.1	0.0%
302C	Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony	C	5.5	0.8%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
302D	Montauk fine sandy loam, 15 to 35 percent slopes, extremely stony	C	21.9	3.1%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	0.2	0.0%
602	Urban land		77.3	10.9%
603	Urban land, wet substratum		21.2	3.0%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	A	2.3	0.3%
653	Udorthents, sandy		76.8	10.8%
655	Udorthents, wet substratum		49.3	7.0%
656	Udorthents-Urban land complex		85.8	12.1%
Totals for Area of Interest			**708.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Data Report

for

Massachusetts Department of Transportation – Highway Division

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Project File No. 608051

BMP & Test Pit Results

for

State Route 38 (Main Street)

Wilmington, Massachusetts

Date: 8/26/2020

Prepared for:
Green International Affiliates, Inc.
239 Littleton Road, Suite 3
Westford, Massachusetts 01886
Phone: 978-923-0400

Prepared by:
Lamson Engineering Corporation
437 Cherry Street, Room # 109
Newton, Massachusetts 02465
Phone: 617-558-0101

TABLE OF CONTENTS

– Introduction

Appendices

1. Project Location Plan
2. As-Drilled BMP & As-Dug Test Pit Location Plan
3. Boring & Test Pit Logs
4. Test Pit Lab Testing Results

INTRODUCTION

The purpose of this Data Report is to present the results of 2020 BMP (Best Management Practices) boring and test pit exploration program for the State Route 38 (Main Street) project in the Town of Wilmington, Massachusetts

2020 Subsurface Exploration Program

A subsurface exploration program consisting of test borings BH-1 to BH-3 and test pits TP-1 to TP-6 was completed in August 2020 for the proposed Route 38 project, as indicated on Appendix 2, 'As-Drilled BMP & As-Dug Test Pit Location Plan'.

Borings BH-1 to BH-3 were conducted by using all-terrain vehicle (ATV) drilling. Test Pits TP-1 to TP-6 were conducted by using Mini Excavator.

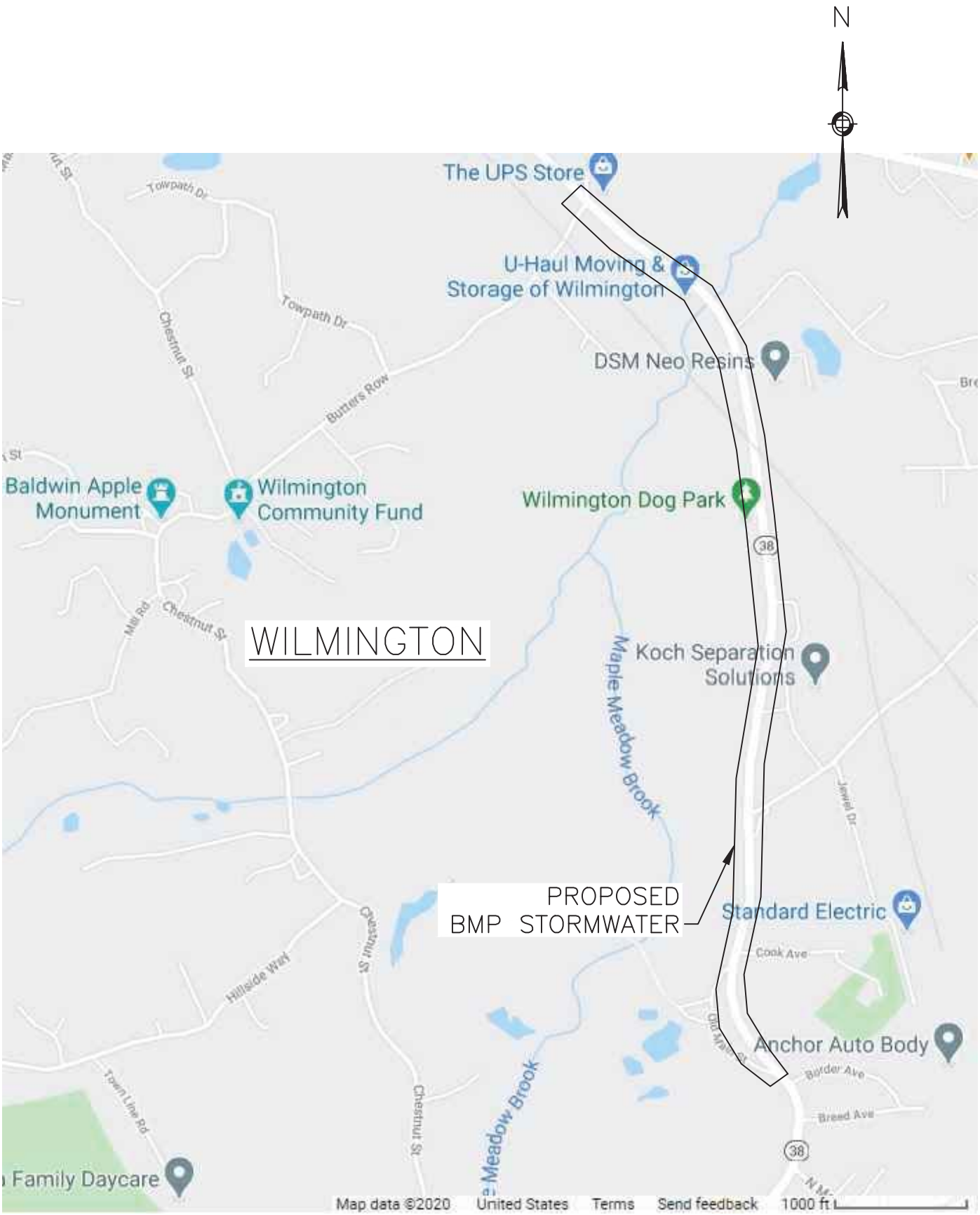
The exploration was performed between August 07 and August 12, 2020 by New England Boring Contractors located on 40 Fordway Street, Derry, New Hampshire (Phone: 603-437-1610). The monitoring of boring exploration was performed by Lamson Engineering Corporation. Materials recorded on the boring logs were visually identified at the site by an engineer from Lamson Engineering, who is also involved in the preparation of this report.

The soil samples were taken using a 2" outside diameter split spoon sampler driven 24" into the soil by a 140-pound hammer falling 30". Blows per 6" were recorded. The visual classification of the collected sample materials at the site was included on the boring logs.

APPENDIX 1

Project Location Plan

(1 Sheet)



massDOT Highway

GREEN INTERNATIONAL AFFILIATES, INC.
PROJECT FILE NO.: 608051
STATE ROUTE 38 (MAIN STREET)
WILMINGTON, MASSACHUSETTS

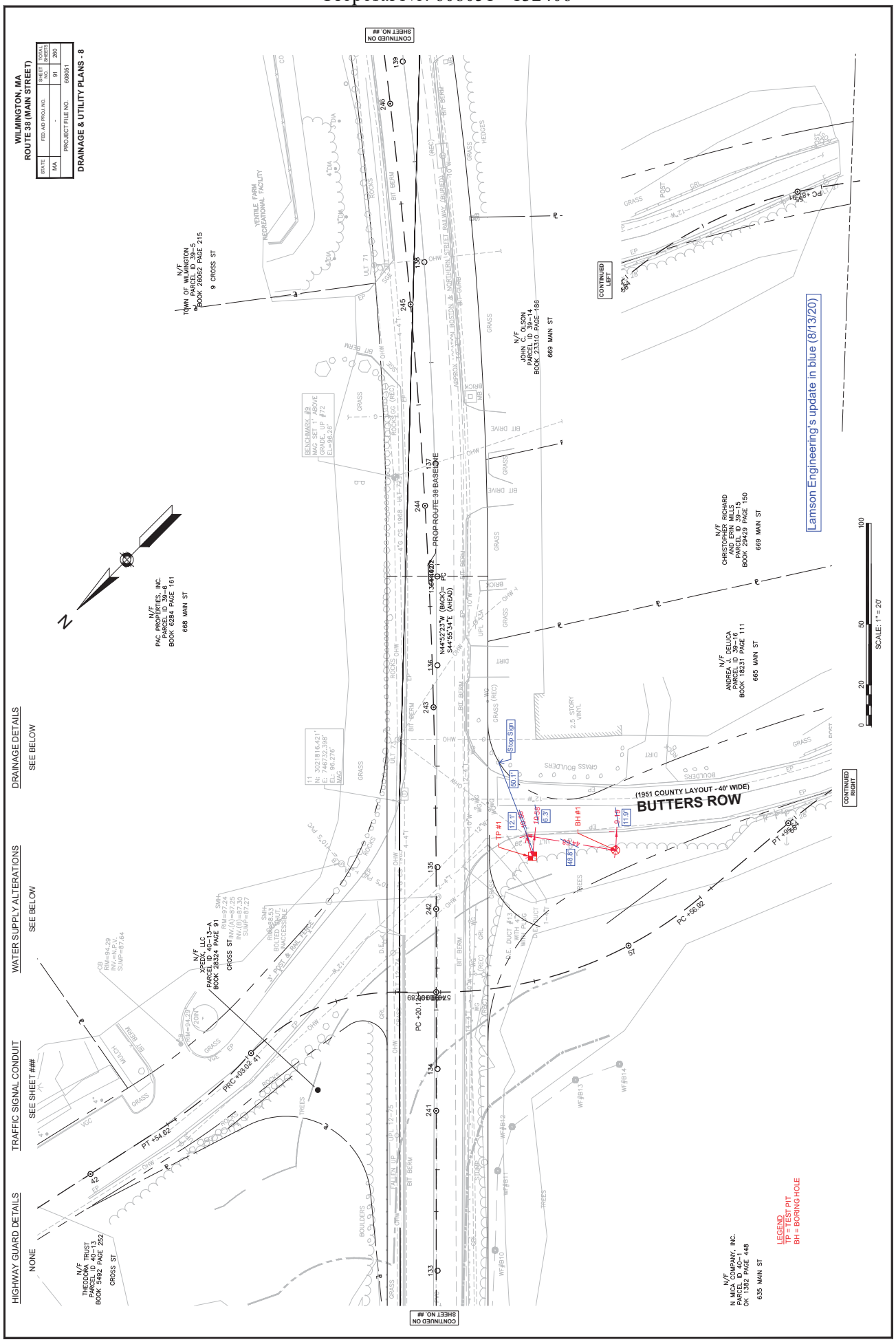
PROJECT LOCATION PLAN
AS NOTED

PREPARED BY
LAMSON ENGINEERING CORP.
NEWTON, MASS.

APPENDIX 2

As-Drilled BMP & As-Dug Test Pit Location Plan

(5 Sheets)


WILMINGTON, MA
ROUTE 38 (MAIN STREET)
DRAINAGE & UTILITY PLANS - 8
STATE: MA
FED. AID PROJ. NO.: -
PROJECT FILE NO.: 608051
SHEET NO.: 91
TOTAL SHEETS: 260
HIGHWAY GUARD DETAILS: NONE
TRAFFIC SIGNAL CONDUIT: SEE SHEET ###
WATER SUPPLY ALTERATIONS: SEE BELOW
DRAINAGE DETAILS: SEE BELOW
PROP ROUTE 38 BASELINE
BUTTERS ROW
(1951 COUNTY LAYOUT - 40' WIDE)
Lamson Engineering's update in blue (8/13/20)
LEGEND
TP = TEST PIT
BH = BORING HOLE
SCALE: 1" = 20'
CONTINUED ON SHEET NO. ##
CONTINUED LEFT
CONTINUED RIGHT
N/F TOWN OF WILMINGTON PARCEL ID 39-5 BOOK 26062 PAGE 215 9 CROSS ST
N/F JOHN V. OLSON PARCEL ID 39-14 BOOK 23310 PAGE 186 669 MAIN ST
N/F CHRISTOPHER J. RICHARD AND ERIN MILLS PARCEL ID 39-15 BOOK 29429 PAGE 150 669 MAIN ST
N/F ANDREA J. DELUCA PARCEL ID 39-16 BOOK 18231 PAGE 111 685 MAIN ST
N/F PAC PROPERTIES, INC. PARCEL ID 39-16 BOOK 6284 PAGE 161 668 MAIN ST
N/F XPEDX, LLC PARCEL ID 40-13-A BOOK 28324 PAGE 91 CROSS ST
N/F THEODORA TRUST PARCEL ID 40-13 BOOK 5492 PAGE 252 CROSS ST
N/F N. MICA COMPANY, INC. PARCEL ID 40-1 OK 1382 PAGE 448 635 MAIN ST
TP #1
BH #1
Stop Sign
PC +20.14
PT +54.62
PRC +69.02
PC +56.92
PT +39.64
PC +89.01
N44°52'23"W (BACK)= S44°55'34"E (AHEAD)
BENCHMARK #9 MAG SET 1" ABOVE GRADE, UP #72 EL=96.28
11 N: 3021816.421' E: 746732.398' EL: 96.276' MAG
6081051_UT01(UTILITY-PLANS)-FOR TEST PIT LOCATIONS.DWG Plotted on 24-Jul-2020 3:17 PM

A00840 - 454

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE BELOW

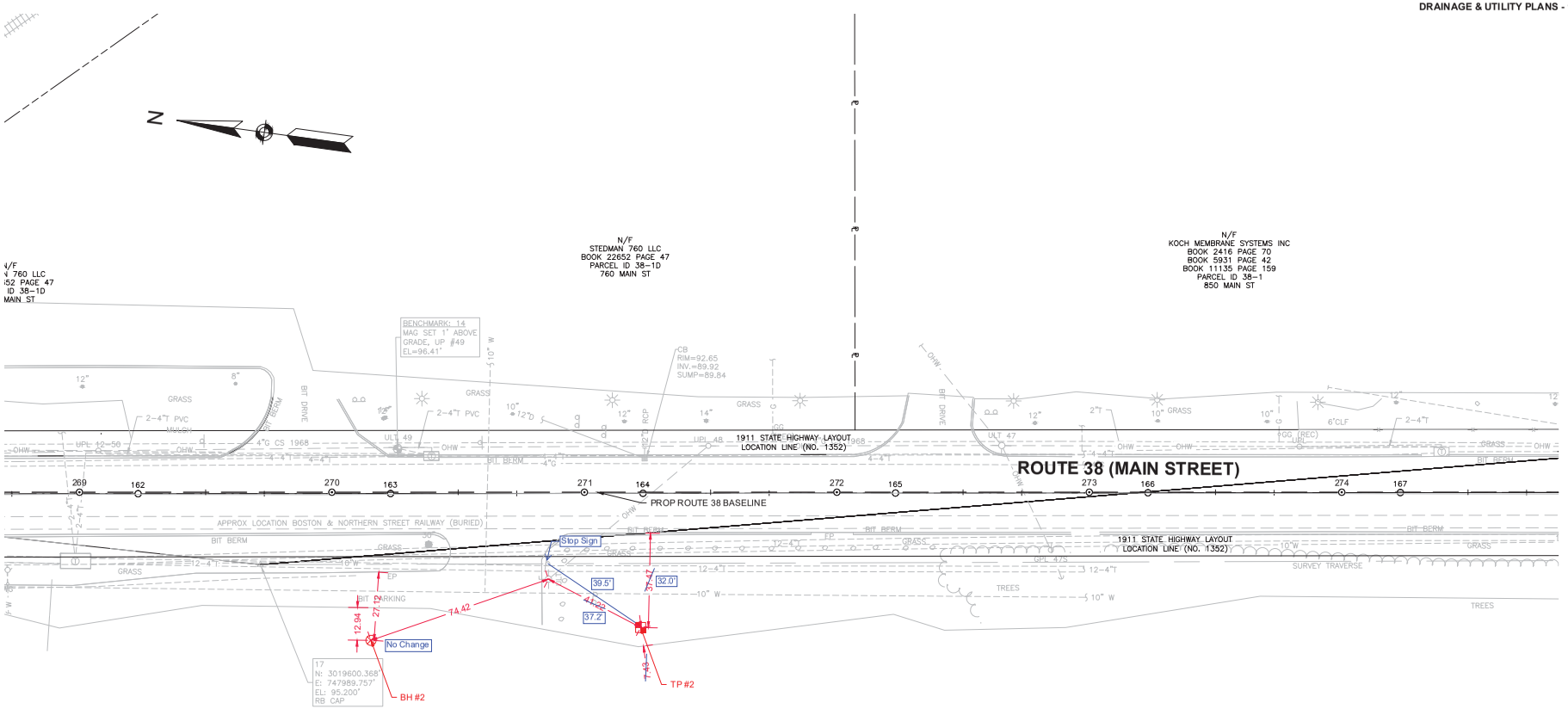
DRAINAGE DETAILS

SEE BELOW

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	##	260
PROJECT FILE NO.	608051		

DRAINAGE & UTILITY PLANS - 13



LEGEND
TP = TEST PIT
BH = BORING HOLE

0 20 50 100
SCALE: 1" = 20'

608051_UT01(UTILITY-PLANS)-FOR TEST PIT LOCATIONS.DWG Plotted on 24-Jul-2020 3:16 PM

Proposal No. 608051 - 132406

A00840 - 455

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE BELOW

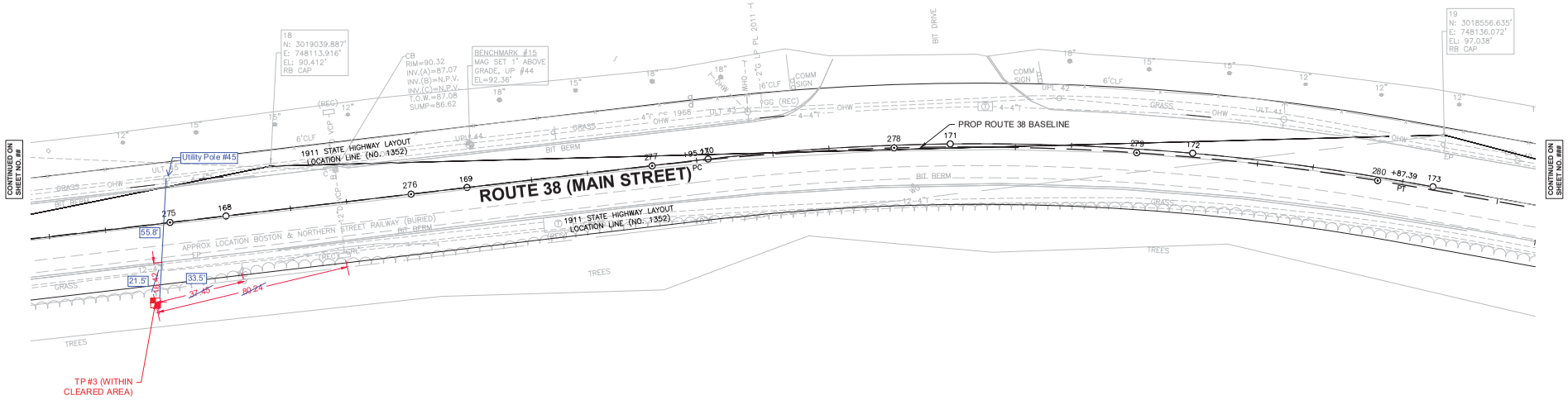
DRAINAGE DETAILS

SEE BELOW

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	###	260
PROJECT FILE NO.	608051		

DRAINAGE & UTILITY PLANS - 14

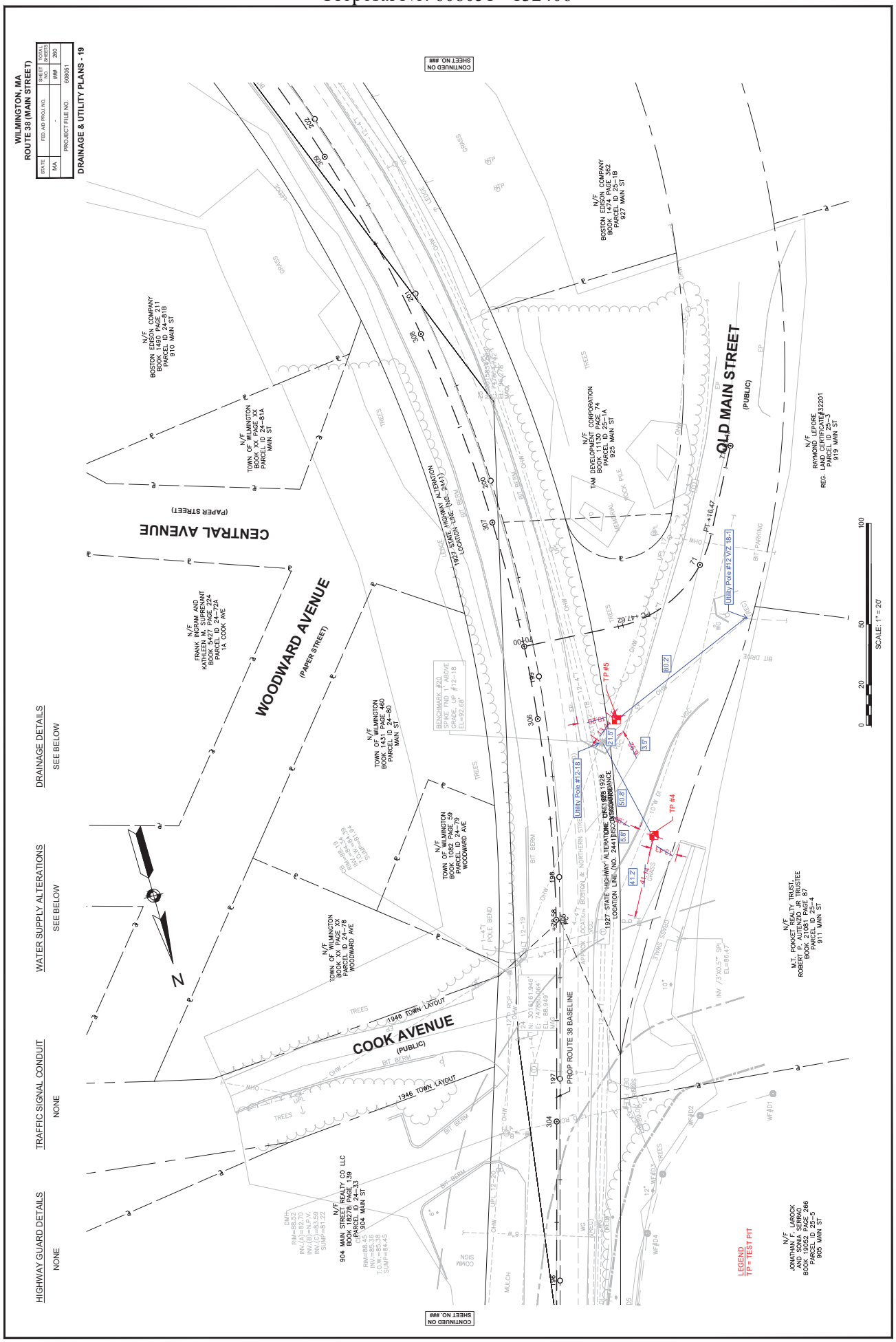


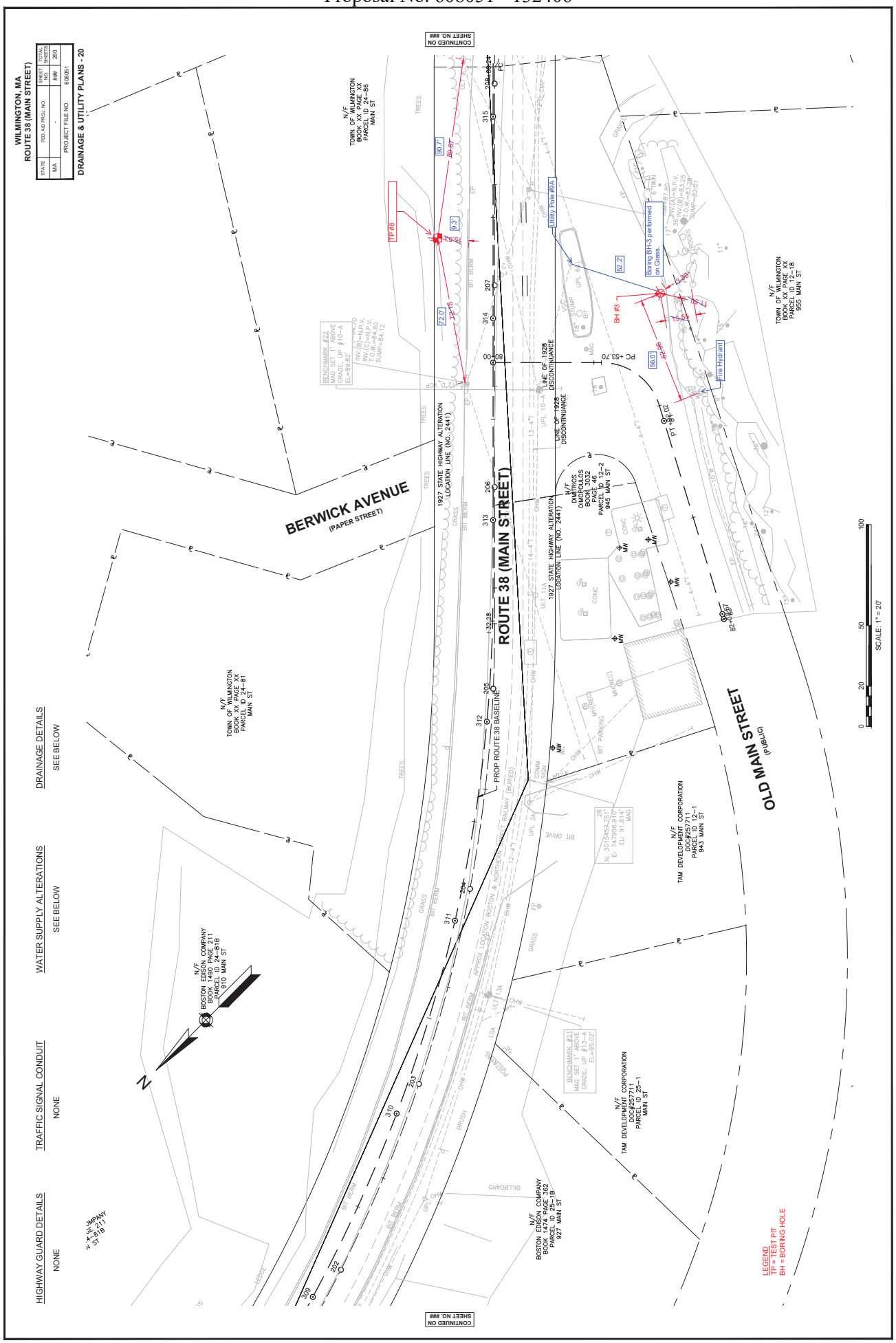
LEGEND
TP = TEST PIT

0 20 50 100
SCALE: 1" = 20'

608051_UT01(UTILITY-PLANS)-FOR TEST PIT LOCATIONS.DWG Plotted on 24-Jul-2020 3:16 PM

Proposal No. 608051 - 132406


WILMINGTON, MA
ROUTE 38 (MAIN STREET)
DRAINAGE & UTILITY PLANS - 19
STATE | FED. AID PROJ. NO. | SHEET NO. | TOTAL SHEETS
MA | - | ### | 260
PROJECT FILE NO. 608051
HIGHWAY GUARD DETAILS NONE
TRAFFIC SIGNAL CONDUIT NONE
WATER SUPPLY ALTERATIONS SEE BELOW
DRAINAGE DETAILS SEE BELOW
CENTRAL AVENUE (PAPER STREET)
WOODWARD AVENUE (PAPER STREET)
COOK AVENUE (PUBLIC)
OLD MAIN STREET (PUBLIC)
1946 TOWN LAYOUT
1927 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 2441)
PROP ROUTE 38 BASELINE
BENCHMARK #20
CHISELED "+" ON TOP OF CURB INLET
SPIKE
EL=92.68'
TP #4
TP #5
Utility Pole #12 V/Z 18-1
Utility Pole #12-18
LEGEND
TP = TEST PIT
SCALE: 1" = 20'
0 20 50 100
N/F BOSTON EDISON COMPANY BOOK 1490 PAGE 271 PARCEL ID 24-51B 910 MAIN ST
N/F TOWN OF WILMINGTON BOOK XX PAGE XX PARCEL ID 24-61A MAIN ST
N/F FRANK INGHAM AND KATHLEEN M. SUPRENANT BOOK 5427 PAGE 224 PARCEL ID 24-72A 1A COOK AVE
N/F TOWN OF WILMINGTON BOOK 1431 PAGE 460 PARCEL ID 24-80 MAIN ST
N/F TOWN OF WILMINGTON BOOK 1082 PAGE 59 PARCEL ID 24-79 WOODWARD AVE
N/F TOWN OF WILMINGTON BOOK XX PAGE XX PARCEL ID 24-78 WOODWARD AVE
N/F 904 MAIN STREET REALTY CO LLC BOOK 32139 PAGE 539 PARCEL ID 24-33 904 MAIN ST
N/F BOSTON EDISON COMPANY BOOK 1414 PAGE 302 PARCEL ID 25-1B 927 MAIN ST
N/F TAM DEVELOPMENT CORPORATION BOOK 1130 PAGE 74 PARCEL ID 25-1A 925 MAIN ST
N/F RAYMOND LEPORE REG. LAND CERT. #122201 PARCEL ID 25-3 919 MAIN ST
N/F M.T. POCKET REALTY TRUST, ROBERT P. AUTENZIO JR TRUSTEE BOOK 21081 PAGE 87 PARCEL ID 25-4 911 MAIN ST
N/F JONATHAN T. LABROCK AND SONIA SERRAO BOOK 19052 PAGE 266 PARCEL ID 25-5 905 MAIN ST
CONTINUED ON SHEET NO. ###
CONTINUED ON SHEET NO. ###


WILMINGTON, MA
ROUTE 38 (MAIN STREET)
DRAINAGE & UTILITY PLANS - 20
STATE: MA
FED. AID PROJ. NO.: -
PROJECT FILE NO.: 608051
SHEET NO.: ###
TOTAL SHEETS: 260
HIGHWAY GUARD DETAILS: NONE
TRAFFIC SIGNAL CONDUIT: NONE
WATER SUPPLY ALTERATIONS: SEE BELOW
DRAINAGE DETAILS: SEE BELOW
ROUTE 38 (MAIN STREET)
BERWICK AVENUE
(PAPER STREET)
OLD MAIN STREET
(PUBLIC)
PROP ROUTE 38 BASELINE
1927 STATE HIGHWAY ALTERATION
LOCATION LINE (NO. 2441)
LINE OF 1928 DISCONTINUANCE
APPROX LOCATION BOSTON & NORTHERN STREET RAILWAY (BURIED)
N/F TOWN OF WILMINGTON BOOK XX PAGE XX PARCEL ID 24-66 MAIN ST
N/F TOWN OF WILMINGTON BOOK XX PAGE XX PARCEL ID 24-81 MAIN ST
N/F BOSTON EDISON COMPANY BOOK 1490 PAGE 211 PARCEL ID 24-81B 910 MAIN ST
N/F DIMITRIOS DIMAKOPOULOS BOOK 3032 PAGE 46 PARCEL ID 12-2 945 MAIN ST
N/F TAM DEVELOPMENT CORPORATION DOC#257711 PARCEL ID 12-1 943 MAIN ST
N/F TAM DEVELOPMENT CORPORATION DOC#257711 PARCEL ID 25-1 MAIN ST
N/F BOSTON EDISON COMPANY BOOK 1474 PAGE 362 PARCEL ID 25-1B 927 MAIN ST
N/F TOWN OF WILMINGTON BOOK XX PAGE XX PARCEL ID 12-18 955 MAIN ST
TP #6
BH #3
Boring BH-3 performed on Grass
Utility Pole #9A
Fire Hydrant
BENCHMARK #22 MAG SET 1" ABOVE GRADE, UP #10-A EL=89.67
BENCHMARK #21 MAG SET 1" ABOVE GRADE, UP #13-A EL=95.02
CONTINUED ON SHEET NO. ###
CONTINUED ON SHEET NO. ###
SCALE: 1" = 20'
LEGEND
TP = TEST PIT
BH = BORING HOLE

APPENDIX 3

Boring & Test Pit Logs

(9 Sheets)

Note:

- For 2020 boring and test pit locations see Appendix 1, 'As-Drilled BMP & As-Dug Test Pit Location Plan'.
- There are 3 sheets for Borings BH-1, BH-2, and BH-3.
- There are 6 sheets for Test Pits TP-1, TP-2, TP-3, TP-4, TP-5, and TP-6.
- The elevations shown on the attached 2020 logs are based on 1988 NAVD datum.

Moving Massachusetts Forward massDOT Highway

Boring Log

LAMSON ENGINEERING CORPORATION
437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Boring No. BH-1 (BMP Boring) | Page 1/1
Scale: 1" = 3'

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: State Route 38 (Main Street)		Date & Time Started: 8/12/20 8:30 a.m.	Total Hours:
Groundwater Depth (Feet): 10' Date & Time: 8/12/20 11:30 a.m.		Date & Time Completed: 8/12/20 12:00 p.m.	3.5
Coordinates: N 3,021,757 E 746,635	Ground Elevation (Feet): 94.5'	Inspector's Name: Weijie Dong	
Drilling Company: New England Boring Contractors		Driller's Name: Manlea Thompson	Helper's Name: Will Sebigny

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches (Coring Times Minute Per Foot)	Recovery (inches)	Field Description	Strata Changes
S-1	0' - 2'	2 3 7 8	10"	Grass O Layer 1" Dry, loose, dark brown, LOAMY SAND, some vegetation. 4"	A Layer
				Dry, medium dense, brown, FINE SAND, some fine to medium gravel, trace inorganic silt.	B Layer
S-2	2' - 2'5"	120/5"	3"	Dry, loose, brown, FINE SAND, trace inorganic silt.	2'5"
				Boulder	3'7"
S-3	4' - 6'	1 1 3 3	12"	Dry, loose, brown, FINE SAND, trace inorganic silt.	
S-4	6' - 8'	7 6 7 9	9"	Dry, medium dense, brown, FINE SAND, trace inorganic silt.	B Layer
S-5	8' - 10'	12 11 11 11	12"	Dry, medium dense, brown, FINE SAND, trace inorganic silt.	
S-6	10' - 12'	6 17 21 16	11"	Wet, dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	
S-7	12' - 13'6"	23 20 125	14"	Wet, dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	13'
				Top of Possible Bedrock @ 13'6" 13'6"	C Layer
				Rollerbit into possible bedrock.	R Layer 15'
				Bottom of Exploration @ 15'	

Legend:
O Layer = Organic Surface Layer
A Layer = Surface Layer
B Layer = Subsoil
C Layer = Substratum
R Layer = Bedrock

Notes:

Arrow-Board: N/A
Signs: -
Cones: 12

Protective Device Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N=Sum of Second and Third 6" Blow Counts

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: ATV Mobile B-57
Hammer Weight: 140 lbs Fall: 30"
Casing Types: HW
Size: 4"
Depth: 12'

Sampler Type: S/S Size: 1 3/8" ID
Automatic Hammer Weight: 140 lbs
Safety Hammer Weight:
Donut Hammer Weight: Fall: 30"

Core Barrel Type: - Size: -

Moving Massachusetts Forward massDOT Highway

Boring Log

LAMSON ENGINEERING CORPORATION

437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Boring No. BH-2 (BMP Boring) | Page 1/1

Scale: 1" = 3'

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: State Route 38 (Main Street)		Date & Time Started: 8/11/20 11:45 a.m.	Total Hours:
Groundwater Depth (Feet): -	Date & Time: -	Date & Time Completed: 8/11/20 3:15 p.m.	3.5
Coordinates: N 3,019,553 E 747,966	Ground Elevation (Feet): 94.4'	Inspector's Name: Weijie Dong	
Drilling Company: New England Boring Contractors		Driller's Name: Manlea Thompson	Helper's Name: Will Sebigny

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches / Coring Times Minute Per Foot	Recovery (inches)	Field Description	Strata Changes
				Asphalt & Sub-base Layer.	8"
S-1	1' - 3'	3 14 14 15	15"	Dry, medium dense, brown, FINE SAND, some fine to medium gravel, trace inorganic silt.	
S-2	3' - 5'	16 12 11 9	8"	Dry, medium dense, brown, FINE SAND, some fine to medium gravel, trace inorganic silt.	B Layer
S-3	5' - 7'	4 7 9 9	14"	Dry, medium dense, brown, FINE SAND, some fine gravel, trace inorganic silt.	
S-4	7' - 7'6"	42 120/0"	6"	Dry, very dense, brown, FINE SAND, some fine gravel, trace inorganic silt.	7'6"
				Top of Bedrock @ 7'6"	
				Rollerbit to 10' and begin coring.	
C-1	10' - 15'	3 3 4 5 5	38"	Moderately weathered, fractured, gray, GRANITE GNEISS. Percent Recovery = 63%, RQD = 24"/60" = 24%	R Layer
					15'
				Bottom of Exploration @ 15'	

Legend:

O Layer = Organic Surface Layer
A Layer = Surface Layer
B Layer = Subsoil
C Layer = Substratum
R Layer = Bedrock

Notes:

Arrow-Board: N/A
Signs: -
Cones: 12

Protective Device Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: ATV Mobile B-57

Hammer Weight: 140 lbs Fall: 30"
Casing Types: HW
Size: 4"
Depth: 9'

Sampler Type: S/S Size: 1 3/8" ID
Automatic Hammer Weight: 140 lbs
Safety Hammer Weight:
Donut Hammer Weight: Fall: 30"

Core Barrel Type: NX Size: 2.15" ID

Moving Massachusetts Forward massDOT Highway

Boring Log

LAMSON ENGINEERING CORPORATION

437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Boring No. BH-3 (BMP Boring) | Page 1/1

Scale: 1" = 3'

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: State Route 38 (Main Street)		Date & Time Started: 8/11/20 8:15 a.m.	Total Hours:
Groundwater Depth (Feet): 9' Date & Time: 8/11/20 9:30 a.m.		Date & Time Completed: 8/11/20 11:15 p.m.	3.0
Coordinates: N 3,015,232 E 748,080	Ground Elevation (Feet): 89.7'	Inspector's Name: Weijie Dong	
Drilling Company: New England Boring Contractors		Driller's Name: Manlea Thompson	Helper's Name: Will Sebigny

Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery (inches)	Field Description	Strata Changes
							Grass O Layer 1"	
S-1	0' - 2'	2	3	7	8	10"	Dry, medium dense, dark brown, LOAMY SAND, trace vegetation.	A Layer 2'4"
S-2	2' - 4'	7	18	18	11	14"	Dry, dense, brown, FINE SAND, some fine to medium gravel, trace inorganic silt.	
S-3	4' - 6'	22	52	65	76	12"	Dry, very dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.	
S-4	6' - 8'	80	81	62	90	20"	Dry, very dense, brown, FINE TO COARSE SAND & FINE TO COARSE GRAVEL, trace inorganic silt.	B Layer
S-5	8' - 10'	20	21	23	29	9"	Moist, dense, brown, FINE TO COARSE SAND & FINE TO COARSE GRAVEL, trace inorganic silt.	
S-6	10' - 12'	13	33	42	25	17"	Wet, very dense, brown, FINE TO COARSE SAND & FINE TO COARSE GRAVEL, trace inorganic silt.	
S-7	12' - 14'	31	29	15	17	12"	Wet, dense, brown, FINE TO COARSE SAND & FINE TO COARSE GRAVEL, trace inorganic silt.	
S-8	14' - 16'	34	14	22	17	9"	Wet, dense, brown, FINE TO COARSE SAND & FINE TO COARSE GRAVEL, trace inorganic silt.	
							Bottom of Exploration @ 16'	16'

Legend:

O Layer = Organic Surface Layer
A Layer = Surface Layer
B Layer = Subsoil
C Layer = Substratum
R Layer = Bedrock

Notes:

Arrow-Board: N/A
Signs: -
Cones: 12

Protective Device Stand: - Box: -
Well Depth: - Solid Pipe: -
Stick Up Pipe: - Screen Pipe: -

Penetration Resistance (N) Guide:

Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silts, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
		Hard	Over 30

N=Sum of Second and Third 6" Blow Counts

Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less

Type of Drill Rig: ATV Mobile B-57

Hammer Weight: - Fall: -
Augers: HSA
Size: 4.25"
Depth: 14'

Sampler Type: S/S Size: 1 3/8" ID
Automatic Hammer Weight: 140 lbs
Safety Hammer Weight:
Donut Hammer Weight: Fall: 30"

Core Barrel Type: - Size: -

Moving Massachusetts Forward massDOT Highway

Test Pit Log

LAMSON ENGINEERING CORPORATION
437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Test Pit No. TP-1 | Page 1/1

Scale: -

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: Route 38 (Main Street), Wilmington MA		Date & Time Started: 8/10/20 10:00 am	Total Hours: 1.5
Coordinates: N 3,021,784 E 746,664	Ground Elev. (Feet): 93.8'	Date & Time Completed: 8/10/20 11:30 am	
Drilling Company: New England Boring Contractors	Driller's Name: Manlea Thompson	Helper's Name: William Sebigny	
Inspector's Name: Weijie Dong	Equipment Type: Mini Excavator KX71-3		

INFORMATION LOG

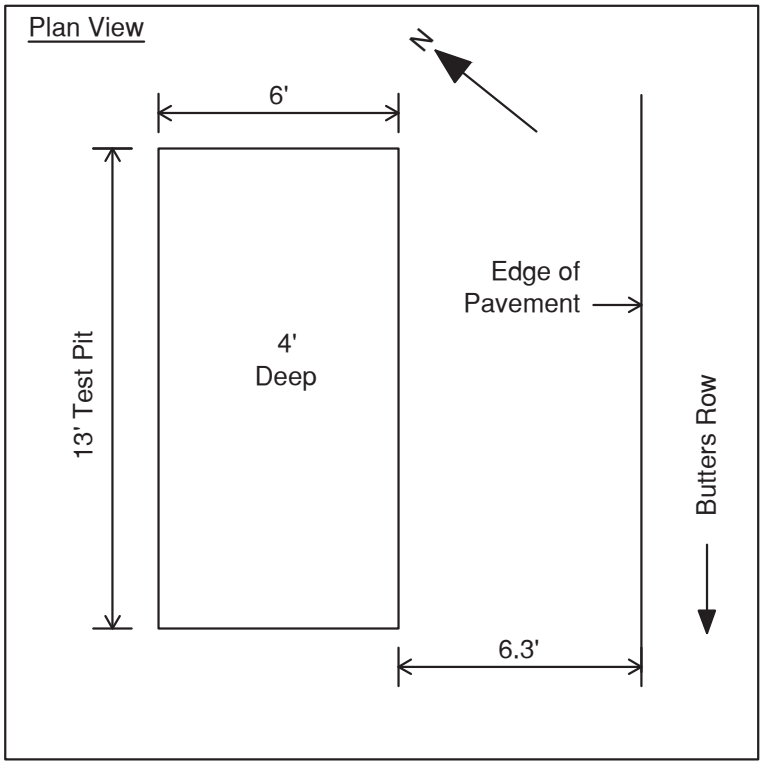
Depth Range	Field Description	Strata Changes
0' - 10"	Topsoil	10"
10" - 4'	Dry, brown, BOULDERS, some fine sand, some cobbles, some fine to coarse gravel, trace inorganic silt.	4'
	BOULDERS	

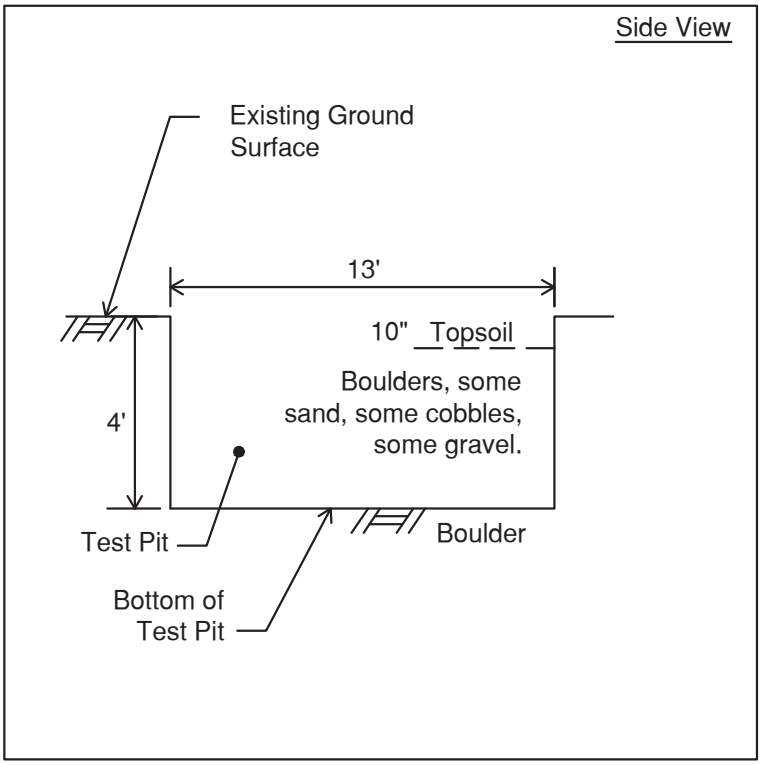
No water encountered.

Remarks:

- Terminated at 4' deep due to boulders.

SKETCHES





Remarks:

massDOT Highway

Test Pit Log

LAMSON ENGINEERING CORPORATION
437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Test Pit No. TP-2 | Page 1/1

Scale: -

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: Route 38 (Main Street), Wilmington MA		Date & Time Started: 8/10/20 8:15 am	Total Hours: 1.25
Coordinates: N 3,019,450 E 747,992	Ground Elev. (Feet): 92.9'	Date & Time Completed: 8/10/20 9:30 am	
Drilling Company: New England Boring Contractors	Driller's Name: Manlea Thompson	Helper's Name: William Sebigny	
Inspector's Name: Weijie Dong	Equipment Type: Mini Excavator KX71-3		

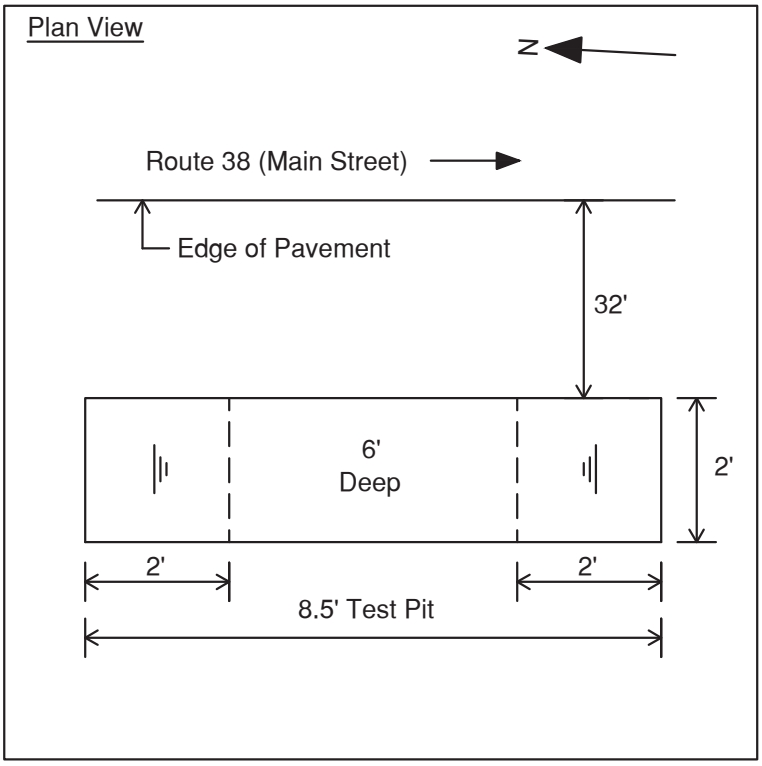
INFORMATION LOG

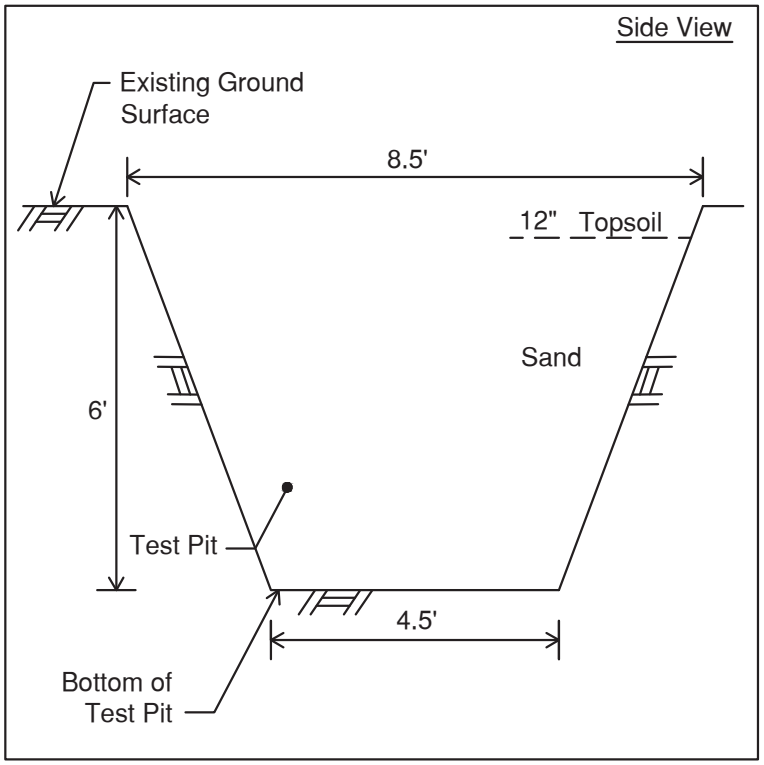
Depth Range	Field Description	Strata Changes
0' - 12"	Topsoil	12"
12" - 6'	Dry, brown, FINE SAND, trace inorganic silt.	6'

No water encountered.

Remarks:

SKETCHES





Remarks:

Test Pit Log

LAMSON ENGINEERING CORPORATION

437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Test Pit No. TP-3 | Page 1/1

Scale: -

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: Route 38 (Main Street), Wilmington MA		Date & Time Started: 8/7/20 1:30 pm	Total Hours: 1.25
Coordinates: N 3,019,081 E 748,052	Ground Elev. (Feet): 88.5'	Date & Time Completed: 8/7/20 2:45 pm	
Drilling Company: New England Boring Contractors	Driller's Name: Manlea Thompson	Helper's Name: William Sebigny	
Inspector's Name: Weijie Dong	Equipment Type: Mini Excavator KX71-3		

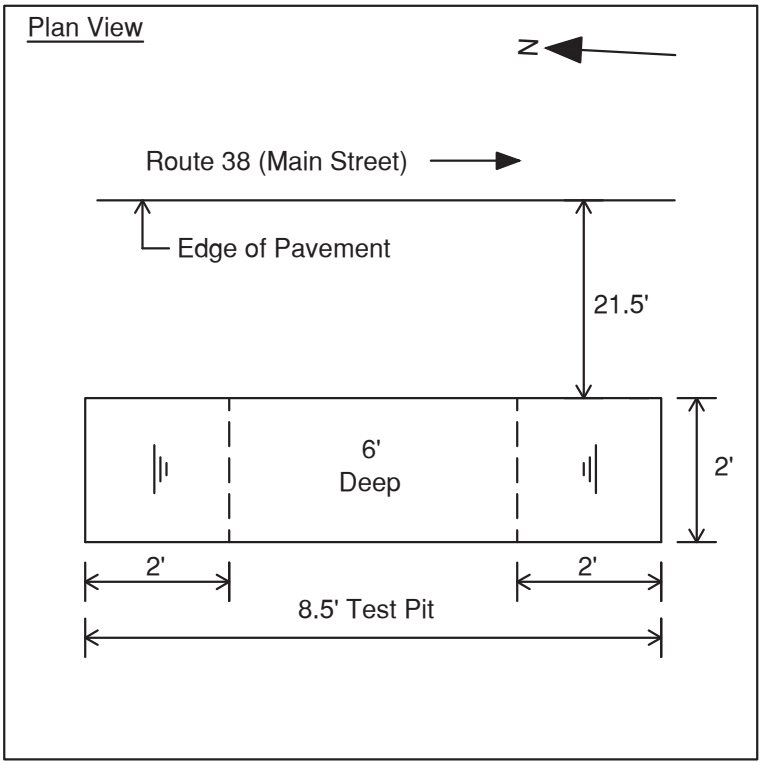
INFORMATION LOG

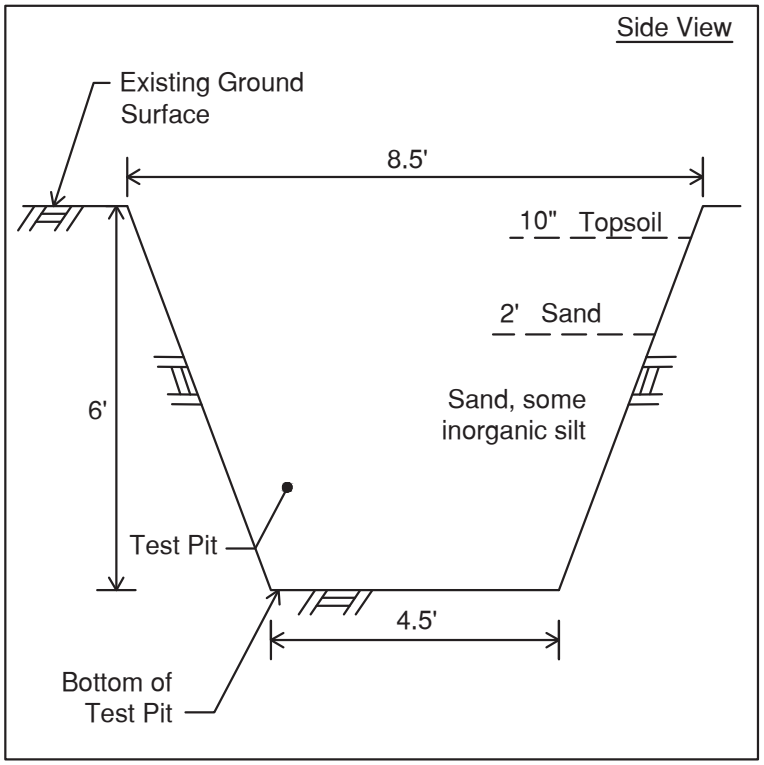
Depth Range	Field Description	Strata Changes
0' - 10"	Topsoil	10"
10" - 2'	Dry, gray, FINE SAND, trace fine gravel, trace inorganic silt.	2'
2' - 6'	Dry, brown, FINE SAND, some inorganic silt.	6'

No water encountered.

Remarks:

SKETCHES





Remarks:

Test Pit Log

LAMSON ENGINEERING CORPORATION

437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Test Pit No. TP-4 | Page 1/1

Scale: -

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: Route 38 (Main Street), Wilmington MA		Date & Time Started: 8/7/20 11:30 am	Total Hours: 1.5
Coordinates: N 3,016,081 E 747,790	Ground Elev. (Feet): 89.8'	Date & Time Completed: 8/7/20 1:00 pm	
Drilling Company: New England Boring Contractors	Driller's Name: Manlea Thompson	Helper's Name: William Sebigny	
Inspector's Name: Weijie Dong	Equipment Type: Mini Excavator KX71-3		

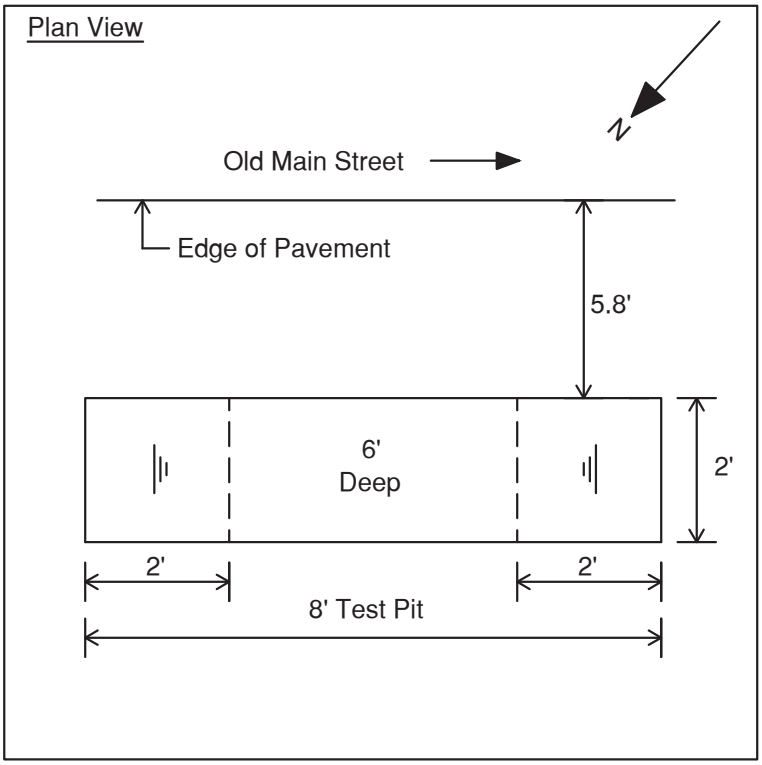
INFORMATION LOG

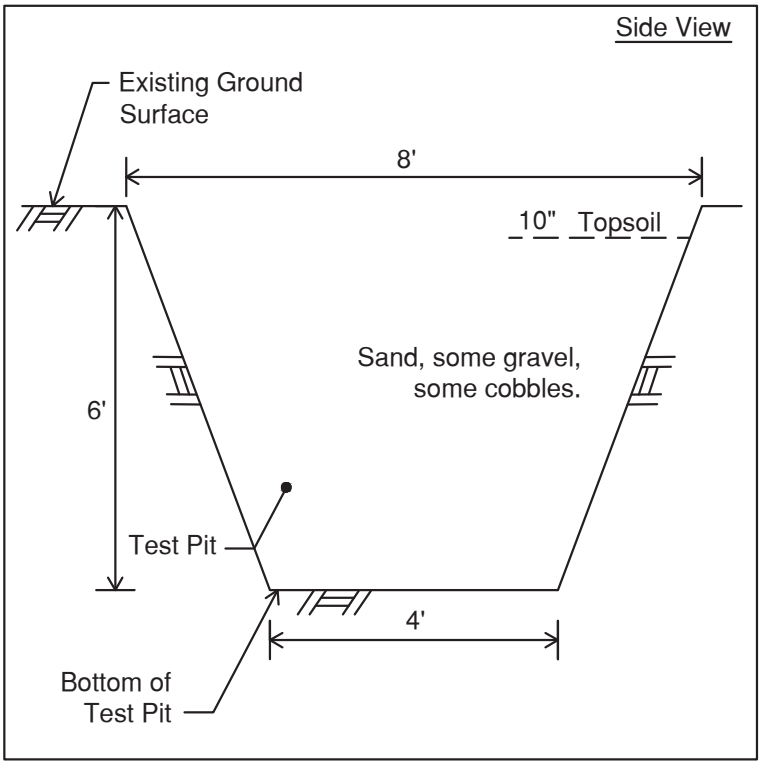
Depth Range	Field Description	Strata Changes
0' - 10"	Topsoil	10"
10" - 6'	Dry, brown, FINE SAND, some fine to coarse gravel, some cobbles, trace inorganic silt.	6'

No water encountered.

Remarks:

SKETCHES





Remarks:

Test Pit Log

LAMSON ENGINEERING CORPORATION

437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Test Pit No. TP-5 | Page 1/1

Scale: -

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: Route 38 (Main Street), Wilmington MA		Date & Time Started: 8/7/20 9:45 am	Total Hours: 1.25
Coordinates: N 3,016,026 E 747,789	Ground Elev. (Feet): 90.5'	Date & Time Completed: 8/7/20 11:00 am	
Drilling Company: New England Boring Contractors	Driller's Name: Manlea Thompson	Helper's Name: William Sebigny	
Inspector's Name: Weijie Dong	Equipment Type: Mini Excavator KX71-3		

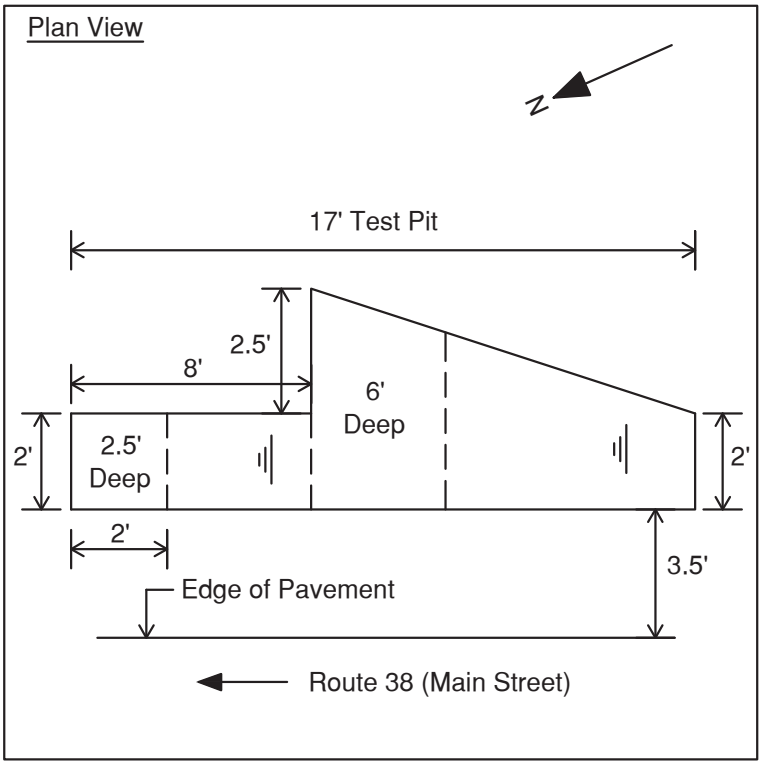
INFORMATION LOG

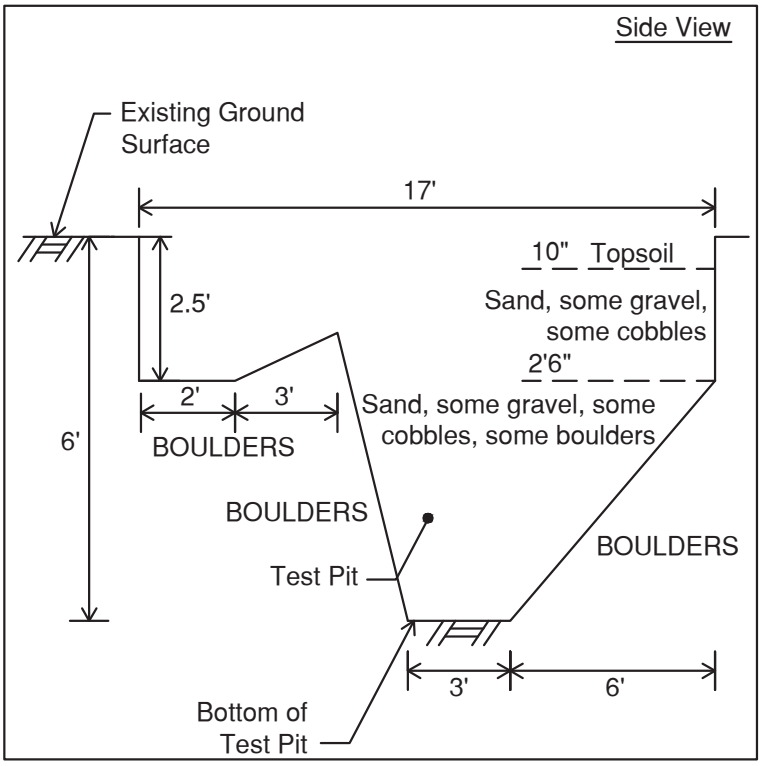
Depth Range	Field Description	Strata Changes
0' - 10"	Topsoil	10"
10" - 2'6"	Dry, brown, FINE SAND, some fine to coarse gravel, some cobbles, trace inorganic silt.	2'6"
2'6" - 6'	Dry, brown, FINE SAND, some fine to coarse gravel, some cobbles, some boulders, trace inorganic silt.	6'

No water encountered.

Remarks:

SKETCHES





Remarks:

Moving Massachusetts Forward massDOT Highway

Test Pit Log

LAMSON ENGINEERING CORPORATION
437 Cherry Street, #109, Newton, Massachusetts 02465
Phone: (617) 558-0101 E-Mail: Lamsoneng@msn.com

Test Pit No. TP-6 | Page 1/1

Scale: -

City/Town: Wilmington	Bridge No.: -	Project File No.: 608051	Contract No.: -
Location: Route 38 (Main Street), Wilmington MA		Date & Time Started: 8/7/20 8:45 am	Total Hours: 0.75
Coordinates: N 3,015,297 E 748,175	Ground Elev. (Feet): 89.2'	Date & Time Completed: 8/7/20 9:30 am	
Drilling Company: New England Boring Contractors	Driller's Name: Manlea Thompson	Helper's Name: William Sebigny	
Inspector's Name: Weijie Dong	Equipment Type: Mini Excavator KX71-3		

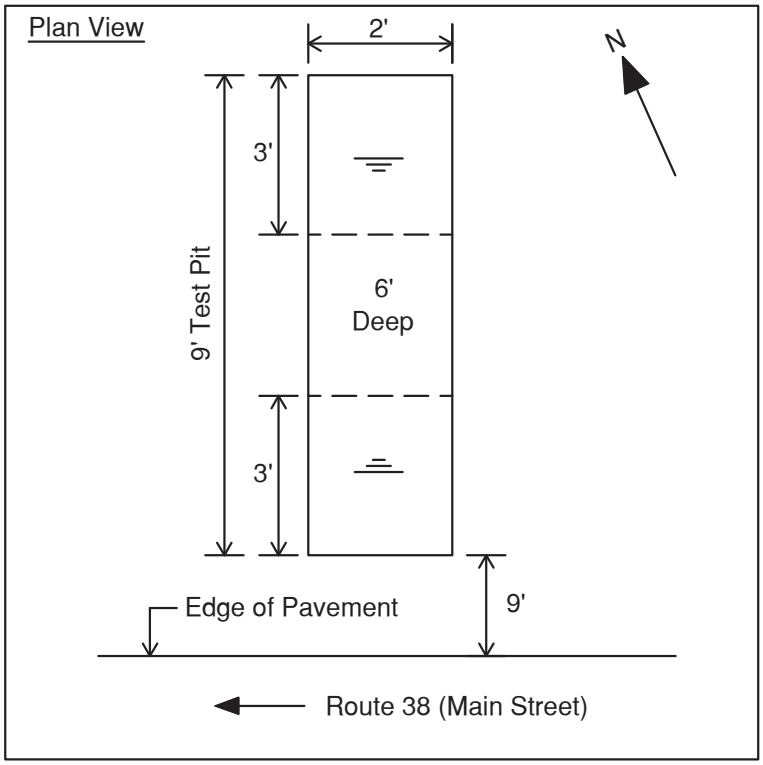
INFORMATION LOG

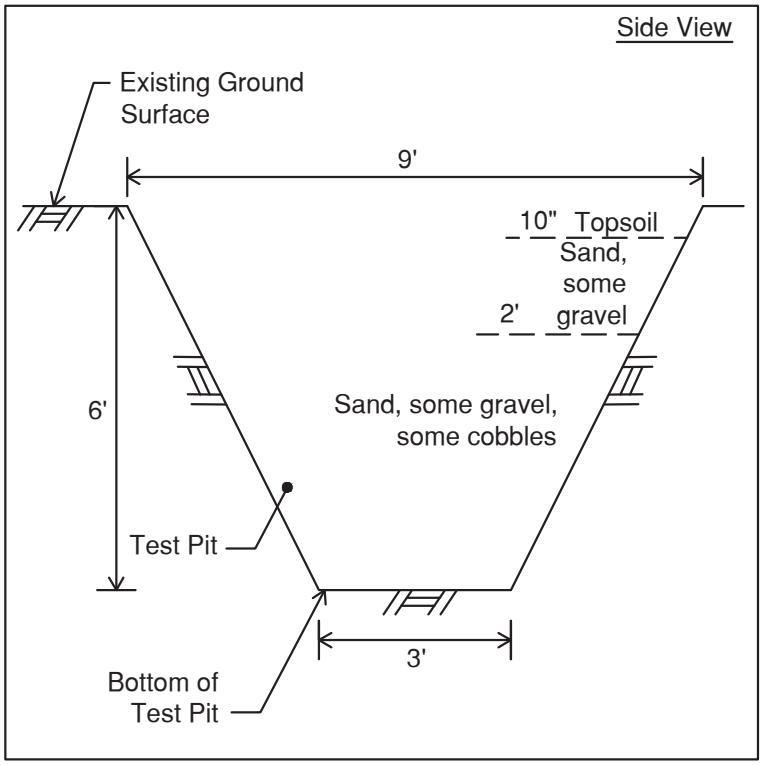
Depth Range	Field Description	Strata Changes
0' - 10"	Topsoil	10"
10" - 3'6"	Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	3'6"
3'6" - 6'	Dry, brown, FINE TO COARSE SAND, some fine to coarse gravel, some cobbles, trace inorganic silt.	6'

No water encountered.

Remarks:

SKETCHES





Remarks:

APPENDIX 4

Test Pit Lab Testing Results

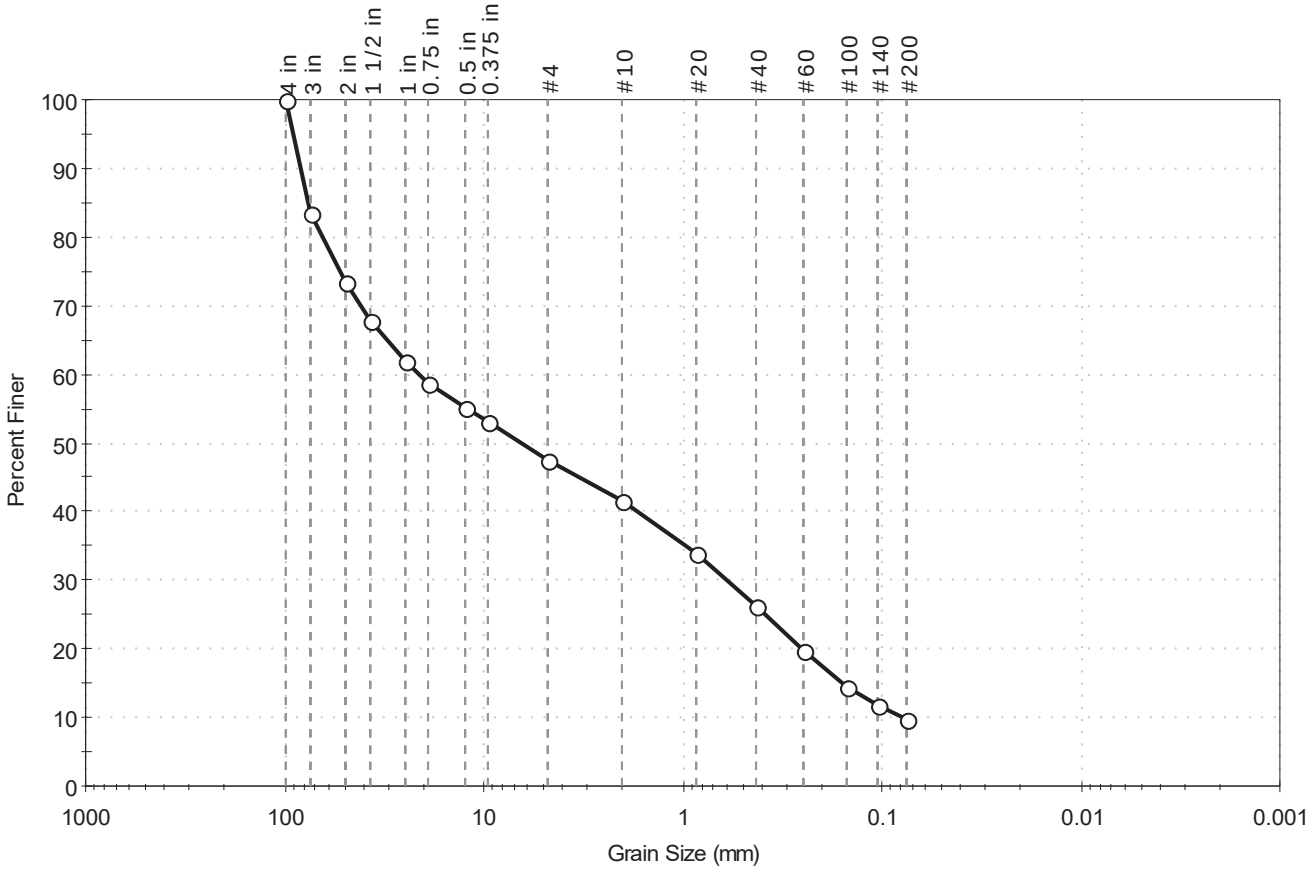
(6 Sheets)

Note:

- Soil samples (5-gal bucket) taken for testing are obtained from test pits TP-1 to TP-6.

Client:	Lamson Engineering Corporation				
Project:	Project File No. 608051				
Location:	Wilmington, MA			Project No:	GTX-312218
Boring ID:	---	Sample Type:	bucket	Tested By:	ckg
Sample ID:	TP-1	Test Date:	08/24/20	Checked By:	bfs
Depth :	1-4 ft	Test Id:	572208		
Test Comment:	---				
Visual Description:	Moist, olive brown sand with silt and gravel				
Sample Comment:	Sample contains asphalt				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
16.4	36.2	37.7	9.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
4 in	100.00	100		
3 in	75.00	84		
2 in	50.00	73		
1 1/2 in	37.50	68		
1 in	25.00	62		
0.75 in	19.00	59		
0.5 in	12.50	55		
0.375 in	9.50	53		
#4	4.75	47		
#10	2.00	42		
#20	0.85	34		
#40	0.42	26		
#60	0.25	20		
#100	0.15	14		
#140	0.11	12		
#200	0.075	9.7		

Coefficients

D_{85} = 76.8674 mm
D_{30} = 0.5903 mm
D_{60} = 21.3072 mm
D_{15} = 0.1595 mm
D_{50} = 6.5479 mm
D_{10} = 0.0795 mm
C_u = 268.015
C_c = 0.206

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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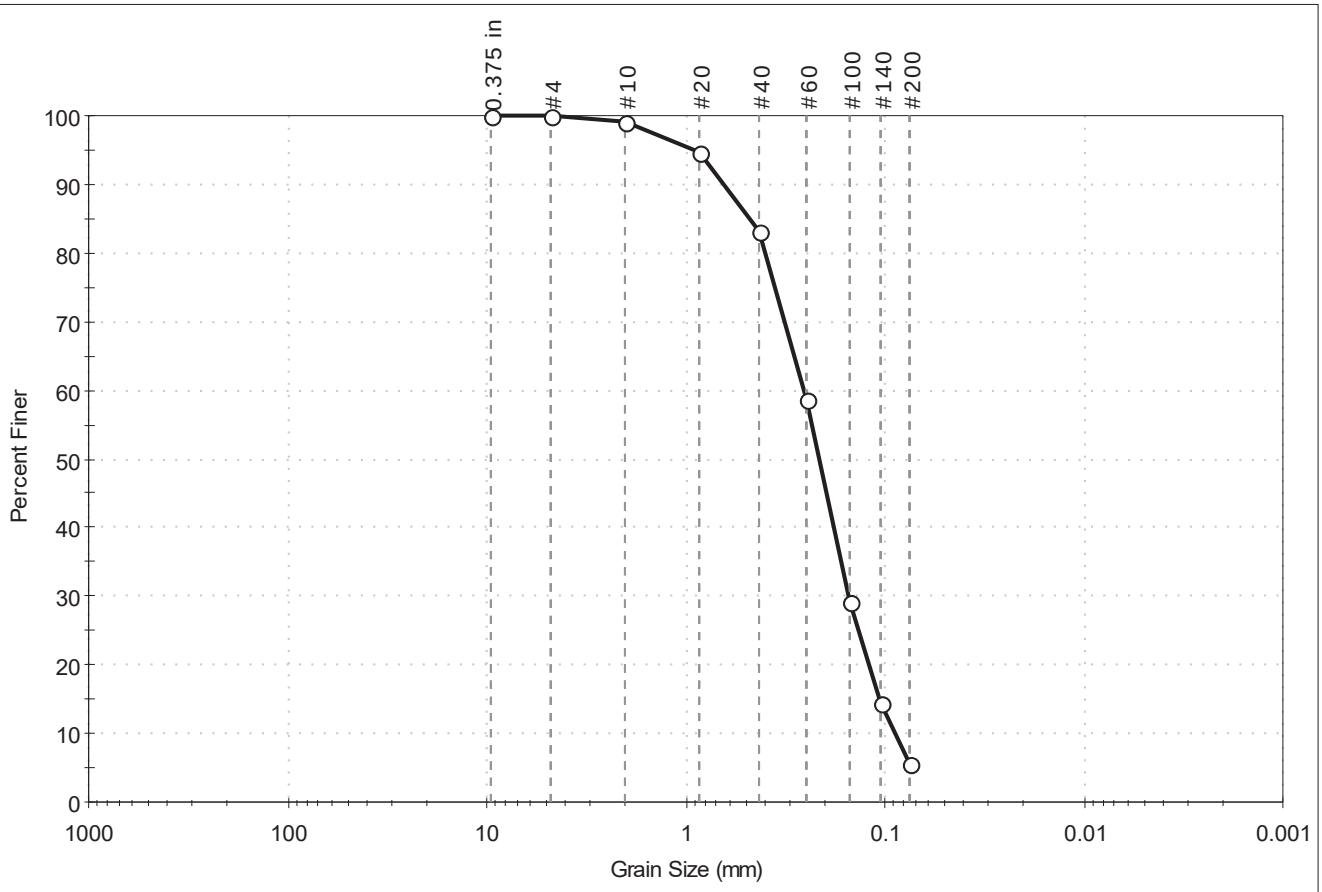
Client:	Lamson Engineering Corporation				
Project:	Project File No. 608051				
Location:	Wilmington, MA			Project No:	GTX-312218
Boring ID:	---	Sample Type:	bucket	Tested By:	ckg
Sample ID:	TP-2	Test Date:	08/19/20	Checked By:	bfs
Depth :	1-6 ft	Test Id:	572209		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	0.0	94.5	5.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	95		
#40	0.42	83		
#60	0.25	59		
#100	0.15	29		
#140	0.11	14		
#200	0.075	5.5		

Coefficients

D_{85} = 0.4756 mm D_{30} = 0.1521 mm
D_{60} = 0.2578 mm D_{15} = 0.1076 mm
D_{50} = 0.2154 mm D_{10} = 0.0895 mm
C_u = 2.880 C_c = 1.003

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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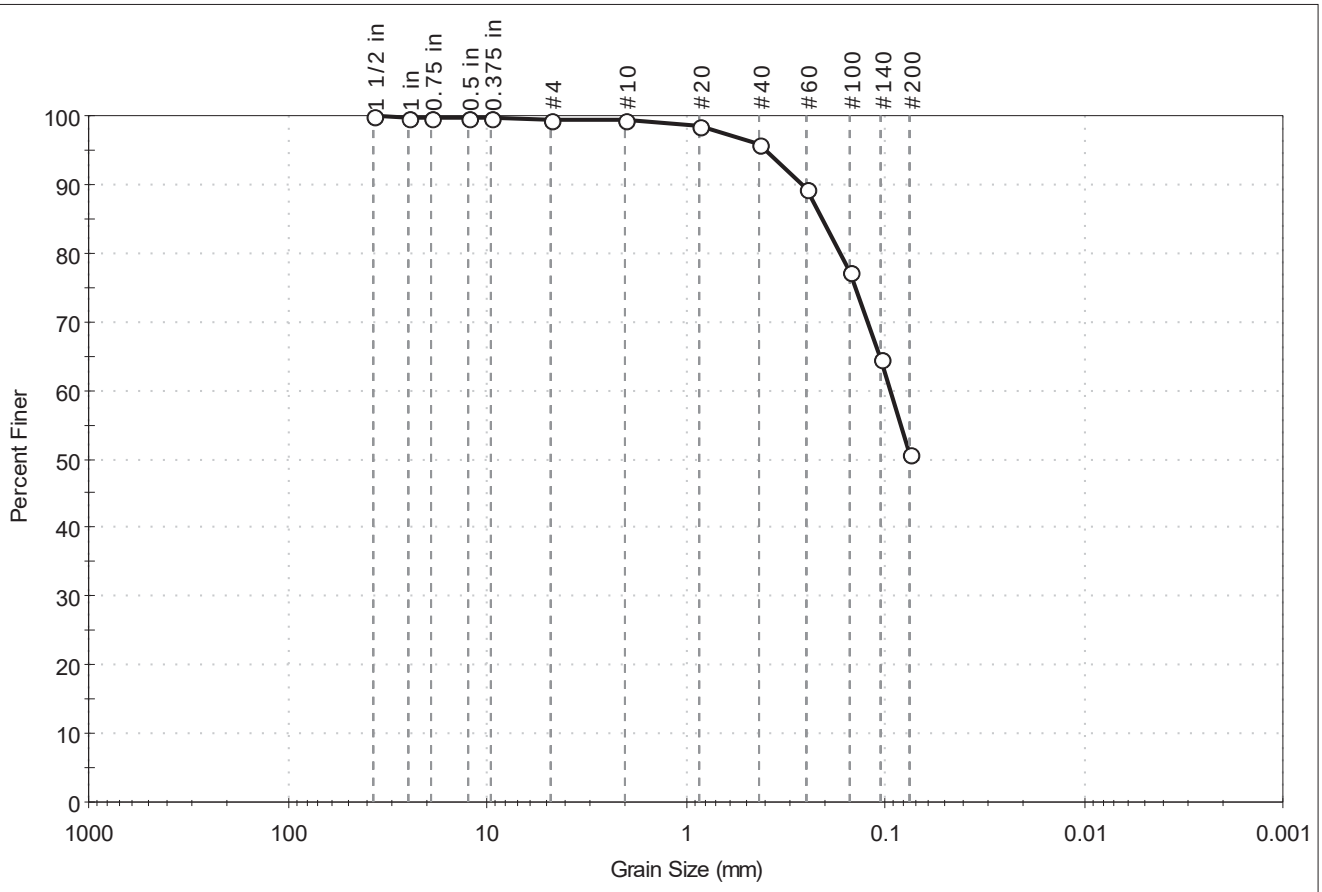
Client:	Lamson Engineering Corporation				
Project:	Project File No. 608051				
Location:	Wilmington, MA			Project No:	GTX-312218
Boring ID:	---	Sample Type:	bucket	Tested By:	ckg
Sample ID:	TP-3	Test Date:	08/20/20	Checked By:	bfs
Depth :	1-6 ft	Test Id:	572210		
Test Comment:	---				
Visual Description:	Moist, light olive brown sandy silty clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.4	48.8	50.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2 in	37.50	100		
1 in	25.00	100		
0.75 in	19.00	100		
0.5 in	12.50	100		
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	99		
#40	0.42	96		
#60	0.25	90		
#100	0.15	77		
#140	0.11	64		
#200	0.075	51		

Coefficients

D_{85} = 0.2074 mm	D_{30} = N/A
D_{60} = 0.0947 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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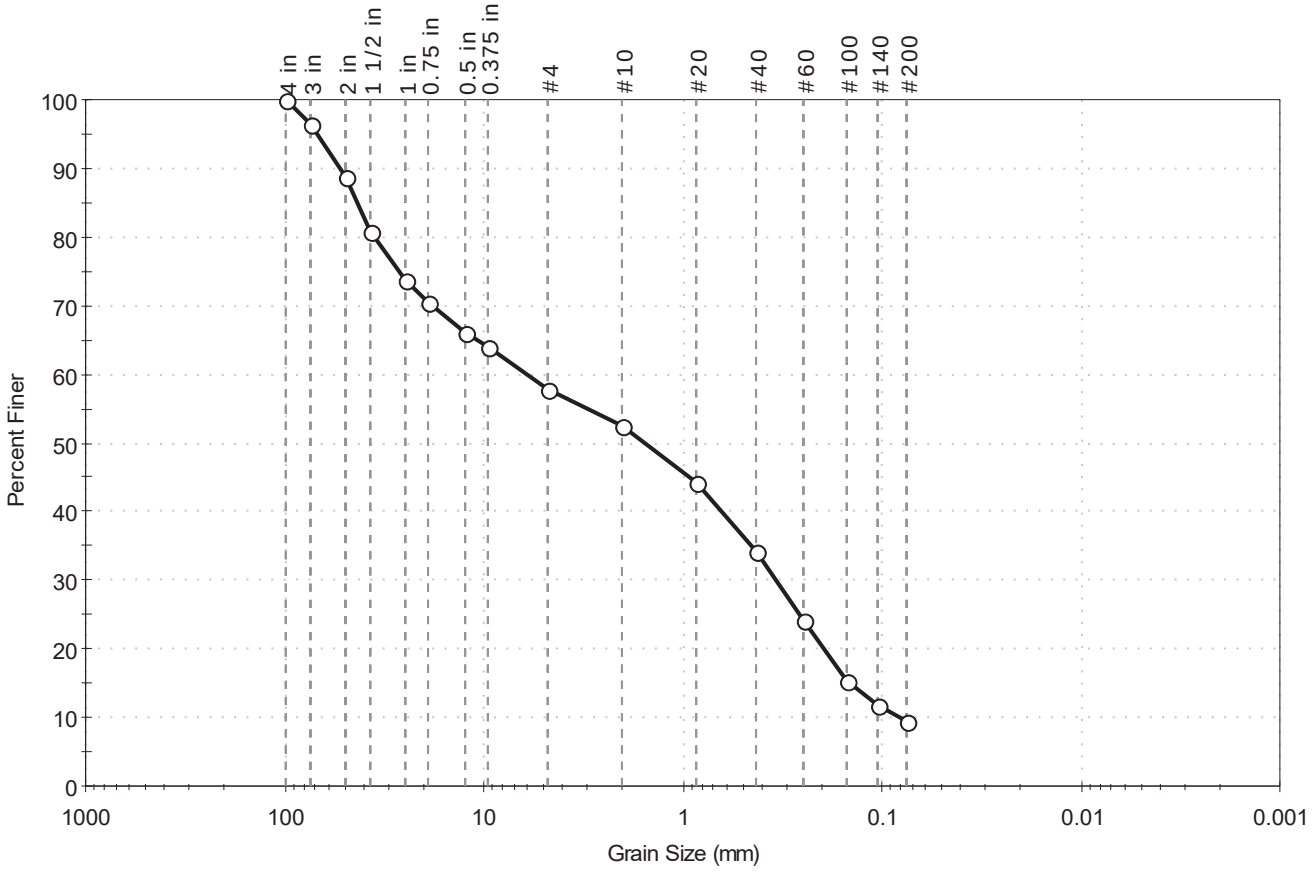
Client:	Lamson Engineering Corporation				
Project:	Project File No. 608051				
Location:	Wilmington, MA			Project No:	GTX-312218
Boring ID:	---	Sample Type:	bucket	Tested By:	ckg
Sample ID:	TP-4	Test Date:	08/20/20	Checked By:	bfs
Depth :	1-6 ft	Test Id:	572211		
Test Comment:	---				
Visual Description:	Moist, dark olive brownsand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
3.7	38.4	48.5	9.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
4 in	100.00	100		
3 in	75.00	96		
2 in	50.00	89		
1 1/2 in	37.50	81		
1 in	25.00	74		
0.75 in	19.00	70		
0.5 in	12.50	66		
0.375 in	9.50	64		
#4	4.75	58		
#10	2.00	53		
#20	0.85	44		
#40	0.42	34		
#60	0.25	24		
#100	0.15	15		
#140	0.11	12		
#200	0.075	9.4		

Coefficients

D_{85} = 43.6610 mm	D_{30} = 0.3384 mm
D_{60} = 6.0682 mm	D_{15} = 0.1447 mm
D_{50} = 1.5414 mm	D_{10} = 0.0814 mm
C_u = 74.548	C_c = 0.232

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

Sample / Test Description

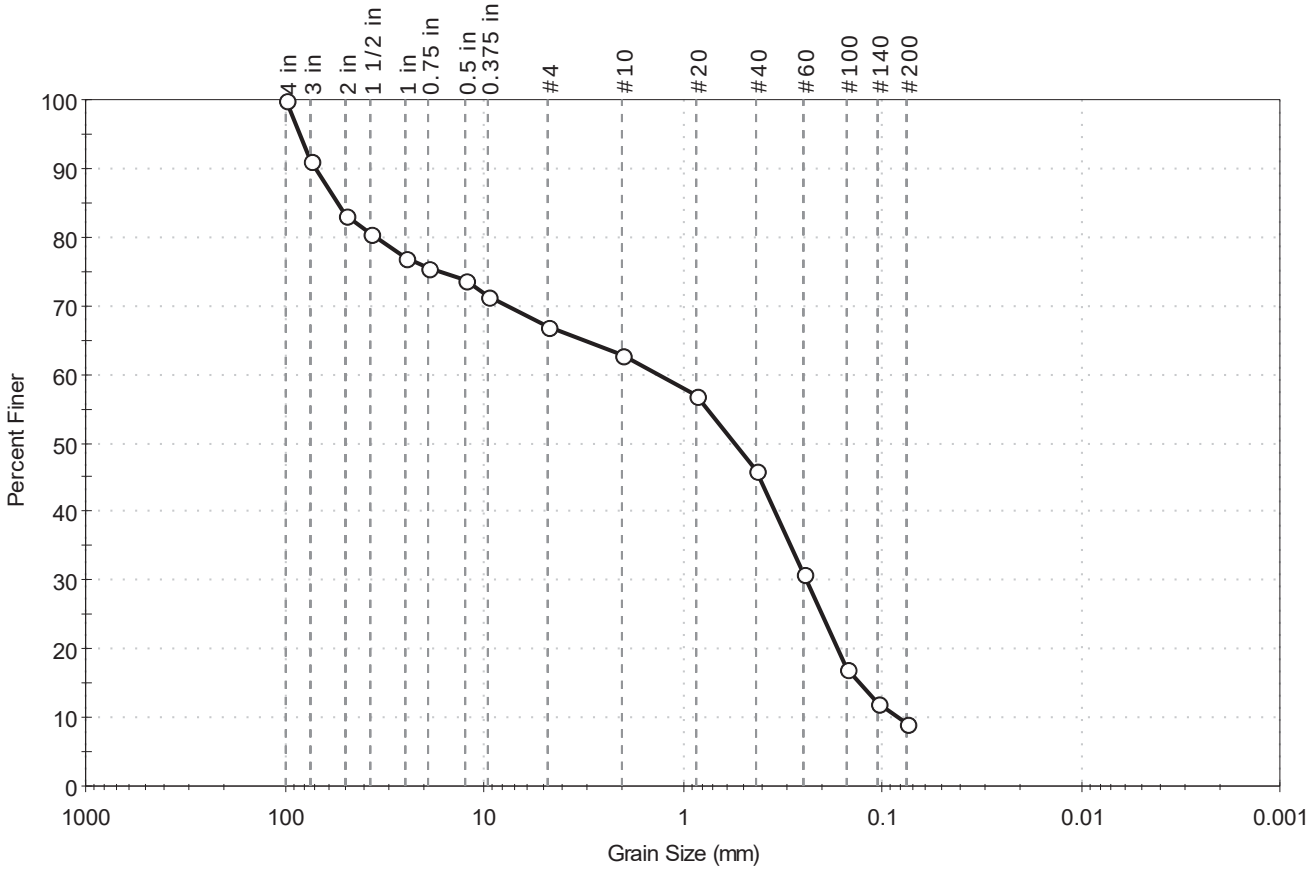
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

printed 8/24/2020 1:15:56 PM

Client:	Lamson Engineering Corporation				
Project:	Project File No. 608051				
Location:	Wilmington, MA			Project No:	GTX-312218
Boring ID:	---	Sample Type:	bucket	Tested By:	ckg
Sample ID:	TP-5	Test Date:	08/20/20	Checked By:	bfs
Depth :	1-6 ft	Test Id:	572212		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
8.9	24.0	58.0	9.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
4 in	100.00	100		
3 in	75.00	91		
2 in	50.00	83		
1 1/2 in	37.50	81		
1 in	25.00	77		
0.75 in	19.00	76		
0.5 in	12.50	74		
0.375 in	9.50	71		
#4	4.75	67		
#10	2.00	63		
#20	0.85	57		
#40	0.42	46		
#60	0.25	31		
#100	0.15	17		
#140	0.11	12		
#200	0.075	9.1		

Coefficients

D_{85} = 54.9536 mm	D_{30} = 0.2403 mm
D_{60} = 1.3171 mm	D_{15} = 0.1293 mm
D_{50} = 0.5458 mm	D_{10} = 0.0835 mm
C_u = 15.774	C_c = 0.525

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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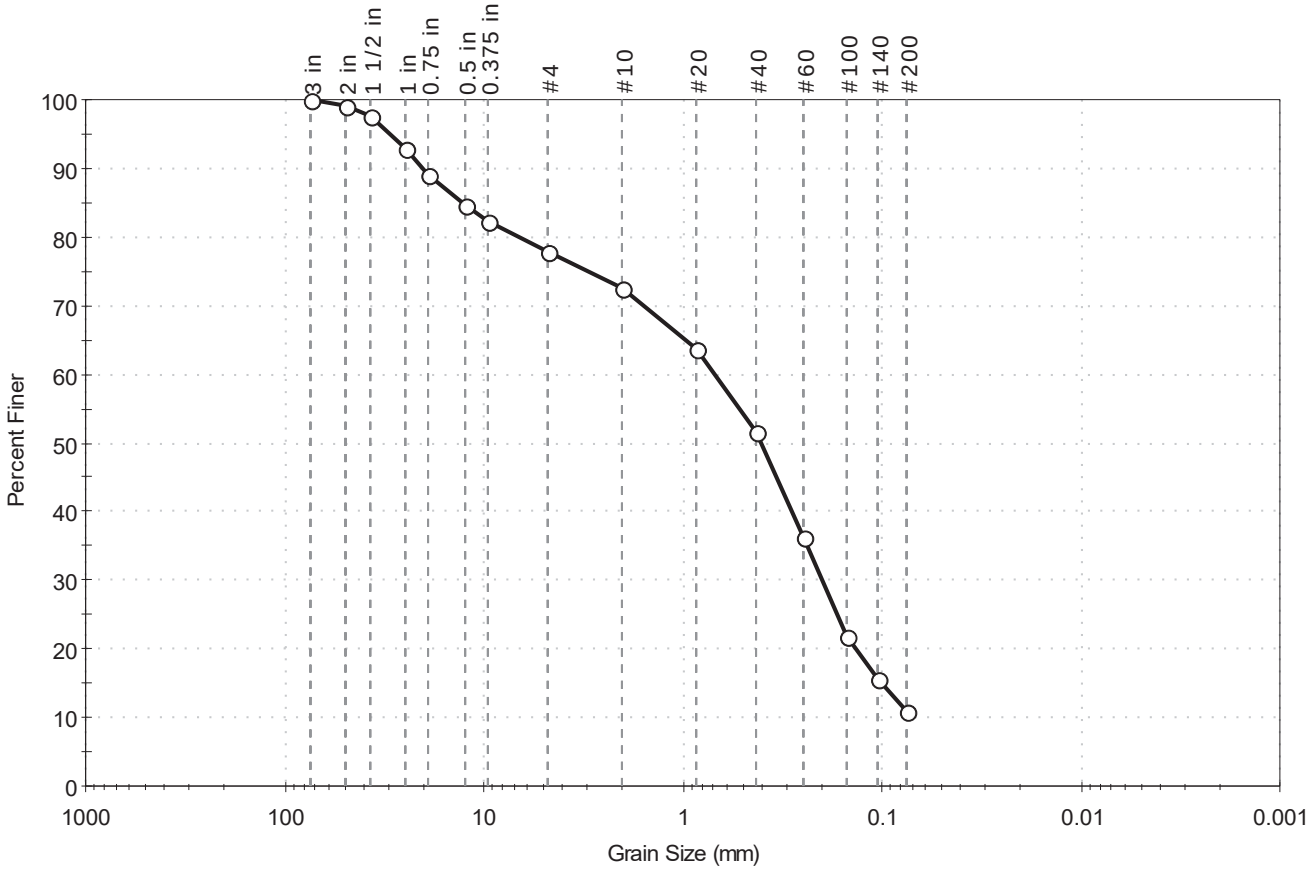
Client:	Lamson Engineering Corporation				
Project:	Project File No. 608051				
Location:	Wilmington, MA			Project No:	GTX-312218
Boring ID:	---	Sample Type:	bucket	Tested By:	ckg
Sample ID:	TP-6	Test Date:	08/20/20	Checked By:	bfs
Depth :	1-6 ft	Test Id:	572213		
Test Comment:	---				
Visual Description:	Moist, dark yellowish brown sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	22.1	66.9	11.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	99		
1 1/2 in	37.50	98		
1 in	25.00	93		
0.75 in	19.00	89		
0.5 in	12.50	85		
0.375 in	9.50	82		
#4	4.75	78		
#10	2.00	72		
#20	0.85	64		
#40	0.42	52		
#60	0.25	36		
#100	0.15	22		
#140	0.11	16		
#200	0.075	11		

Coefficients

D_{85} = 12.7569 mm	D_{30} = 0.2005 mm
D_{60} = 0.6886 mm	D_{15} = 0.1019 mm
D_{50} = 0.4012 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

printed 8/24/2020 1:16:01 PM

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	83	224
PROJECT FILE NO.	608051		

DRAINAGE & UTILITY PLANS - 8

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
NONE	SEE SHEET 106	SEE BELOW	SEE BELOW

LIMIT OF WOR□
END PA□EMENT MICROMILLING &
AND RESURFACING
STA. 40□00.00

END FULL DEPTH RECONSTRUCTION MATCH
STA. 40□25.00

N/F
THEODORA TRUST
PARCEL ID 40-13
BOOK 5492 PAGE 252

CROSS ST

PC 35+38

R&R-BO

100-FT WETLAND
BUFFER ZONE

PRC □93.04

N/F
XPEDX, LLC
PARCEL ID 40-13-A
BOOK 28324 PAGE 91

CROSS ST

SMH
RIM=97.24
INV.(A)=87.25
INV.(B)=87.30
SUMP=87.27

PT □28.52
PC □30.83

SMH
RIM=88.53
BOLTED SHUT,
INACCESSIBLE

PROP UP-BO

50-FT NO-BUILD
□ONE

PROP. CB (TYP.)

23 LF - 12" RCP

PROP. □GATE □AL□E AND BOX
CONNECT TO EXISTING 12" W

PROP. 1□8 BEND

PROP. 12" DIP WATER

PROP. □GATE □AL□E AND BOX

R&R-BO

ADJ-BO

PT □88.79

PROP. 12" DIP WATER

PROP. 12" P□C SEWER

42□06.10

50□00

76 LF - 12" RCP

R&S

ADJ

R&R

TP # 1

RET

PROP. OUTLET
CONTROL
STRUCTURE

POTENTIAL BMP
LOCATION

BUTTERS ROW

(1951 COUNTY LAYOUT - 40' WIDE)

BH # 1

PROP UP-BO

13 LF - 12" RCP

19 LF - 12" RCP

PROP. DMH
(TYP.)

PROP. FLARED END SECTION

PT □89.54

22 LF - 12" RCP

PROP. WATER QUALITY STRUCTURE

15 LF - 12" RCP

11 LF - 12" RCP

66 LF - 12" RCP

PC □31+76

N/F
N MICA COMPANY, INC.
PARCEL ID 40-1
OK 1382 PAGE 448

635 MAIN ST

N/F
PAC PROPERTIES, INC.
PARCEL ID 39-6
BOOK 6284 PAGE 161

668 MAIN ST

N/F
ANDREA J. DELUCA
PARCEL ID 39-16
BOOK 18231 PAGE 111

665 MAIN ST

N/F
CHRISTOPHER RICHARD
AND ERIN MILLS
PARCEL ID 39-15
BOOK 29429 PAGE 150

669 MAIN ST

N/F
TOWN OF WILMINGTON
PARCEL ID 39-5
BOOK 26062 PAGE 215

9 CROSS ST

YENTILE FARM
RECREATIONAL FACILITY

END OF
1910 LAYOUT

BEGINNING OF
1911 LAYOUT

PROP. 1□8 BEND

PROP ROUTE 38 BASELINE

R&R-BO

ABANDON EXIST.
10" WATER MAIN

N/F
JOHN C. OLSON
PARCEL ID 39-14
BOOK 23310 PAGE 186

669 MAIN ST

2.5 STORY
VINYL

CONTINUED
LEFT

PC □39+35

PT □84.62

END FULL DEPTH RECONSTRUCTION
STA. 53□00.00

LIMIT OF WOR□
END PA□EMENT MICROMILLING
AND RESURFACING
STA. 53□15.00

53+23.11

CONTINUED ON
SHEET NO. 82

CONTINUED ON
SHEET NO. 84

CONTINUED
RIGHT

TP = TEST PIT

0 20 50 100
SCALE: 1" = 20'

608051_UT01(DRAINAGE-UTILITY-PLANS).DWG Plotted on 25-Oct-2017 9:51 AM

Proposal No. 608051 - 132406

A00840 - 475

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	96	260
PROJECT FILE NO.	608051		

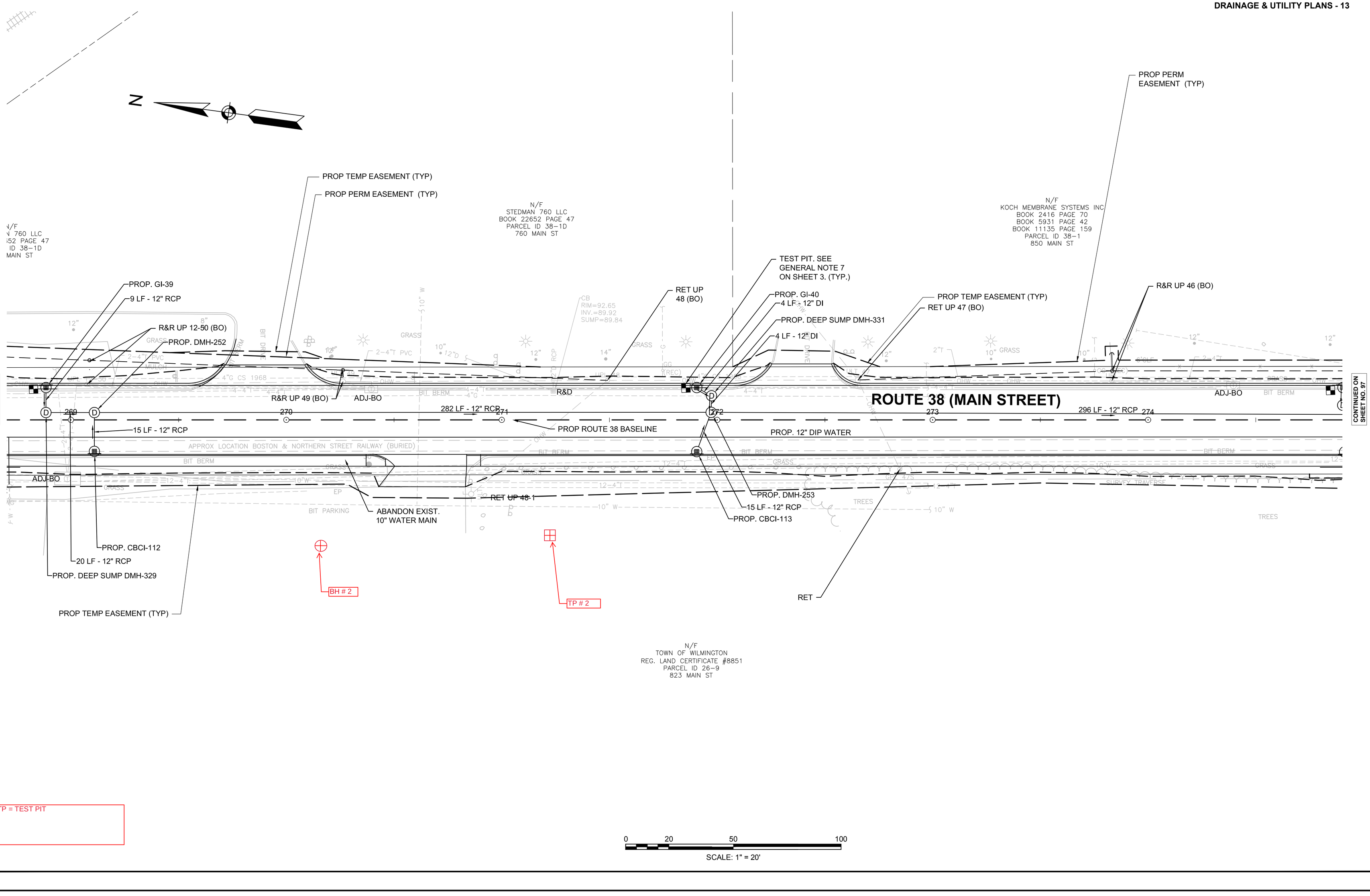
DRAINAGE & UTILITY PLANS - 13

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
SEE BELOW

DRAINAGE DETAILS
SEE BELOW



608051_UT01(DRAINAGE-UTILITY-PLANS).DWG Plotted on 1-Oct-2019 5:09 PM

Proposal No. 608051 - 132406

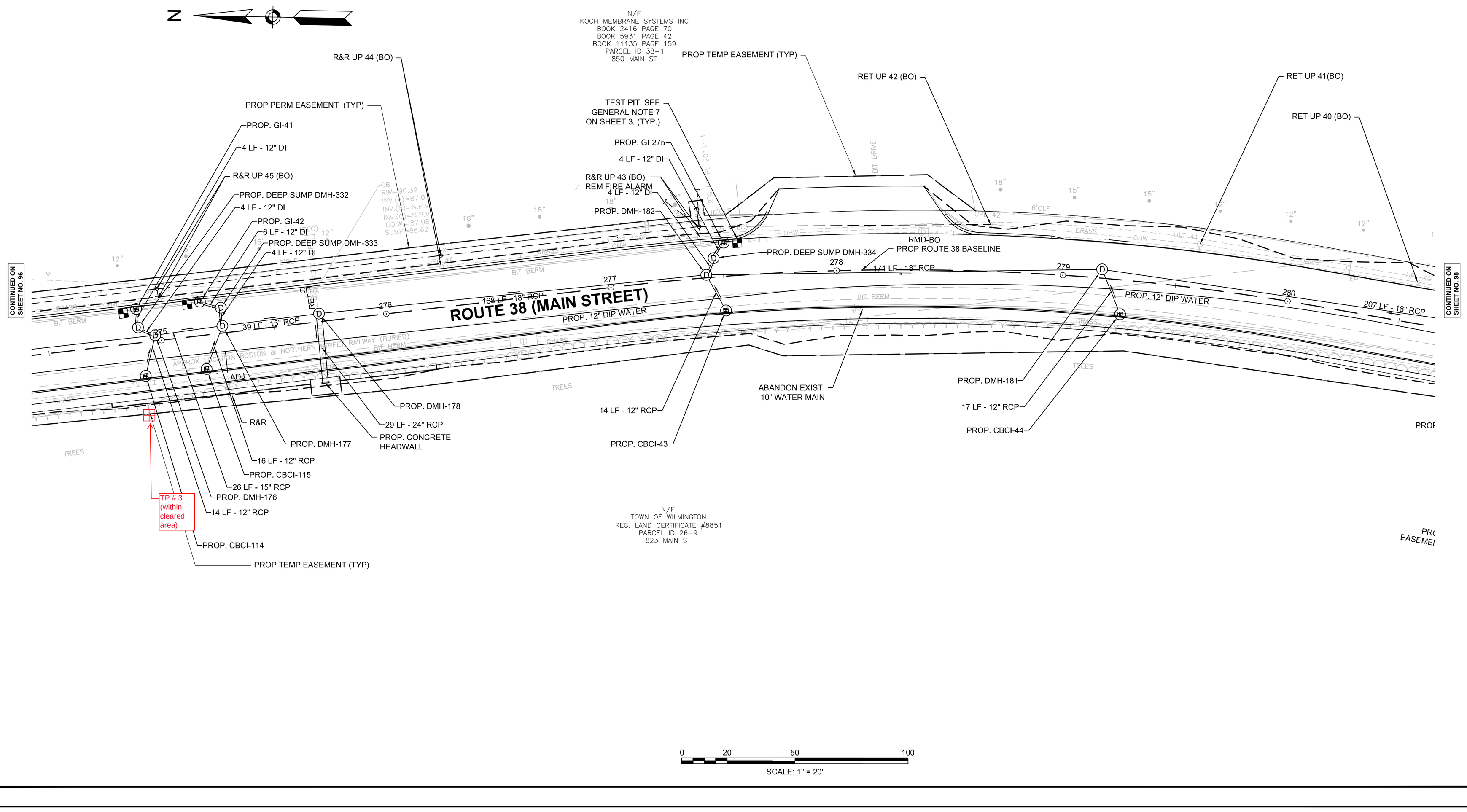
A00840 - 476

HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
NONE	NONE	SEE BELOW	SEE BELOW

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	97	260
PROJECT FILE NO.		608051	

DRAINAGE & UTILITY PLANS - 14



608051_UT01(DRAINAGE-UTILITY-PLANS).DWG Plotted on 8-Oct-2019 4:23 PM

Proposal No. 608051 - 132406

A00840 - 477

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	94	224
PROJECT FILE NO.	608051		

DRAINAGE & UTILITY PLANS - 19

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
SEE BELOW

DRAINAGE DETAILS
SEE BELOW

171 LF

N/F
BOSTON EDISON COMPANY
BOOK 1490 PAGE 211
PARCEL ID 24-81B
910 MAIN ST

N/F
FRANK INGRAM AND
KATHLEEN M. SUPRENANT
BOOK 5427 PAGE 224
PARCEL ID 24-72A
1A COOK AVE

CENTRAL AVENUE
(PAPER STREET)

N/F
TOWN OF WILMINGTON
BOOK XX PAGE XX
PARCEL ID 24-81A
MAIN ST

WOODWARD AVENUE
(PAPER STREET)

N/F
TOWN OF WILMINGTON
BOOK XX PAGE XX
PARCEL ID 24-78
WOODWARD AVE

N/F
TOWN OF WILMINGTON
BOOK 1431 PAGE 460
PARCEL ID 24-80
MAIN ST

N/F
904 MAIN STREET REALTY CO LLC
BOOK 18278 PAGE 139
PARCEL ID 24-33
904 MAIN ST

DMH
RIM=88.52
INV.(A)=82.70
INV.(B)=N.P.V.
INV.(C)=83.59
SUMP=81.22

CB
RIM=88.45
INV.=85.36
T.O.W.=85.38
SUMP=84.45

CB
RIM=88.19
INV.=84.34
T.O.W.=84.39
SUMP=81.94

COOK AVENUE
(PUBLIC)

CONTINUED ON SHEET NO. 93

CONTINUED ON SHEET NO. 95

PROP. CB (TYP.)
6 LF - 12" RCP
5 LF - 12" RCP
PROP. DMH (TYP.)
R&R-BO
ADJ
ADJ-BO
RET
176 LF - 15" RCP
180 LF - 12" RCP
16 LF - 12" RCP
18 LF - 12" RCP
7 LF - 24" RCP
4 LF - 12" RCP
304
305
306
307
308
309
PROP ROUTE 38 BASELINE
71+50.70
71+03.08
PT
TP # 5
TP # 4
LINE OF 1928 DISCONTINUANCE
POTENTIAL BMP LOCATION
PROP. CONCRETE HEADWALL
100-FT WETLAND BUFFER ZONE
50-FT NO-BUILD ZONE
15-FT NO-DISTURB ZONE
END FULL DEPTH RECONSTRUCTION
STA. 71+33.00
LIMIT OF WORK
END PAVEMENT MICROMILLING AND RESURFACING
STA. 71+18.00
PC 34.24
70+00
OLD MAIN STREET
(PRIVATE)

N/F
TAM DEVELOPMENT CORPORATION
BOOK 11130 PAGE 74
PARCEL ID 25-1A
925 MAIN ST

N/F
BOSTON EDISON COMPANY
BOOK 1474 PAGE 362
PARCEL ID 25-1B
927 MAIN ST

N/F
JONATHAN F. LAROCK
AND SONIA SERRAO
BOOK 19052 PAGE 266
PARCEL ID 25-5
905 MAIN ST

N/F
M.T. POKKET REALTY TRUST,
ROBERT P. AUTENZIO JR TRUSTEE
BOOK 21081 PAGE 87
PARCEL ID 25-4
911 MAIN ST

N/F
RAYMOND LEPORE
REG. LAND CERTIFICATE#32201
PARCEL ID 25-3
919 MAIN ST

TP = TEST PIT

0 20 50 100
SCALE: 1" = 20'

608051_UT01(DRAINAGE-UTILITY-PLANS).DWG Plotted on 24-Oct-2017 10:46 AM

Proposal No. 608051 - 132406

A008840 - 478

WILMINGTON, MA
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	95	224
PROJECT FILE NO.	608051		

DRAINAGE & UTILITY PLANS - 20

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE BELOW

DRAINAGE DETAILS

SEE BELOW

N/F
BOSTON EDISON COMPANY
BOOK 1490 PAGE 211
PARCEL ID 24-81B
910 MAIN ST

N/F
TOWN OF WILMINGTON
BOOK XX PAGE XX
PARCEL ID 24-81
MAIN ST

BERWICK AVENUE
(PAPER STREET)

171 LF - 12" RCP

6 LF - 12" RCP

5 LF - 12" RCP

PROP. CB (TYP.)

98 LF - 12" RCP

126 LF - 12" RCP

PROP ROUTE 38 BASELINE

ROUTE 38 (MAIN STREET)

17 LF - 12" RCP

PROP. DMH (TYP.)

ADJ-BO

R&R-BO

CONNECT TO EXIST. PIPE

R&R-BO

9 LF - 12" DI

PROP. DEEP SUMP DMH

11 LF - 12" DI

PROP. GI

ADJ-BO

PROP. CONCRETE HEADWALL

11 LF - 18" RCP

17 LF - 12" RCP

35 LF - 15" RCP

PROP. CBCI

8 LF - 12" RCP

37 LF - 15" RCP

PROP. CBCI

15 LF - 12" RCP

4 LF - 12" DI

75 LF - 15" RCP

5 LF - 12" DI

20 LF - 12" RCP

PROP. GI

6 LF - 12" DI

PROP. DEEP SUMP DMH TEST PIT. SEE GENERAL NOTE 7 ON SHEET 3. (TYP.)

POTENTIAL BMP LOCATION

TP # 6

BH # 3

CB
RIM=88.60
INV.(A)=84.70
INV.(B)=N.P.V.
INV.(C)=N.P.V.
T.O.W.=84.80
SUMP=84.12

LINE OF 1928 DISCONTINUANCE

PT 48.86

PC 10.55

81

82.57

80.00

LIMIT OF WORK
END PAVEMENT MICROMILLING AND RESURFACING
STA. 80+73.00

N/F
TOWN OF WILMINGTON
BOOK XX PAGE XX
PARCEL ID 24-86
MAIN ST

N/F
TOWN OF WILMINGTON
BOOK XX PAGE XX
PARCEL ID 12-18
955 MAIN ST

N/F
DIMITRIOS DIMOPOULOS
BOOK 3032 PAGE 46
PARCEL ID 12-2
945 MAIN ST

N/F
BOSTON EDISON COMPANY
BOOK 1474 PAGE 362
PARCEL ID 25-1B
927 MAIN ST

N/F
TAM DEVELOPMENT CORPORATION
DOC#257711
PARCEL ID 25-1
MAIN ST

N/F
TAM DEVELOPMENT CORPORATION
DOC#257711
PARCEL ID 12-1
943 MAIN ST

OLD MAIN STREET
(PRIVATE)

309 310 311 312 313 314 315

CONTINUED ON SHEET NO. 94

CONTINUED ON SHEET NO. 96

TP = TEST PIT

0 20 50 100
SCALE: 1" = 20'

608051_UT01(DRAINAGE-UTILITY-PLANS).DWG Plotted on 24-Oct-2017 10:46 AM

Proposal No. 608051 - 132406

A00840 - 479

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland zone (FIPSZONE 2001), meters. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs. This information was derived from digital orthophotos produced at a scale of 1:5,000 from aerial photography dated April 2005.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A A	Cross section line
23 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
2676000mN	1000-meter Universal Transverse Mercator grid values, zone 19
600000 FT	5000-foot grid values: Massachusetts State Plane coordinate system, Mainland zone (FIPSZONE 2001), Lambert Conformal Conic projection
DX5510 X	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 4, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0291E

FIRM

FLOOD INSURANCE RATE MAP

MIDDLESEX COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 291 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WILMINGTON, TOWN OF	250227	0291	E

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

MAP NUMBER
25017C0291E

EFFECTIVE DATE
JUNE 4, 2010

Federal Emergency Management Agency

MAP NUMBER 25017C0291E
EFFECTIVE DATE JUNE 4, 2010
Federal Emergency Management Agency

Proposal No. 060051 - 13249

AUG 04 - 480

Appendix C: Supporting Calculations

- Recharge Volume Calculations
- Water Quality Calculations
- TSS Removal Calculations
- Pretreatment Calculations
- HydroCAD Storage Tables
- ADS Cumulatrive Storage Volumes
- Outlet Protection Design Calculations

Green International Affiliates, Inc.
100 Ames Pond Drive, Suite 200 Tewksbury, MA 01876
T: (978) 923-0400 | www.greenintl.com

RECHARGE VOLUME CALCULATIONS

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA

Prepared By: BV
Checked By: JT

Recharge Volume Design

Objective: Size infiltration SCMs that will approximate the annual recharge from the existing. This project is a redevelopment and is required to meet this Standard (3) to the maximum extent practicable.

Methodology: MA Department of Environmental Protection (DEP) Massachusetts Stormwater Handbook (Vol.3, Ch.1)

Design Criteria:

The required recharge volume equals a depth of runoff corresponding to the soil type times the net increase in impervious areas covering that soil type at the post-development site.

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Gro	Soil Texture	Target Depth Factor (F)
A	Sand	0.60 inches
B	Loam	0.35 inches
C	Silty Loam	0.25 inches
D	Clay	0.10 inches

The soils are defined by the Soil Conservation Services (SCS) Soil Survey of Suffolk County of Massachusetts.

Required Drawdown Time: Maximum of 72 Hours using the following equation:

$$\text{Drawdown Time} = \frac{R_v}{(K x A_{Bot})}$$

R_v = Required Recharge Volume
K = Permeability Rate
A_{Bot} = Bottom area of basin

Calculation Results:

Designation	Volume Required Total (cf)	Volume Required Net (cf)	Volume Provided (cf)
For Entire Project Site	**28,175**	**2,990**	**6,919**

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Recharge Volume Calculations

Required: **Recharge Required based on Total Impervious Area within LOW**

Hydrologic Soil Group	Proposed Impervious Area (sf)*	Target Depth	Volume Required (cf)
A	562,704	0.60	28,135
B	0	0.35	0
C	0	0.25	0
D	4,728	0.10	39
Total	567,432		**28,175**

* The existing impervious area is 506,710 sf within the LOW, so there is a net increase of 60,722 sf.

Required: **Recharge Required based on Net Impervious Area within LOW**

Hydrologic Soil Group	Net Impervious Area (sf)*	Target Depth	Volume Required (cf)
A	59,623	0.60	2,981
B	0	0.35	0
C	0	0.25	0
D	1,099	0.10	9
Total	60,722		**2,990**

Provided: **Sum of BMP's**
METHOD USED: STATIC

R_v = combined storage below lowest outlets for all BMP's = **6,919** cf

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RECHARGE VOLUME CALCULATIONS

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM1 (Dog Park parking lot)

Prepared By: AKM/BV
Checked By: JT

Recharge Volume Design

Objective: Size infiltration SCMs that will approximate the annual recharge from the existing conditions.

Methodology: MA Department of Environmental Protection (DEP) Massachusetts Stormwater Handbook (Vol.3, Ch.1)

Design Criteria:

The required recharge volume equals a depth of runoff corresponding to the soil type times the increase in impervious areas covering that soil type at the post-development site.

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Group	Soil Texture	Target Depth Factor (F)
A	Sand	0.60 inches
B	Loam	0.35 inches
C	Silty Loam	0.25 inches
D	Clay	0.10 inches

The soils are defined by the Soil Conservation Services (SCS) Soil Survey of Middlesex County of Massachusetts. This watershed is comprised of 'A' soils.

Required Drawdown Time: Maximum of 72 Hours using the following equation:

$$\text{Drawdown Time} = \frac{R_v}{(K x A_{Bot})}$$

R_v = Required Recharge Volume
K = Permeability
A_{Bot} = Bottom area of basin

Calculation Results:

Designation	Volume Required (cf)	Volume Provided (cf)
Subsurface Infiltration System	**1,167**	**3,511**

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Recharge Volume

Required: **Total Recharge Required**

Hydrologic Soil Group	Proposed Impervious Area* (sf)	Target Depth	Volume Required (cf)
A	23,330	0.60	1,167
B	0	0.35	0
C	0	0.25	0
D	0	0.10	0
Total	23,330		**1,167**

Recharge Volume

Provided: **METHOD USED:** STATIC

Drainage Area to Subsurface Infiltration Chamber

R_v = storage below lowest outlet (orifice) = **3,511** cf (Elev. 88.00, see

A_{Bot} = bottom area (L x W) = 3,941 sf HydroCAD table)

R_v cf	K * in/hr	A_{Bot} sf	Drawdown Time Hours		
3,511	0.27	3,941	**39.60**	**<**	**72 Hours**

*Catchment is HSG A. Chambers are in HSG C per NRCS. Test pits indicate A soils. To be conservative C-Soil infiltration rate per RAWLS was used

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RECHARGE VOLUME CALCULATIONS

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM2 (North end of Old Main Street)

Prepared By: AKM/BV
Checked By: JT

Recharge Volume Design

Objective: Size infiltration SCMs that will approximate the annual recharge from the existing conditions.

Methodology: MA Department of Environmental Protection (DEP) Massachusetts Stormwater Handbook (Vol.3, Ch.1)

Design Criteria:

The required recharge volume equals a depth of runoff corresponding to the soil type times the increase in impervious areas covering that soil type at the post-development site.

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Group	Soil Texture	Target Depth Factor (F)
A	Sand	0.60 inches
B	Loam	0.35 inches
C	Silty Loam	0.25 inches
D	Clay	0.10 inches

The soils are defined by the Soil Conservation Services (SCS) Soil Survey of Middlesex County of Massachusetts. This watershed is comprised of 'A' soils.

Required Drawdown Tim Maximum of 72 Hours using the following equation:

$$\text{Drawdown Time} = \frac{R_v}{(K x A_{Bot})}$$

R_v = Required Recharge Volume
K = Permeability Rate
A_{Bot} = Bottom area of basin

Calculation Results:

Designation	Volume Required (cf)	Volume Provided (cf)
Surface Infiltration Basin	**462**	**955**

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Recharge Volume

Required: **Total Recharge Required**

Hydrologic Soil Group	Proposed Impervious Area (sf)	Target Depth	Volume Required (cf)
A	9,233	0.60	462
B	0	0.35	0
C	0	0.25	0
D	0	0.10	0
Total	9,233		462

Recharge Volume

Provided: **METHOD USED:** STATIC

Drainage Area to Surface Infiltration Basin

R_v = storage below lowest outlet (orifice) = **955** cf (Elev. 86.70, see

A_{Bot} = bottom area (irregular) = 235 sf HydroCAD table)

R_v cf	K in/hr	A_{Bot} sf	Drawdown Time Hours		
955	2.41	235	**20.23**	**<**	**72 Hours**

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RECHARGE VOLUME CALCULATIONS

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM3 (South End of Old Main Street)

Prepared By: AKM/BV
Checked By: JT

Recharge Volume Design

Objective: Size infiltration SCMs that will approximate the annual recharge from the existing conditions.

Methodology: MA Department of Environmental Protection (DEP) Massachusetts Stormwater Handbook (Vol.3, Ch.1)

Design Criteria:

The required recharge volume equals a depth of runoff corresponding to the soil type times the increase in impervious areas covering that soil type at the post-development site.

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Group	Soil Texture	Target Depth Factor (F)
A	Sand	0.60 inches
B	Loam	0.35 inches
C	Silty Loam	0.25 inches
D	Clay	0.10 inches

The soils are defined by the Soil Conservation Services (SCS) Soil Survey of Middlesex County of Massachusetts. The site is comprised of 'C' soils.

Required Drawdown Time: Maximum of 72 Hours using the following equation:

$$\text{Drawdown Time} = \frac{R_v}{(KxA_{Bot})}$$

R_v = Required Recharge Volume
K = Permeability
A_{Bot} = Bottom area of basin

Calculation Results:

Designation	Volume Required (cf)	Volume Provided (cf)
Subsurface Infiltration System	**260**	**2,453**

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Recharge Volume

Required: **Total Recharge Required**

Hydrologic Soil Group	Proposed Impervious Area (sf)	Target Depth	Volume Required (cf)
A	0	0.60	0
B	0	0.35	0
C	12,491	0.25	260
D	0	0.10	0
Total	12,491		260

Recharge Volume

Provided: **METHOD USED:** STATIC

Infiltration System

Drainage Area to Subsurface infiltration Basin

R_v = storage below lowest outlet (orifice) = **2,453** cf (Elev.83.94 see HydroCAD table)

A_{Bot} = bottom area (L x W) = 3,740 sf

R_v cf	K in/hr	A_{Bot} sf	Drawdown Time Hours		
2,453	0.27	3,740	**29.15**	**<**	**72 Hours**

*Catchment is HSG A and C. Chambers are near HSG C per NRCS. Test pits indicate A soils. To be conservative C-Soil infiltration rate per RAWLS was used

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WATER QUALITY CALCULATIONS

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM1 (Dog Park parking lot)

Prepared By: BV
Checked By: JT

Objective: To determine the required Water Quality Volume (WQV) for adaqute stormwater treatment. This project is a redevelopment and is required to meet this Standard (4) to the maximum extent practicable.

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: Volume to be treated =1.0" x Post Development Impervious Area

Critical Areas (include ORW, ACEC, recharge areas for public water supplies (Zone Is, Zone IIs and Interim Wellhead Protection Areas for ground water sources and Zone As for surface water sources), bathing beaches, cold water fisheries, shellfish growing areas and LUHPPL's

Volume to be treated = 1.0" x Post Development Impervious Area

All WQ calculations use 1" since the site is located within a Zone II

Calculation results:

Designation	Volume Required (cf)	Volume Provided (cf)
Subsurface Infiltration System	**1,944**	**3,511**

Volume to be Treated:

Drainage to SCM1

Total Proposed Impervious Area: **23,330** sf
Total Volume to be treated: **1,944 cf**

Volume Provided:

Drainage to SCM1

WQ_v = storage below lowest outlet (bypass) = **3,511 cf** (Elev. 88.00, see HydroCAD

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WATER QUALITY CALCULATIONS

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Li
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM2 (North end of Old Main Road)

Prepared By: BV
Checked By: JT/DS

Objective: To determine the required Water Quality Volume (WQV) for adaqute stormwater treatment. This project is a redevelopment and is required to meet this Standard (4) to the maximum extent practicable.

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: Volume to be treated =1.0" x Post Development Impervious Area

Critical Areas (include ORW, ACEC, recharge areas for public water supplies (Zone Is, Zone IIs and Interim Wellhead Protection Areas for ground water sources and Zone As for surface water sources), bathing beaches, cold water fisheries, shellfish growing areas and LUHPPL's

Volume to be treated = 1.0" x Post Development Impervious Area

All WQ calculations use 1" since the site is located within a Zone II

Calculation results:

Designation	Volume Required (cf)	Volume Provided (cf)
Surface Infiltration Basin	**751**	**955**

Volume to be Treated:

Drainage to SCM2

Total Proposed Impervious Area: **9,006** sf
Total Volume to be treated: **751 cf**

Volume Provided:

Drainage to SCM2

WQ_v = storage below lowest outlet (orifice) = **955 cf** Elev. 86.70, see HydroCA

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WATER QUALITY CALCULATIONS

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM3 (South end of Old Main Road)

Prepared By: BV
Checked By: JT

Objective: To determine the required Water Quality Volume (WQV) for adaqute stormwater treatment. This project is a redevelopment and is required to meet this Standard (4) to the maximum extent practicable.

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: Volume to be treated =1.0" x Post Development Impervious Area

Critical Areas (include ORW, ACEC, recharge areas for public water supplies (Zone Is, Zone IIs and Interim Wellhead Protection Areas for ground water sources and Zone As for surface water sources), bathing beaches, cold water fisheries, shellfish growing areas and LUHPPL's

Volume to be treated = 1.0" x Post Development Impervious Area

All WQ calculations use 1" since the site is located within a Zone II

Calculation results:

Designation	Volume Required (cf)	Volume Provided (cf)
Subsurface Infiltration System	**1,041**	**2,453**

Volume to be Treated:

Drainage to SCM3

Total Proposed Impervious Area: **12,491** sf
Total Volume to be treated: **1,041 cf**

Volume Provided:

Drainage to SCM3

WQ_v = storage below lowest outlet (orifice) = **2,453 cf** Elev.83.94, see HydroCAD tabl

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Wilmington Rte 38 Pretreatment to SCM-1 & SCM-3

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Subsurface Infiltration Structure	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 13033.19 #608051
Prepared By: BV
Date: 1/14/2025

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

A00840 - 493

Proposal No. 608051 - 132406

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Wilmington Rte 38 SCM-2 to DP-18

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 13033.19 #608051
Prepared By: BV/JM
Date: 1/14/2025

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

A00840 - 494

Proposal No. 608051 - 132406

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Wilmington Rte 38 Pretreatment to SCMs

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56

Total TSS Removal = 44%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 13033.19 #608051
Prepared By: BV/JM
Date: 1/14/2025

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

A00840 - 495

Proposal No. 608051 - 132406

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Wilmington Rte 38 DP-1,3,4,5,7,8,9,14,18,20

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75

Total TSS Removal = 25%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 13033.19 #608051
Prepared By: BV
Date: 1/14/2025

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

Green International Affiliates, Inc.
100 Ames Pond Drive, Suite 200 Tewksbury, MA 01876
T: (978) 923-0400 | www.greenintl.com

PRETREATMENT CALCULATION

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM1

Prepared By: BV
Checked By:

Objective: To determine the required pretreatment Volume for adaqute stormwater treatment. This project is a redevelopment and is required to meet this Standard (4) to the maximum extent practicable.

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 2, Ch. 2)

Design Criteria: Volume to be treated = (0.1" x Post Development Impervious Area)

Calculation results:

Pretreatment requires 44% TSS removal since the site is located within a Zone II

Designation	Required (cfs)	Provided (cfs)
Drainage to Isolator Rows at SCM1	**0.62**	**0.62**

Volume to be Treated:

Drainage to Isolator Rows at SCM1

T_c =	6.0 min	0.1 hr	
qu =	774.0 csm/in (From Type II Chart)		
A =	22,330 sf	0.000801 sm	
WQV =	1,861 cf		
$Q_{1.0}$ =	0.62 cfs		

Volume Provided:

Isolator Rows at SCM1

Provided: 0.62 cfs (ADS Isolator Rows)

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PRETREATMENT CALCULATION

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM2 (North end of Old Main Road)

Prepared By: BV
Checked By:

Objective: To determine the required pretreatment Volume for adaqute stormwater treatment. This project is a redevelopment and is required to meet this Standard (4) to the maximum extent practicable.

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 2, Ch. 2)

Design Criteria: Volume to be treated = (0.1" x Post Development Impervious Area)

Pretreatment requires 44% TSS removal since the site is located within a Zone II

Calculation results:

Designation	Volume Required (cf)	Volume Provided (cf)
Drainage to Forebay of SCM2	**77**	**188**

Volume to be Treated:

Drainage to Forebay of SCM2

Total Proposed Impervious Area: 9,233 sf
Total Treatment Volume: **77 cf**

Volume Provided:

Forebay of SCM2

Top Elevation = 86.50 Area of contour = 189 sf
Bottom Elev = 85.00 Area of contour = 62 sf Volume of storage: 188 cf

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PRETREATMENT CALCULATION

Date: January 14, 2025
Revised:
Project: Reconstruction on Route 38 (Main Street) from Route 62 to the Woburn City Line
Project No: 13033.19 #608051
Location: Wilmington, MA - SCM3

Prepared By: BV
Checked By:

Objective: To determine the required pretreatment Volume for adaqute stormwater treatment. This project is a redevelopment and is required to meet this Standard (4) to the maximum extent practicable.

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 2, Ch. 2)

Design Criteria: Volume to be treated = (0.1" x Post Development Impervious Area)

Calculation results: **Pretreatment requires 44% TSS removal since the site is located within a Zone II**

Designation	Required (cfs)	Provided (cfs)
Drainage to Isolator Rows at SCM3	**0.33**	**0.33**

Volume to be Treated:

Drainage to Isolator Rows at SCM3

T_c =	6.0	min	0.1	hr
qu =	774.0	csm/in (From Type II Chart)		
A =	12,000	sf	0.0004304	sm
WQV =	1,000	cf		
$Q_{1.0}$ =	0.33	cfs		

Volume Provided:

Isolator Rows at SCM3

Provided: 0.33 cfs (ADS Isolator Rows)

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*
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Stage-Area-Storage for Pond SCM1: Subsurface Infiltration System

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
86.55	0	87.07	655	87.59	2,286
86.56	12	87.08	687	87.60	2,316
86.57	24	87.09	718	87.61	2,347
86.58	35	87.10	750	87.62	2,377
86.59	47	87.11	782	87.63	2,408
86.60	59	87.12	814	87.64	2,438
86.61	71	87.13	846	87.65	2,469
86.62	83	87.14	878	87.66	2,499
86.63	95	87.15	909	87.67	2,530
86.64	106	87.16	941	87.68	2,560
86.65	118	87.17	973	87.69	2,590
86.66	130	87.18	1,005	87.70	2,621
86.67	142	87.19	1,036	87.71	2,651
86.68	154	87.20	1,068	87.72	2,681
86.69	166	87.21	1,100	87.73	2,711
86.70	177	87.22	1,131	87.74	2,741
86.71	189	87.23	1,163	87.75	2,771
86.72	201	87.24	1,195	87.76	2,801
86.73	213	87.25	1,226	87.77	2,831
86.74	225	87.26	1,258	87.78	2,861
86.75	236	87.27	1,290	87.79	2,891
86.76	248	87.28	1,321	87.80	2,921
86.77	260	87.29	1,353	87.81	2,951
86.78	272	87.30	1,384	87.82	2,981
86.79	284	87.31	1,416	87.83	3,011
86.80	296	87.32	1,447	87.84	3,040
86.81	307	87.33	1,479	87.85	3,070
86.82	319	87.34	1,510	87.86	3,100
86.83	331	87.35	1,541	87.87	3,129
86.84	343	87.36	1,573	87.88	3,159
86.85	355	87.37	1,604	87.89	3,189
86.86	366	87.38	1,635	87.90	3,218
86.87	378	87.39	1,666	87.91	3,248
86.88	390	87.40	1,698	87.92	3,277
86.89	402	87.41	1,729	87.93	3,306
86.90	414	87.42	1,760	87.94	3,336
86.91	426	87.43	1,791	87.95	3,365
86.92	437	87.44	1,822	87.96	3,394
86.93	449	87.45	1,853	87.97	3,423
86.94	461	87.46	1,885	87.98	3,453
86.95	473	87.47	1,916	87.99	3,482
86.96	485	87.48	1,947	88.00	3,511
86.97	497	87.49	1,978	88.01	3,540
86.98	508	87.50	2,009	88.02	3,569
86.99	520	87.51	2,039	88.03	3,598
87.00	532	87.52	2,070	88.04	3,627
87.01	544	87.53	2,101	88.05	3,656
87.02	556	87.54	2,132	88.06	3,684
87.03	567	87.55	2,163	88.07	3,713
87.04	579	87.56	2,194	88.08	3,742
87.05	591	87.57	2,224	88.09	3,771
87.06	623	87.58	2,255	88.10	3,799

Water Quality Volume provided below lowest orifice for SCM-1

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*
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Stage-Area-Storage for Pond SCM1: Subsurface Infiltration System (continued)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
88.11	3,828	88.63	5,233	89.15	6,414
88.12	3,856	88.64	5,258	89.16	6,434
88.13	3,885	88.65	5,283	89.17	6,453
88.14	3,913	88.66	5,308	89.18	6,472
88.15	3,941	88.67	5,333	89.19	6,491
88.16	3,970	88.68	5,358	89.20	6,509
88.17	3,998	88.69	5,383	89.21	6,528
88.18	4,026	88.70	5,408	89.22	6,546
88.19	4,054	88.71	5,433	89.23	6,564
88.20	4,082	88.72	5,457	89.24	6,582
88.21	4,110	88.73	5,482	89.25	6,599
88.22	4,138	88.74	5,506	89.26	6,616
88.23	4,166	88.75	5,530	89.27	6,633
88.24	4,194	88.76	5,554	89.28	6,650
88.25	4,222	88.77	5,579	89.29	6,666
88.26	4,250	88.78	5,602	89.30	6,682
88.27	4,277	88.79	5,626	89.31	6,698
88.28	4,305	88.80	5,650	89.32	6,713
88.29	4,332	88.81	5,674	89.33	6,728
88.30	4,360	88.82	5,697	89.34	6,743
88.31	4,387	88.83	5,721	89.35	6,758
88.32	4,415	88.84	5,744	89.36	6,773
88.33	4,442	88.85	5,767	89.37	6,787
88.34	4,469	88.86	5,791	89.38	6,801
88.35	4,497	88.87	5,814	89.39	6,815
88.36	4,524	88.88	5,837	89.40	6,829
88.37	4,551	88.89	5,860	89.41	6,842
88.38	4,578	88.90	5,883	89.42	6,856
88.39	4,605	88.91	5,905	89.43	6,869
88.40	4,632	88.92	5,928	89.44	6,882
88.41	4,659	88.93	5,950	89.45	6,895
88.42	4,686	88.94	5,973	89.46	6,908
88.43	4,712	88.95	5,995	89.47	6,921
88.44	4,739	88.96	6,017	89.48	6,934
88.45	4,765	88.97	6,039	89.49	6,947
88.46	4,792	88.98	6,061	89.50	6,959
88.47	4,818	88.99	6,083	89.51	6,971
88.48	4,845	89.00	6,105	89.52	6,984
88.49	4,871	89.01	6,126	89.53	6,996
88.50	4,897	89.02	6,148	89.54	7,008
88.51	4,924	89.03	6,169	89.55	7,020
88.52	4,950	89.04	6,190	89.56	7,032
88.53	4,976	89.05	6,211	89.57	7,043
88.54	5,002	89.06	6,232	89.58	7,055
88.55	5,028	89.07	6,253	89.59	7,067
88.56	5,054	89.08	6,274	89.60	7,079
88.57	5,079	89.09	6,294	89.61	7,091
88.58	5,105	89.10	6,315	89.62	7,103
88.59	5,131	89.11	6,335	89.63	7,114
88.60	5,156	89.12	6,355	89.64	7,126
88.61	5,182	89.13	6,375	89.65	7,138
88.62	5,207	89.14	6,395	89.66	7,150

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*
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Stage-Area-Storage for Pond SCM1: Subsurface Infiltration System (continued)

Elevation (feet)	Storage (cubic-feet)
89.67	7,162
89.68	7,173
89.69	7,185
89.70	7,197
89.71	7,209
89.72	7,221
89.73	7,233
89.74	7,244
89.75	7,256
89.76	7,268
89.77	7,280
89.78	7,292
89.79	7,303
89.80	7,315
89.81	7,327
89.82	7,339
89.83	7,351
89.84	7,363
89.85	7,374
89.86	7,386
89.87	7,398
89.88	7,410
89.89	7,422
89.90	7,434
89.91	7,445
89.92	7,457
89.93	7,469
89.94	7,481
89.95	7,493
89.96	7,504
89.97	7,516
89.98	7,528
89.99	7,540
90.00	7,552
90.01	7,564
90.02	7,575
90.03	7,587
90.04	7,599
90.05	7,611
90.06	7,623
90.07	7,635
90.08	7,646
90.09	7,658
90.10	7,670
90.11	7,682
90.12	7,694
90.13	7,705
90.14	7,717
90.15	7,729
90.16	7,741
90.17	7,753
90.18	7,765
90.19	7,776
90.20	7,788
90.21	7,800
90.22	7,812
90.23	7,824
90.24	7,835
90.25	7,847
90.26	7,859
90.27	7,871
90.28	7,883
90.29	7,895
90.30	7,906
90.31	7,918
90.32	7,930
90.33	7,942
90.34	7,954
90.35	7,966
90.36	7,977
90.37	7,989
90.38	8,001
90.39	8,013
90.40	8,025
90.41	8,036
90.42	8,048
90.43	8,060
90.44	8,072
90.45	8,084
90.46	8,096
90.47	8,107
90.48	8,119
90.49	8,131
90.50	8,143
90.51	8,155
90.52	8,167
90.53	8,178
90.54	8,190
90.55	**8,202**

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*

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Stage-Area-Storage for Pond SCM2: Old Main St Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
85.00	235	0	85.52	412	166
85.01	238	2	85.53	416	170
85.02	241	5	85.54	420	174
85.03	244	7	85.55	424	179
85.04	247	10	85.56	428	183
85.05	250	12	85.57	432	187
85.06	253	15	85.58	436	192
85.07	256	17	85.59	440	196
85.08	259	20	85.60	444	200
85.09	262	22	85.61	448	205
85.10	265	25	85.62	452	209
85.11	268	28	85.63	456	214
85.12	272	30	85.64	460	218
85.13	275	33	85.65	464	223
85.14	278	36	85.66	469	228
85.15	281	39	85.67	473	232
85.16	284	41	85.68	477	237
85.17	288	44	85.69	481	242
85.18	291	47	85.70	485	247
85.19	294	50	85.71	489	252
85.20	297	53	85.72	494	257
85.21	301	56	85.73	498	262
85.22	304	59	85.74	502	267
85.23	307	62	85.75	507	272
85.24	311	65	85.76	511	277
85.25	314	68	85.77	515	282
85.26	317	72	85.78	520	287
85.27	321	75	85.79	524	292
85.28	324	78	85.80	528	298
85.29	328	81	85.81	533	303
85.30	331	85	85.82	537	308
85.31	335	88	85.83	542	314
85.32	338	91	85.84	546	319
85.33	342	95	85.85	551	324
85.34	345	98	85.86	555	330
85.35	349	102	85.87	560	336
85.36	352	105	85.88	564	341
85.37	356	109	85.89	569	347
85.38	360	112	85.90	573	353
85.39	363	116	85.91	578	358
85.40	367	119	85.92	582	364
85.41	371	123	85.93	587	370
85.42	374	127	85.94	592	376
85.43	378	131	85.95	596	382
85.44	382	134	85.96	601	388
85.45	386	138	85.97	606	394
85.46	389	142	85.98	611	400
85.47	393	146	85.99	615	406
85.48	397	150	86.00	620	412
85.49	401	154	86.01	624	418
85.50	405	158	86.02	628	425
85.51	408	162	86.03	632	431

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*
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Stage-Area-Storage for Pond SCM2: Old Main St Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
86.04	637	437
86.05	641	444
86.06	645	450
86.07	649	457
86.08	653	463
86.09	658	470
86.10	662	476
86.11	666	483
86.12	670	490
86.13	675	496
86.14	679	503
86.15	683	510
86.16	688	517
86.17	692	524
86.18	696	531
86.19	701	538
86.20	705	545
86.21	709	552
86.22	714	559
86.23	718	566
86.24	723	573
86.25	727	580
86.26	732	588
86.27	736	595
86.28	741	602
86.29	745	610
86.30	750	617
86.31	754	625
86.32	759	632
86.33	763	640
86.34	768	648
86.35	772	655
86.36	777	663
86.37	782	671
86.38	786	679
86.39	791	687
86.40	796	695
86.41	800	703
86.42	805	711
86.43	810	719
86.44	814	727
86.45	819	735
86.46	824	743
86.47	829	751
86.48	833	760
86.49	838	768
86.50	843	777
86.51	848	785
86.52	853	793
86.53	857	802
86.54	862	811
86.55	867	819
86.56	872	828
86.57	877	837
86.58	882	846
86.59	887	854
86.60	892	863
86.61	897	872
86.62	902	881
86.63	906	890
86.64	911	899
86.65	916	908
86.66	921	918
86.67	926	927
86.68	932	936
86.69	937	946
86.70	942	955
86.71	947	964
86.72	952	974
86.73	957	983
86.74	962	993
86.75	967	1,003
86.76	972	1,012
86.77	977	1,022
86.78	983	1,032
86.79	988	1,042
86.80	993	1,052
86.81	998	1,062
86.82	1,004	1,072
86.83	1,009	1,082
86.84	1,014	1,092
86.85	1,019	1,102
86.86	1,025	1,112
86.87	1,030	1,122
86.88	1,035	1,133
86.89	1,041	1,143
86.90	1,046	1,154
86.91	1,051	1,164
86.92	1,057	1,175
86.93	1,062	1,185
86.94	1,067	1,196
86.95	1,073	1,207
86.96	1,078	1,217
86.97	1,084	1,228
86.98	1,089	1,239
86.99	1,095	1,250
87.00	1,100	1,261
87.01	1,105	1,272
87.02	1,110	1,283
87.03	1,115	1,294
87.04	1,120	1,305
87.05	1,125	1,316
87.06	1,130	1,328
87.07	1,135	1,339

Water Quality Volume provided below lowest orifice for SCM-1

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*
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Stage-Area-Storage for Pond SCM2: Old Main St Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
87.08	1,140	1,350
87.09	1,145	1,362
87.10	1,150	1,373
87.11	1,155	1,385
87.12	1,160	1,396
87.13	1,165	1,408
87.14	1,170	1,420
87.15	1,176	1,431
87.16	1,181	1,443
87.17	1,186	1,455
87.18	1,191	1,467
87.19	1,196	1,479
87.20	1,201	1,491
87.21	1,206	1,503
87.22	1,212	1,515
87.23	1,217	1,527
87.24	1,222	1,539
87.25	1,227	1,552
87.26	1,233	1,564
87.27	1,238	1,576
87.28	1,243	1,589
87.29	1,248	1,601
87.30	1,254	1,614
87.31	1,259	1,626
87.32	1,264	1,639
87.33	1,270	1,651
87.34	1,275	1,664
87.35	1,280	1,677
87.36	1,286	1,690
87.37	1,291	1,703
87.38	1,296	1,716
87.39	1,302	1,729
87.40	1,307	1,742
87.41	1,312	1,755
87.42	1,318	1,768
87.43	1,323	1,781
87.44	1,329	1,794
87.45	1,334	1,808
87.46	1,340	1,821
87.47	1,345	1,834
87.48	1,351	1,848
87.49	1,356	1,861
87.50	1,362	1,875
87.51	1,367	1,889
87.52	1,373	1,902
87.53	1,378	1,916
87.54	1,384	1,930
87.55	1,389	1,944
87.56	1,395	1,958
87.57	1,400	1,972
87.58	1,406	1,986
87.59	1,412	2,000
87.60	1,417	2,014
87.61	1,423	2,028
87.62	1,428	2,042
87.63	1,434	2,057
87.64	1,440	2,071
87.65	1,445	2,086
87.66	1,451	2,100
87.67	1,457	2,115
87.68	1,463	2,129
87.69	1,468	2,144
87.70	1,474	2,159
87.71	1,480	2,173
87.72	1,485	2,188
87.73	1,491	2,203
87.74	1,497	2,218
87.75	1,503	2,233
87.76	1,509	2,248
87.77	1,514	2,263
87.78	1,520	2,278
87.79	1,526	2,294
87.80	1,532	2,309
87.81	1,538	2,324
87.82	1,544	2,340
87.83	1,549	2,355
87.84	1,555	2,371
87.85	1,561	2,386
87.86	1,567	2,402
87.87	1,573	2,418
87.88	1,579	2,433
87.89	1,585	2,449
87.90	1,591	2,465
87.91	1,597	2,481
87.92	1,603	2,497
87.93	1,609	2,513
87.94	1,615	2,529
87.95	1,621	2,545
87.96	1,627	2,561
87.97	1,633	2,578
87.98	1,639	2,594
87.99	1,645	2,611
88.00	1,651	2,627
88.01	1,656	2,644
88.02	1,661	2,660
88.03	1,666	2,677
88.04	1,671	2,694
88.05	1,677	2,710
88.06	1,682	2,727
88.07	1,687	2,744
88.08	1,692	2,761
88.09	1,697	2,778
88.10	1,702	2,795
88.11	1,708	2,812

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*
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Stage-Area-Storage for Pond SCM2: Old Main St Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
88.12	1,713	2,829
88.13	1,718	2,846
88.14	1,723	2,863
88.15	1,728	2,880
88.16	1,734	2,898
88.17	1,739	2,915
88.18	1,744	2,933
88.19	1,749	2,950
88.20	1,755	2,968
88.21	1,760	2,985
88.22	1,765	3,003
88.23	1,770	3,020
88.24	1,776	3,038
88.25	1,781	3,056
88.26	1,786	3,074
88.27	1,791	3,092
88.28	1,797	3,110
88.29	1,802	3,128
88.30	1,807	3,146
88.31	1,813	3,164
88.32	1,818	3,182
88.33	1,823	3,200
88.34	1,829	3,218
88.35	1,834	3,237
88.36	1,840	3,255
88.37	1,845	3,273
88.38	1,850	3,292
88.39	1,856	3,310
88.40	1,861	3,329
88.41	1,867	3,348
88.42	1,872	3,366
88.43	1,877	3,385
88.44	1,883	3,404
88.45	1,888	3,423
88.46	1,894	3,442
88.47	1,899	3,461
88.48	1,905	3,480
88.49	1,910	3,499
88.50	1,916	3,518
88.51	1,921	3,537
88.52	1,927	3,556
88.53	1,932	3,576
88.54	1,938	3,595
88.55	1,943	3,614
88.56	1,949	3,634
88.57	1,954	3,653
88.58	1,960	3,673
88.59	1,965	3,693
88.60	1,971	3,712
88.61	1,977	3,732
88.62	1,982	3,752
88.63	1,988	3,772
88.64	1,993	3,792
88.65	1,999	3,811
88.66	2,005	3,831
88.67	2,010	3,852
88.68	2,016	3,872
88.69	2,021	3,892
88.70	2,027	3,912
88.71	2,033	3,932
88.72	2,038	3,953
88.73	2,044	3,973
88.74	2,050	3,994
88.75	2,055	4,014
88.76	2,061	4,035
88.77	2,067	4,055
88.78	2,072	4,076
88.79	2,078	4,097
88.80	2,084	4,118
88.81	2,090	4,139
88.82	2,095	4,159
88.83	2,101	4,180
88.84	2,107	4,201
88.85	2,113	4,223
88.86	2,118	4,244
88.87	2,124	4,265
88.88	2,130	4,286
88.89	2,136	4,308
88.90	2,142	4,329
88.91	2,147	4,350
88.92	2,153	4,372
88.93	2,159	4,393
88.94	2,165	4,415
88.95	2,171	4,437
88.96	2,177	4,458
88.97	2,182	4,480
88.98	2,188	4,502
88.99	2,194	4,524
89.00	**2,200**	**4,546**

Proposed Condition
Type III 24-hr 100y24h Rainfall=8.23"
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Stage-Area-Storage for Pond SCM3: Subsurface Infiltration System

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
82.80	0	83.32	621	83.84	2,164
82.81	11	83.33	651	83.85	2,193
82.82	22	83.34	681	83.86	2,222
82.83	34	83.35	712	83.87	2,251
82.84	45	83.36	742	83.88	2,280
82.85	56	83.37	772	83.89	2,309
82.86	67	83.38	802	83.90	2,338
82.87	79	83.39	832	83.91	2,366
82.88	90	83.40	862	83.92	2,395
82.89	101	83.41	892	83.93	2,424
82.90	112	83.42	922	83.94	2,453
82.91	123	83.43	952	83.95	2,481
82.92	135	83.44	982	83.96	2,510
82.93	146	83.45	1,012	83.97	2,538
82.94	157	83.46	1,042	83.98	2,567
82.95	168	83.47	1,072	83.99	2,595
82.96	180	83.48	1,102	84.00	2,624
82.97	191	83.49	1,132	84.01	2,652
82.98	202	83.50	1,162	84.02	2,681
82.99	213	83.51	1,192	84.03	2,709
83.00	224	83.52	1,222	84.04	2,737
83.01	236	83.53	1,252	84.05	2,766
83.02	247	83.54	1,281	84.06	2,794
83.03	258	83.55	1,311	84.07	2,822
83.04	269	83.56	1,341	84.08	2,850
83.05	280	83.57	1,371	84.09	2,878
83.06	292	83.58	1,401	84.10	2,907
83.07	303	83.59	1,430	84.11	2,935
83.08	314	83.60	1,460	84.12	2,963
83.09	325	83.61	1,490	84.13	2,991
83.10	337	83.62	1,519	84.14	3,019
83.11	348	83.63	1,549	84.15	3,047
83.12	359	83.64	1,578	84.16	3,074
83.13	370	83.65	1,608	84.17	3,102
83.14	381	83.66	1,637	84.18	3,130
83.15	393	83.67	1,667	84.19	3,158
83.16	404	83.68	1,696	84.20	3,186
83.17	415	83.69	1,726	84.21	3,213
83.18	426	83.70	1,755	84.22	3,241
83.19	438	83.71	1,785	84.23	3,268
83.20	449	83.72	1,814	84.24	3,296
83.21	460	83.73	1,843	84.25	3,324
83.22	471	83.74	1,873	84.26	3,351
83.23	482	83.75	1,902	84.27	3,378
83.24	494	83.76	1,931	84.28	3,406
83.25	505	83.77	1,961	84.29	3,433
83.26	516	83.78	1,990	84.30	3,461
83.27	527	83.79	2,019	84.31	3,488
83.28	539	83.80	2,048	84.32	3,515
83.29	550	83.81	2,077	84.33	3,542
83.30	561	83.82	2,106	84.34	3,569
83.31	591	83.83	2,135	84.35	3,596

Water Quality Volume provided below lowest orifice for SCM-3

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*
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Stage-Area-Storage for Pond SCM3: Subsurface Infiltration System (continued)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
84.36	3,623	84.88	4,953	85.40	6,072
84.37	3,650	84.89	4,977	85.41	6,090
84.38	3,677	84.90	5,001	85.42	6,108
84.39	3,704	84.91	5,025	85.43	6,126
84.40	3,731	84.92	5,049	85.44	6,144
84.41	3,758	84.93	5,072	85.45	6,162
84.42	3,785	84.94	5,096	85.46	6,179
84.43	3,811	84.95	5,119	85.47	6,197
84.44	3,838	84.96	5,142	85.48	6,214
84.45	3,864	84.97	5,166	85.49	6,230
84.46	3,891	84.98	5,189	85.50	6,247
84.47	3,917	84.99	5,212	85.51	6,263
84.48	3,944	85.00	5,235	85.52	6,279
84.49	3,970	85.01	5,258	85.53	6,295
84.50	3,996	85.02	5,281	85.54	6,310
84.51	4,023	85.03	5,303	85.55	6,325
84.52	4,049	85.04	5,326	85.56	6,340
84.53	4,075	85.05	5,348	85.57	6,355
84.54	4,101	85.06	5,371	85.58	6,370
84.55	4,127	85.07	5,393	85.59	6,384
84.56	4,153	85.08	5,415	85.60	6,398
84.57	4,179	85.09	5,437	85.61	6,412
84.58	4,205	85.10	5,459	85.62	6,425
84.59	4,231	85.11	5,481	85.63	6,438
84.60	4,256	85.12	5,503	85.64	6,452
84.61	4,282	85.13	5,525	85.65	6,465
84.62	4,308	85.14	5,547	85.66	6,477
84.63	4,333	85.15	5,568	85.67	6,490
84.64	4,359	85.16	5,590	85.68	6,503
84.65	4,384	85.17	5,611	85.69	6,515
84.66	4,410	85.18	5,633	85.70	6,528
84.67	4,435	85.19	5,654	85.71	6,540
84.68	4,461	85.20	5,675	85.72	6,552
84.69	4,486	85.21	5,696	85.73	6,564
84.70	4,511	85.22	5,717	85.74	6,576
84.71	4,536	85.23	5,738	85.75	6,588
84.72	4,561	85.24	5,758	85.76	6,600
84.73	4,586	85.25	5,779	85.77	6,612
84.74	4,611	85.26	5,799	85.78	6,623
84.75	4,636	85.27	5,820	85.79	6,635
84.76	4,661	85.28	5,840	85.80	6,646
84.77	4,685	85.29	5,860	85.81	6,657
84.78	4,710	85.30	5,880	85.82	6,668
84.79	4,735	85.31	5,900	85.83	6,680
84.80	4,759	85.32	5,919	85.84	6,691
84.81	4,784	85.33	5,939	85.85	6,702
84.82	4,808	85.34	5,958	85.86	6,713
84.83	4,832	85.35	5,978	85.87	6,724
84.84	4,857	85.36	5,997	85.88	6,736
84.85	4,881	85.37	6,016	85.89	6,747
84.86	4,905	85.38	6,035	85.90	6,758
84.87	4,929	85.39	6,053	85.91	6,769

Proposed Condition *Type III 24-hr 100y24h Rainfall=8.23"*
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Stage-Area-Storage for Pond SCM3: Subsurface Infiltration System (continued)

Elevation (feet)	Storage (cubic-feet)
85.92	6,780
85.93	6,792
85.94	6,803
85.95	6,814
85.96	6,825
85.97	6,837
85.98	6,848
85.99	6,859
86.00	6,870
86.01	6,881
86.02	6,893
86.03	6,904
86.04	6,915
86.05	6,926
86.06	6,938
86.07	6,949
86.08	6,960
86.09	6,971
86.10	6,982
86.11	6,994
86.12	7,005
86.13	7,016
86.14	7,027
86.15	7,039
86.16	7,050
86.17	7,061
86.18	7,072
86.19	7,083
86.20	7,095
86.21	7,106
86.22	7,117
86.23	7,128
86.24	7,139
86.25	7,151
86.26	7,162
86.27	7,173
86.28	7,184
86.29	7,196
86.30	7,207
86.31	7,218
86.32	7,229
86.33	7,240
86.34	7,252
86.35	7,263
86.36	7,274
86.37	7,285
86.38	7,297
86.39	7,308
86.40	7,319
86.41	7,330
86.42	7,341
86.43	7,353
86.44	7,364
86.45	7,375
86.46	7,386
86.47	7,398
86.48	7,409
86.49	7,420
86.50	7,431
86.51	7,442
86.52	7,454
86.53	7,465
86.54	7,476
86.55	7,487
86.56	7,498
86.57	7,510
86.58	7,521
86.59	7,532
86.60	7,543
86.61	7,555
86.62	7,566
86.63	7,577
86.64	7,588
86.65	7,599
86.66	7,611
86.67	7,622
86.68	7,633
86.69	7,644
86.70	7,656
86.71	7,667
86.72	7,678
86.73	7,689
86.74	7,700
86.75	7,712
86.76	7,723
86.77	7,734
86.78	7,745
86.79	7,757
86.80	**7,768**

Project Name: Rte 38 Date 1/17/2024
Location: Wilminton MA
Site Designation: SCM 3

Site Conditions

Rainfall Depth=	1	in	
Impervious Acreage=	0.29	ac	
Total Acreage=	0.29	ac	
Time of Concentration=	6	min	
I=	100.0	%	
R_v(Runoff Coefficient)=	0.95		
WQ_v=	1000	cf	
q_u(Unit Peak Discharge)=	774	csm/in	From Type II Chart
Q_p(Water Quality Storm)=	0.33	cfs	
SC-740's per row	13	Chambers	

Project: **Route 38 (SCM-1)**

Include Perimeter Stone in Calculations

Click for Stage Area Data

Click to Invert Stage Area Data

Click Here for Metric

Chamber Model -	SC-740	
Units -	Imperial	
Number of Chambers -	108	
Voids in the stone (porosity) -	30	%
Base of Stone Elevation -	86.55	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	6	in
Area of system -	4120	sf Min. Area - 3651 sf min. area

StormTech SC-740 Cumulative Storage Volumes

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Total Chamber *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch & St *(cubic feet)*	Cumulative Chamber *(cubic feet)*	Elevation *(feet)*
48	0.00	0.00	103.00	103.00	8417.88	90.55
47	0.00	0.00	103.00	103.00	8314.88	90.47
46	0.00	0.00	103.00	103.00	8211.88	90.38
45	0.00	0.00	103.00	103.00	8108.88	90.30
44	0.00	0.00	103.00	103.00	8005.88	90.22
43	0.00	0.00	103.00	103.00	7902.88	90.13
42	0.00	0.00	103.00	103.00	7799.88	90.05
41	0.00	0.00	103.00	103.00	7696.88	89.97
40	0.00	0.00	103.00	103.00	7593.88	89.88
39	0.00	0.00	103.00	103.00	7490.88	89.80
38	0.00	0.00	103.00	103.00	7387.88	89.72
37	0.00	0.00	103.00	103.00	7284.88	89.63
36	0.05	5.94	101.22	107.16	7181.88	89.55
35	0.16	17.60	97.72	115.32	7074.73	89.47
34	0.28	30.45	93.87	124.31	6959.41	89.38
33	0.60	65.23	83.43	148.66	6835.09	89.30
32	0.80	86.59	77.02	163.61	6686.43	89.22
31	0.95	102.67	72.20	174.87	6522.83	89.13
30	1.07	116.05	68.19	184.23	6347.95	89.05
29	1.18	127.49	64.75	192.25	6163.72	88.97
28	1.27	136.69	61.99	198.68	5971.48	88.88
27	1.36	146.34	59.10	205.44	5772.79	88.80
26	1.45	157.04	55.89	212.93	5567.35	88.72
25	1.52	164.67	53.60	218.27	5354.42	88.63
24	1.58	170.89	51.73	222.62	5136.15	88.55
23	1.64	177.37	49.79	227.16	4913.53	88.47
22	1.70	183.55	47.94	231.48	4686.37	88.38
21	1.75	189.32	46.21	235.52	4454.89	88.30
20	1.80	194.70	44.59	239.29	4219.37	88.22
19	1.85	200.34	42.90	243.24	3980.08	88.13
18	1.89	204.45	41.66	246.12	3736.84	88.05
17	1.93	208.87	40.34	249.21	3490.72	87.97
16	1.97	213.30	39.01	252.31	3241.51	87.88
15	2.01	217.07	37.88	254.95	2989.20	87.80
14	2.04	220.86	36.74	257.60	2734.25	87.72
13	2.07	224.10	35.77	259.87	2476.65	87.63
12	2.10	227.33	34.80	262.13	2216.78	87.55
11	2.13	230.23	33.93	264.16	1954.65	87.47
10	2.15	232.62	33.22	265.83	1690.49	87.38
9	2.18	235.12	32.46	267.59	1424.66	87.30
8	2.20	237.42	31.77	269.20	1157.07	87.22
7	2.21	238.39	31.48	269.87	887.87	87.13
6	0.00	0.00	103.00	103.00	618.00	87.05
5	0.00	0.00	103.00	103.00	515.00	86.97
4	0.00	0.00	103.00	103.00	412.00	86.88
3	0.00	0.00	103.00	103.00	309.00	86.80
2	0.00	0.00	103.00	103.00	206.00	86.72
1	0.00	0.00	103.00	103.00	103.00	86.63

Project: **Route 38 (SCM-3)**

Chamber Model -	SC-740	
Units -	Imperial	
Number of Chambers -	102	
Voids in the stone (porosity) -	30	%
Base of Stone Elevation -	82.70	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	6	in
Area of system -	3923	sf Min. Area - 3448 sf min. area

☑ Include Perimeter Stone in Calculations

☐ Click for Stage Area Data

☐ Click to Invert Stage Area Data

Click Here for Metric

StormTech SC-740 Cumulative Storage Volumes

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Total Chamber *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch & St *(cubic feet)*	Cumulative Chamber *(cubic feet)*	Elevation *(feet)*
48	0.00	0.00	98.08	98.08	7988.49	86.70
47	0.00	0.00	98.08	98.08	7890.42	86.62
46	0.00	0.00	98.08	98.08	7792.34	86.53
45	0.00	0.00	98.08	98.08	7694.27	86.45
44	0.00	0.00	98.08	98.08	7596.19	86.37
43	0.00	0.00	98.08	98.08	7498.12	86.28
42	0.00	0.00	98.08	98.08	7400.04	86.20
41	0.00	0.00	98.08	98.08	7301.97	86.12
40	0.00	0.00	98.08	98.08	7203.89	86.03
39	0.00	0.00	98.08	98.08	7105.82	85.95
38	0.00	0.00	98.08	98.08	7007.74	85.87
37	0.00	0.00	98.08	98.08	6909.67	85.78
36	0.05	5.61	96.39	102.00	6811.59	85.70
35	0.16	16.62	93.09	109.71	6709.59	85.62
34	0.28	28.76	89.45	118.21	6599.88	85.53
33	0.60	61.60	79.59	141.20	6481.68	85.45
32	0.80	81.77	73.54	155.32	6340.48	85.37
31	0.95	96.97	68.98	165.95	6185.16	85.28
30	1.07	109.60	65.19	174.80	6019.21	85.20
29	1.18	120.41	61.95	182.36	5844.41	85.12
28	1.27	129.10	59.35	188.44	5662.05	85.03
27	1.36	138.21	56.61	194.82	5473.61	84.95
26	1.45	148.32	53.58	201.90	5278.78	84.87
25	1.52	155.52	51.42	206.94	5076.89	84.78
24	1.58	161.40	49.66	211.05	4869.95	84.70
23	1.64	167.51	47.82	215.33	4658.89	84.62
22	1.70	173.35	46.07	219.42	4443.56	84.53
21	1.75	178.80	44.44	223.23	4224.14	84.45
20	1.80	183.89	42.91	226.80	4000.90	84.37
19	1.85	189.21	41.31	230.52	3774.11	84.28
18	1.89	193.10	40.15	233.24	3543.59	84.20
17	1.93	197.27	38.89	236.16	3310.34	84.12
16	1.97	201.45	37.64	239.09	3074.18	84.03
15	2.01	205.01	36.57	241.58	2835.09	83.95
14	2.04	208.59	35.50	244.09	2593.51	83.87
13	2.07	211.65	34.58	246.23	2349.42	83.78
12	2.10	214.70	33.66	248.37	2103.19	83.70
11	2.13	217.44	32.84	250.29	1854.83	83.62
10	2.15	219.69	32.17	251.86	1604.54	83.53
9	2.18	222.06	31.46	253.52	1352.68	83.45
8	2.20	224.23	30.81	255.04	1099.17	83.37
7	2.21	225.15	30.53	255.68	844.13	83.28
6	0.00	0.00	98.08	98.08	588.45	83.20
5	0.00	0.00	98.08	98.08	490.38	83.12
4	0.00	0.00	98.08	98.08	392.30	83.03
3	0.00	0.00	98.08	98.08	294.23	82.95
2	0.00	0.00	98.08	98.08	196.15	82.87
1	0.00	0.00	98.08	98.08	98.08	82.78

GREEN INTERNATIONAL AFFILIATES, INC.
Civil & Structural Engineers
100 Ames Pond Drive, Suite 200
Tewksbury, MA 01876

JOB	13033.19		
SHEET NO.	1	OF	1
CALCULATED BY	VP	DATE	1/16/2024
CHECKED BY	AF	DATE	1/16/2024
DESCRIPTION	Culvert Main Street		
SCALE			

Hydraulic Engineering Circular No. 14, Third Edition

Several relationships have been proposed for riprap sizing for culvert aprons and several of these are discussed in greater detail in Appendix D. The independent variables in these relationships include one or more of the following variables: outlet velocity, rock specific gravity, pipe dimension (e.g. diameter), outlet Froude number, and tailwater. The following equation (Fletcher and Grace, 1972) is recommended for circular culverts:

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right) \qquad (10.4)$$

where,

- D_{50} = riprap size, m (ft)
- Q = design discharge, m^3/s (ft^3/s)
- D = culvert diameter (circular), m (ft)
- TW = tailwater depth, m (ft)
- g = acceleration due to gravity, 9.81 m/s^2 (32.2 ft/s^2)

Tailwater depth for Equation 10.4 should be limited to between 0.4D and 1.0D. If tailwater is unknown, use 0.4D.

D=	4.93	ft	Culvert rise used as culvert diameter
g=	32.2	ft/s^2	
Q=	205.14	cfs	
TW=	0.54	ft	
D_{50}=	1.07	ft	
	12.84	in	
	326.22	mm	Class 4 M2.02.0 Riprap

Table 10.1. Example Riprap Classes and Apron Dimensions

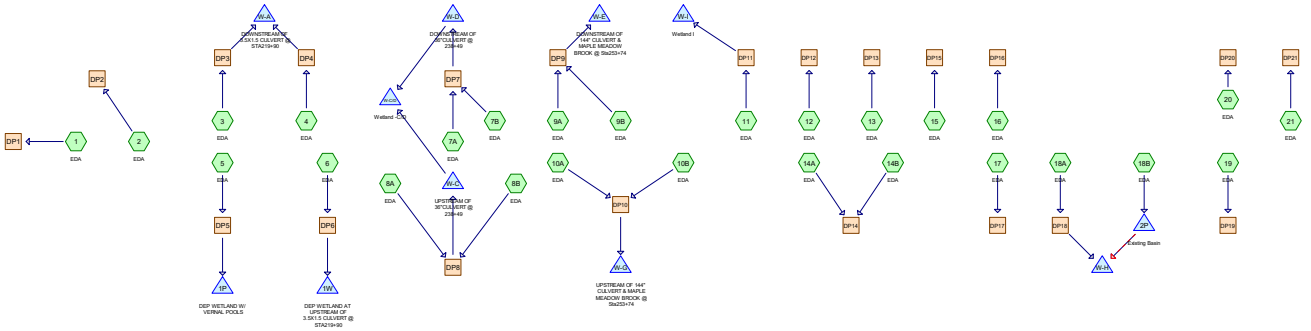
Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

Apron Length=	6.00	x	4.93
	30	ft	
Apron Depth=	2.20	x	1.25
	2.8	ft	
Apron Width=	35	ft	
(Figure 10.4)			

Appendix D: Hydraulic and Hydrologic Data

- Existing Conditions HydroCAD Calculations
- Proposed Conditions HydroCAD Calculations
- Existing Watershed and Drainage Plan
- Proposed Watershed and Drainage Plan



Subcat Reach Pond Link

Routing Diagram for Existing Condition
Prepared by Green International Affiliates, Printed 2/25/2025
HydroCAD® 10.20-5c s/n 06415 © 2023 HydroCAD Software Solutions LLC

Existing Condition

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2y24h	Type III 24-hr		Default	24.00	1	3.30	2
2	10y24h	Type III 24-hr		Default	24.00	1	5.20	2
3	25y24h	Type III 24-hr		Default	24.00	1	6.39	2
4	100y24h	Type III 24-hr		Default	24.00	1	8.23	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.523	49	50-75% Grass cover, Fair, HSG A (2, 3, 4, 5, 7A, 7B, 9A, 9B, 10A, 10B, 12, 13, 14A, 14B, 15, 16, 17, 18A, 18B)
0.248	69	50-75% Grass cover, Fair, HSG B (6, 8A, 11)
0.038	79	50-75% Grass cover, Fair, HSG C (21)
0.020	68	<50% Grass cover, Poor, HSG A (1)
0.187	74	>75% Grass cover, Good, HSG C (20)
0.210	80	>75% Grass cover, Good, HSG D (20)
0.800	76	Gravel roads, HSG A (7A, 10A, 13, 17, 18A)
1.553	91	Gravel roads, HSG D (18A, 20)
1.915	98	Impervious (20)
11.188	98	Paved roads w/curbs & sewers, HSG A (1, 2, 3, 4, 5, 7A, 7B, 9A, 9B, 10A, 10B, 12, 13, 14A, 14B, 15, 16, 17, 18A, 18B)
1.445	98	Paved roads w/curbs & sewers, HSG B (6, 8A, 11)
0.030	98	Paved roads w/curbs & sewers, HSG C (21)
0.087	98	Unconnected pavement, HSG A (19)
2.013	36	Woods, Fair, HSG A (4, 7A, 7B, 8B, 14B, 16, 18A, 19)
0.221	60	Woods, Fair, HSG B (8A, 11)
0.036	73	Woods, Fair, HSG C (21)
0.716	79	Woods, Fair, HSG D (18A)
0.540	70	Woods, Good, HSG C (20)
0.949	77	Woods, Good, HSG D (20)
0.241	45	Woods, Poor, HSG A (3, 5)
0.056	65	Woods/grass comb., Fair, HSG B (6)
26.013	**82**	**TOTAL AREA**

Existing Condition

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
17.872	HSG A	1, 2, 3, 4, 5, 7A, 7B, 8B, 9A, 9B, 10A, 10B, 12, 13, 14A, 14B, 15, 16, 17, 18A, 18B, 19
1.970	HSG B	6, 8A, 11
0.830	HSG C	20, 21
3.427	HSG D	18A, 20
1.915	Other	20
26.013		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: EDA Runoff Area=27,790 sf 96.88% Impervious Runoff Depth>2.95"
Tc=6.0 min CN=97 Runoff=1.97 cfs 0.157 af

Subcatchment 2: EDA Runoff Area=11,386 sf 94.54% Impervious Runoff Depth>2.74"
Tc=6.0 min CN=95 Runoff=0.77 cfs 0.060 af

Subcatchment 3: EDA Runoff Area=52,497 sf 81.12% Impervious Runoff Depth>2.17"
Tc=6.0 min CN=89 Runoff=2.98 cfs 0.218 af

Subcatchment 4: EDA Runoff Area=123,722 sf 83.84% Impervious Runoff Depth>2.26"
Tc=13.6 min CN=90 Runoff=5.81 cfs 0.534 af

Subcatchment 5: EDA Runoff Area=22,514 sf 60.31% Impervious Runoff Depth>1.28"
Tc=8.8 min CN=77 Runoff=0.68 cfs 0.055 af

Subcatchment 6: EDA Runoff Area=26,496 sf 80.11% Impervious Runoff Depth>2.44"
Tc=6.0 min CN=92 Runoff=1.66 cfs 0.124 af

Subcatchment 7A: EDA Runoff Area=40,680 sf 65.46% Impervious Runoff Depth>1.62"
Tc=7.0 min CN=82 Runoff=1.69 cfs 0.126 af

Subcatchment 7B: EDA Runoff Area=11,116 sf 48.11% Impervious Runoff Depth>0.89"
Tc=6.0 min CN=70 Runoff=0.24 cfs 0.019 af

Subcatchment 8A: EDA Runoff Area=37,408 sf 66.89% Impervious Runoff Depth>1.92"
Tc=9.0 min CN=86 Runoff=1.71 cfs 0.137 af

Subcatchment 8B: EDA Runoff Area=5,418 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment 9A: EDA Runoff Area=48,757 sf 59.89% Impervious Runoff Depth>1.35"
Tc=6.0 min CN=78 Runoff=1.71 cfs 0.126 af

Subcatchment 9B: EDA Runoff Area=4,197 sf 55.06% Impervious Runoff Depth>1.22"
Tc=6.0 min CN=76 Runoff=0.13 cfs 0.010 af

Subcatchment 10A: EDA Runoff Area=37,841 sf 70.13% Impervious Runoff Depth>1.76"
Tc=6.0 min CN=84 Runoff=1.76 cfs 0.128 af

Subcatchment 10B: EDA Runoff Area=25,272 sf 60.25% Impervious Runoff Depth>1.41"
Tc=6.0 min CN=79 Runoff=0.93 cfs 0.068 af

Subcatchment 11: EDA Runoff Area=21,893 sf 76.18% Impervious Runoff Depth>2.26"
Tc=6.0 min CN=90 Runoff=1.29 cfs 0.095 af

Subcatchment 12: EDA Runoff Area=14,367 sf 64.65% Impervious Runoff Depth>1.55"
Tc=6.0 min CN=81 Runoff=0.58 cfs 0.043 af

Subcatchment 13: EDA Runoff Area=11,148 sf 19.19% Impervious Runoff Depth>0.45"
Tc=6.0 min CN=60 Runoff=0.08 cfs 0.010 af

Subcatchment 14A: EDA Runoff Area=11,849 sf 73.75% Impervious Runoff Depth>1.84"
Tc=6.0 min CN=85 Runoff=0.58 cfs 0.042 af

Subcatchment 14B: EDA Runoff Area=59,685 sf 67.04% Impervious Runoff Depth>1.48"
Tc=6.1 min CN=80 Runoff=2.31 cfs 0.169 af

Subcatchment 15: EDA Runoff Area=8,734 sf 63.20% Impervious Runoff Depth>1.48"
Tc=6.0 min CN=80 Runoff=0.34 cfs 0.025 af

Subcatchment 16: EDA Runoff Area=11,582 sf 52.73% Impervious Runoff Depth>1.10"
Tc=6.0 min CN=74 Runoff=0.32 cfs 0.024 af

Subcatchment 17: EDA Runoff Area=16,849 sf 63.60% Impervious Runoff Depth>1.76"
Tc=6.0 min CN=84 Runoff=0.79 cfs 0.057 af

Subcatchment 18A: EDA Runoff Area=267,229 sf 37.25% Impervious Runoff Depth>1.04"
Tc=31.7 min CN=73 Runoff=3.90 cfs 0.531 af

Subcatchment 18B: EDA Runoff Area=5,148 sf 47.92% Impervious Runoff Depth>0.99"
Tc=6.0 min CN=72 Runoff=0.13 cfs 0.010 af

Subcatchment 19: EDA Runoff Area=7,862 sf 48.17% Impervious Runoff Depth>0.69"
Tc=6.0 min CN=66 Runoff=0.12 cfs 0.010 af

Subcatchment 20: EDA Runoff Area=217,219 sf 38.40% Impervious Runoff Depth>2.08"
Flow Length=455' Slope=0.0900 '/' Tc=16.1 min CN=88 Runoff=8.94 cfs 0.865 af

Subcatchment 21: EDA Runoff Area=4,489 sf 28.98% Impervious Runoff Depth>1.62"
Tc=6.0 min CN=82 Runoff=0.19 cfs 0.014 af

Reach DP1: Inflow=1.97 cfs 0.157 af
Outflow=1.97 cfs 0.157 af

Reach DP10: Inflow=2.70 cfs 0.196 af
Outflow=2.70 cfs 0.196 af

Reach DP11: Inflow=1.29 cfs 0.095 af
Outflow=1.29 cfs 0.095 af

Reach DP12: Inflow=0.58 cfs 0.043 af
Outflow=0.58 cfs 0.043 af

Reach DP13: Inflow=0.08 cfs 0.010 af
Outflow=0.08 cfs 0.010 af

Reach DP14: Inflow=2.88 cfs 0.210 af
Outflow=2.88 cfs 0.210 af

Reach DP15: Inflow=0.34 cfs 0.025 af
Outflow=0.34 cfs 0.025 af

Reach DP16: Inflow=0.32 cfs 0.024 af
Outflow=0.32 cfs 0.024 af

Reach DP17: Inflow=0.79 cfs 0.057 af
Outflow=0.79 cfs 0.057 af

Reach DP18: Inflow=3.90 cfs 0.531 af
Outflow=3.90 cfs 0.531 af

Reach DP19: Inflow=0.12 cfs 0.010 af
Outflow=0.12 cfs 0.010 af

Reach DP2: Inflow=0.77 cfs 0.060 af
Outflow=0.77 cfs 0.060 af

Reach DP20: Inflow=8.94 cfs 0.865 af
Outflow=8.94 cfs 0.865 af

Reach DP21: Inflow=0.19 cfs 0.014 af
Outflow=0.19 cfs 0.014 af

Reach DP3: Inflow=2.98 cfs 0.218 af
Outflow=2.98 cfs 0.218 af

Reach DP4: Inflow=5.81 cfs 0.534 af
Outflow=5.81 cfs 0.534 af

Reach DP5: Inflow=0.68 cfs 0.055 af
Outflow=0.68 cfs 0.055 af

Reach DP6: Inflow=1.66 cfs 0.124 af
Outflow=1.66 cfs 0.124 af

Reach DP7: Inflow=1.92 cfs 0.145 af
Outflow=1.92 cfs 0.145 af

Reach DP8: Inflow=1.71 cfs 0.137 af
Outflow=1.71 cfs 0.137 af

Reach DP9: Inflow=1.84 cfs 0.135 af
Outflow=1.84 cfs 0.135 af

Pond 1P: DEP WETLAND W/ VERNAL POOLS Inflow=0.68 cfs 0.055 af
Primary=0.68 cfs 0.055 af

Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=1.66 cfs 0.124 af
Primary=1.66 cfs 0.124 af

Pond 2P: Existing Basin Peak Elev=85.98' Storage=425 cf Inflow=0.13 cfs 0.010 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=8.01 cfs 0.752 af
Primary=8.01 cfs 0.752 af

Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49 Inflow=1.71 cfs 0.137 af
Primary=1.71 cfs 0.137 af

Pond W-C/D: Wetland -C/D Inflow=3.62 cfs 0.282 af
Primary=3.62 cfs 0.282 af

Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49 Inflow=1.92 cfs 0.145 af
Primary=1.92 cfs 0.145 af

Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=1.84 cfs 0.135 af
Primary=1.84 cfs 0.135 af

Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=2.70 cfs 0.196 af
Primary=2.70 cfs 0.196 af

Pond W-H: Inflow=3.90 cfs 0.531 af
Primary=3.90 cfs 0.531 af

Pond W-I: Wetland I Inflow=1.29 cfs 0.095 af
Primary=1.29 cfs 0.095 af

Total Runoff Area = 26.013 ac Runoff Volume = 3.654 af Average Runoff Depth = 1.69"
43.63% Pervious = 11.349 ac 56.37% Impervious = 14.665 ac

Summary for Subcatchment 1: EDA

Runoff = 1.97 cfs @ 12.09 hrs, Volume= 0.157 af, Depth> 2.95"
Routed to Reach DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
26,924	98	Paved roads w/curbs & sewers, HSG A
866	68	<50% Grass cover, Poor, HSG A
27,790	97	Weighted Average
866		3.12% Pervious Area
26,924		96.88% Impervious Area

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

Summary for Subcatchment 2: EDA

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 0.060 af, Depth> 2.74"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
10,764	98	Paved roads w/curbs & sewers, HSG A
622	49	50-75% Grass cover, Fair, HSG A
11,386	95	Weighted Average
622		5.46% Pervious Area
10,764		94.54% Impervious Area

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

Summary for Subcatchment 3: EDA

Runoff = 2.98 cfs @ 12.09 hrs, Volume= 0.218 af, Depth> 2.17"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
42,583	98	Paved roads w/curbs & sewers, HSG A
6,681	49	50-75% Grass cover, Fair, HSG A
3,233	45	Woods, Poor, HSG A
52,497	89	Weighted Average
9,914		18.88% Pervious Area
42,583		81.12% Impervious Area

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

Summary for Subcatchment 4: EDA

Runoff = 5.81 cfs @ 12.19 hrs, Volume= 0.534 af, Depth> 2.26"
Routed to Reach DP4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
103,725	98	Paved roads w/curbs & sewers, HSG A
18,190	49	50-75% Grass cover, Fair, HSG A
1,807	36	Woods, Fair, HSG A
123,722	90	Weighted Average
19,997		16.16% Pervious Area
103,725		83.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 5: EDA

Runoff = 0.68 cfs @ 12.13 hrs, Volume= 0.055 af, Depth> 1.28"
Routed to Reach DP5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
13,579	98	Paved roads w/curbs & sewers, HSG A
1,652	49	50-75% Grass cover, Fair, HSG A
7,283	45	Woods, Poor, HSG A
22,514	77	Weighted Average
8,935		39.69% Pervious Area
13,579		60.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 6: EDA

Runoff = 1.66 cfs @ 12.09 hrs, Volume= 0.124 af, Depth> 2.44"
Routed to Reach DP6 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
21,227	98	Paved roads w/curbs & sewers, HSG B
2,835	69	50-75% Grass cover, Fair, HSG B
2,434	65	Woods/grass comb., Fair, HSG B
26,496	92	Weighted Average
5,269		19.89% Pervious Area
21,227		80.11% Impervious Area

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

Summary for Subcatchment 7A: EDA

Runoff = 1.69 cfs @ 12.11 hrs, Volume= 0.126 af, Depth> 1.62"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
26,629	98	Paved roads w/curbs & sewers, HSG A
2,718	49	50-75% Grass cover, Fair, HSG A
6,904	36	Woods, Fair, HSG A
4,429	76	Gravel roads, HSG A
40,680	82	Weighted Average
14,051		34.54% Pervious Area
26,629		65.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 7B: EDA

Runoff = 0.24 cfs @ 12.10 hrs, Volume= 0.019 af, Depth> 0.89"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
5,348	98	Paved roads w/curbs & sewers, HSG A
3,154	49	50-75% Grass cover, Fair, HSG A
2,614	36	Woods, Fair, HSG A
11,116	70	Weighted Average
5,768		51.89% Pervious Area
5,348		48.11% Impervious Area

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

Summary for Subcatchment 8A: EDA

Runoff = 1.71 cfs @ 12.13 hrs, Volume= 0.137 af, Depth> 1.92"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
25,023	98	Paved roads w/curbs & sewers, HSG B
4,412	69	50-75% Grass cover, Fair, HSG B
7,973	60	Woods, Fair, HSG B
37,408	86	Weighted Average
12,385		33.11% Pervious Area
25,023		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 8B: EDA

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
5,418	36	Woods, Fair, HSG A
5,418		100.00% Pervious Area

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

Summary for Subcatchment 9A: EDA

Runoff = 1.71 cfs @ 12.10 hrs, Volume= 0.126 af, Depth> 1.35"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
29,203	98	Paved roads w/curbs & sewers, HSG A
19,554	49	50-75% Grass cover, Fair, HSG A
48,757	78	Weighted Average
19,554		40.11% Pervious Area
29,203		59.89% Impervious Area

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

Summary for Subcatchment 9B: EDA

Runoff = 0.13 cfs @ 12.10 hrs, Volume= 0.010 af, Depth> 1.22"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
2,311	98	Paved roads w/curbs & sewers, HSG A
1,886	49	50-75% Grass cover, Fair, HSG A
4,197	76	Weighted Average
1,886		44.94% Pervious Area
2,311		55.06% Impervious Area

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

Summary for Subcatchment 10A: EDA

Runoff = 1.76 cfs @ 12.09 hrs, Volume= 0.128 af, Depth> 1.76"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
26,539	98	Paved roads w/curbs & sewers, HSG A
11,094	49	50-75% Grass cover, Fair, HSG A
208	76	Gravel roads, HSG A
37,841	84	Weighted Average
11,302		29.87% Pervious Area
26,539		70.13% Impervious Area

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

Summary for Subcatchment 10B: EDA

Runoff = 0.93 cfs @ 12.10 hrs, Volume= 0.068 af, Depth> 1.41"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
15,226	98	Paved roads w/curbs & sewers, HSG A
10,046	49	50-75% Grass cover, Fair, HSG A
25,272	79	Weighted Average
10,046		39.75% Pervious Area
15,226		60.25% Impervious Area

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

Summary for Subcatchment 11: EDA

Runoff = 1.29 cfs @ 12.09 hrs, Volume= 0.095 af, Depth> 2.26"
Routed to Reach DP11 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
16,677	98	Paved roads w/curbs & sewers, HSG B
3,572	69	50-75% Grass cover, Fair, HSG B
1,644	60	Woods, Fair, HSG B
21,893	90	Weighted Average
5,216		23.82% Pervious Area
16,677		76.18% Impervious Area

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

Summary for Subcatchment 12: EDA

Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.043 af, Depth> 1.55"
Routed to Reach DP12 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
9,288	98	Paved roads w/curbs & sewers, HSG A
5,079	49	50-75% Grass cover, Fair, HSG A
14,367	81	Weighted Average
5,079		35.35% Pervious Area
9,288		64.65% Impervious Area

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

Summary for Subcatchment 13: EDA

Runoff = 0.08 cfs @ 12.13 hrs, Volume= 0.010 af, Depth> 0.45"
Routed to Reach DP13 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
2,139	98	Paved roads w/curbs & sewers, HSG A
8,245	49	50-75% Grass cover, Fair, HSG A
764	76	Gravel roads, HSG A
11,148	60	Weighted Average
9,009		80.81% Pervious Area
2,139		19.19% Impervious Area

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

Summary for Subcatchment 14A: EDA

Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.042 af, Depth> 1.84"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
8,739	98	Paved roads w/curbs & sewers, HSG A
3,110	49	50-75% Grass cover, Fair, HSG A
11,849	85	Weighted Average
3,110		26.25% Pervious Area
8,739		73.75% Impervious Area

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

Summary for Subcatchment 14B: EDA

Runoff = 2.31 cfs @ 12.10 hrs, Volume= 0.169 af, Depth> 1.48"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
40,012	98	Paved roads w/curbs & sewers, HSG A
10,242	49	50-75% Grass cover, Fair, HSG A
9,431	36	Woods, Fair, HSG A
59,685	80	Weighted Average
19,673		32.96% Pervious Area
40,012		67.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 15: EDA

Runoff = 0.34 cfs @ 12.10 hrs, Volume= 0.025 af, Depth> 1.48"
Routed to Reach DP15 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
5,520	98	Paved roads w/curbs & sewers, HSG A
3,214	49	50-75% Grass cover, Fair, HSG A
8,734	80	Weighted Average
3,214		36.80% Pervious Area
5,520		63.20% Impervious Area

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

Summary for Subcatchment 16: EDA

Runoff = 0.32 cfs @ 12.10 hrs, Volume= 0.024 af, Depth> 1.10"
Routed to Reach DP16 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
6,107	98	Paved roads w/curbs & sewers, HSG A
4,630	49	50-75% Grass cover, Fair, HSG A
845	36	Woods, Fair, HSG A
11,582	74	Weighted Average
5,475		47.27% Pervious Area
6,107		52.73% Impervious Area

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

Summary for Subcatchment 17: EDA

Runoff = 0.79 cfs @ 12.09 hrs, Volume= 0.057 af, Depth> 1.76"
Routed to Reach DP17 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
10,716	98	Paved roads w/curbs & sewers, HSG A
3,641	49	50-75% Grass cover, Fair, HSG A
2,492	76	Gravel roads, HSG A
16,849	84	Weighted Average
6,133		36.40% Pervious Area
10,716		63.60% Impervious Area

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

Summary for Subcatchment 18A: EDA

Runoff = 3.90 cfs @ 12.48 hrs, Volume= 0.531 af, Depth> 1.04"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
99,544	98	Paved roads w/curbs & sewers, HSG A
37,004	49	50-75% Grass cover, Fair, HSG A
56,609	36	Woods, Fair, HSG A
31,170	79	Woods, Fair, HSG D
26,944	76	Gravel roads, HSG A
15,958	91	Gravel roads, HSG D
267,229	73	Weighted Average
167,685		62.75% Pervious Area
99,544		37.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18B: EDA

AREA GOING TO THE EXISTING BMP

Runoff = 0.13 cfs @ 12.10 hrs, Volume= 0.010 af, Depth> 0.99"
Routed to Pond 2P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
2,467	98	Paved roads w/curbs & sewers, HSG A
2,681	49	50-75% Grass cover, Fair, HSG A
5,148	72	Weighted Average
2,681		52.08% Pervious Area
2,467		47.92% Impervious Area

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

Summary for Subcatchment 19: EDA

Runoff = 0.12 cfs @ 12.11 hrs, Volume= 0.010 af, Depth> 0.69"
Routed to Reach DP19 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
3,787	98	Unconnected pavement, HSG A
4,075	36	Woods, Fair, HSG A
7,862	66	Weighted Average
4,075		51.83% Pervious Area
3,787		48.17% Impervious Area
3,787		100.00% Unconnected

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

Summary for Subcatchment 20: EDA

Runoff = 8.94 cfs @ 12.22 hrs, Volume= 0.865 af, Depth> 2.08"
Routed to Reach DP20 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

	Area (sf)	CN	Description
*	83,409	98	Impervious
	8,137	74	>75% Grass cover, Good, HSG C
	9,133	80	>75% Grass cover, Good, HSG D
	23,541	70	Woods, Good, HSG C
	41,329	77	Woods, Good, HSG D
	51,670	91	Gravel roads, HSG D
	217,219	88	Weighted Average
	133,810		61.60% Pervious Area
	83,409		38.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0900	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
4.5	405	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	455	Total			

Summary for Subcatchment 21: EDA

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Depth> 1.62"
Routed to Reach DP21 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
1,301	98	Paved roads w/curbs & sewers, HSG C
1,640	79	50-75% Grass cover, Fair, HSG C
1,548	73	Woods, Fair, HSG C
4,489	82	Weighted Average
3,188		71.02% Pervious Area
1,301		28.98% Impervious Area

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

Summary for Reach DP1:

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

Inflow Area = 0.638 ac, 96.88% Impervious, Inflow Depth > 2.95" for 2y24h event
Inflow = 1.97 cfs @ 12.09 hrs, Volume= 0.157 af
Outflow = 1.97 cfs @ 12.09 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP10:

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

Inflow Area = 1.449 ac, 66.17% Impervious, Inflow Depth > 1.62" for 2y24h event
Inflow = 2.70 cfs @ 12.09 hrs, Volume= 0.196 af
Outflow = 2.70 cfs @ 12.09 hrs, Volume= 0.196 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-G : UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP11:

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

Inflow Area = 0.503 ac, 76.18% Impervious, Inflow Depth > 2.26" for 2y24h event
Inflow = 1.29 cfs @ 12.09 hrs, Volume= 0.095 af
Outflow = 1.29 cfs @ 12.09 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-I : Wetland I

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP12:

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

Inflow Area = 0.330 ac, 64.65% Impervious, Inflow Depth > 1.55" for 2y24h event
Inflow = 0.58 cfs @ 12.09 hrs, Volume= 0.043 af
Outflow = 0.58 cfs @ 12.09 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP13:

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

Inflow Area = 0.256 ac, 19.19% Impervious, Inflow Depth > 0.45" for 2y24h event
Inflow = 0.08 cfs @ 12.13 hrs, Volume= 0.010 af
Outflow = 0.08 cfs @ 12.13 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP14:

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

Inflow Area = 1.642 ac, 68.15% Impervious, Inflow Depth > 1.54" for 2y24h event
Inflow = 2.88 cfs @ 12.10 hrs, Volume= 0.210 af
Outflow = 2.88 cfs @ 12.10 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP15:

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

Inflow Area = 0.201 ac, 63.20% Impervious, Inflow Depth > 1.48" for 2y24h event
Inflow = 0.34 cfs @ 12.10 hrs, Volume= 0.025 af
Outflow = 0.34 cfs @ 12.10 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP16:

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

Inflow Area = 0.266 ac, 52.73% Impervious, Inflow Depth > 1.10" for 2y24h event
Inflow = 0.32 cfs @ 12.10 hrs, Volume= 0.024 af
Outflow = 0.32 cfs @ 12.10 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP17:

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

Inflow Area = 0.387 ac, 63.60% Impervious, Inflow Depth > 1.76" for 2y24h event
Inflow = 0.79 cfs @ 12.09 hrs, Volume= 0.057 af
Outflow = 0.79 cfs @ 12.09 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP18:

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

Inflow Area = 6.135 ac, 37.25% Impervious, Inflow Depth > 1.04" for 2y24h event
Inflow = 3.90 cfs @ 12.48 hrs, Volume= 0.531 af
Outflow = 3.90 cfs @ 12.48 hrs, Volume= 0.531 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-H :

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP19:

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

Inflow Area = 0.180 ac, 48.17% Impervious, Inflow Depth > 0.69" for 2y24h event
Inflow = 0.12 cfs @ 12.11 hrs, Volume= 0.010 af
Outflow = 0.12 cfs @ 12.11 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP2:

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

Inflow Area = 0.261 ac, 94.54% Impervious, Inflow Depth > 2.74" for 2y24h event
Inflow = 0.77 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.77 cfs @ 12.09 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP20:

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

Inflow Area = 4.987 ac, 38.40% Impervious, Inflow Depth > 2.08" for 2y24h event
Inflow = 8.94 cfs @ 12.22 hrs, Volume= 0.865 af
Outflow = 8.94 cfs @ 12.22 hrs, Volume= 0.865 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP21:

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

Inflow Area = 0.103 ac, 28.98% Impervious, Inflow Depth > 1.62" for 2y24h event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP3:

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

Inflow Area = 1.205 ac, 81.12% Impervious, Inflow Depth > 2.17" for 2y24h event
Inflow = 2.98 cfs @ 12.09 hrs, Volume= 0.218 af
Outflow = 2.98 cfs @ 12.09 hrs, Volume= 0.218 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP4:

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

Inflow Area = 2.840 ac, 83.84% Impervious, Inflow Depth > 2.26" for 2y24h event
Inflow = 5.81 cfs @ 12.19 hrs, Volume= 0.534 af
Outflow = 5.81 cfs @ 12.19 hrs, Volume= 0.534 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP5:

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

Inflow Area = 0.517 ac, 60.31% Impervious, Inflow Depth > 1.28" for 2y24h event
Inflow = 0.68 cfs @ 12.13 hrs, Volume= 0.055 af
Outflow = 0.68 cfs @ 12.13 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : DEP WETLAND W/ VERNAL POOLS

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP6:

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

Inflow Area = 0.608 ac, 80.11% Impervious, Inflow Depth > 2.44" for 2y24h event
Inflow = 1.66 cfs @ 12.09 hrs, Volume= 0.124 af
Outflow = 1.66 cfs @ 12.09 hrs, Volume= 0.124 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1W : DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP7:

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

Inflow Area = 1.189 ac, 61.74% Impervious, Inflow Depth > 1.46" for 2y24h event
Inflow = 1.92 cfs @ 12.11 hrs, Volume= 0.145 af
Outflow = 1.92 cfs @ 12.11 hrs, Volume= 0.145 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-D : DOWNSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP8:

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

Inflow Area = 0.983 ac, 58.43% Impervious, Inflow Depth > 1.68" for 2y24h event
Inflow = 1.71 cfs @ 12.13 hrs, Volume= 0.137 af
Outflow = 1.71 cfs @ 12.13 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C : UPSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP9:

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

Inflow Area = 1.216 ac, 59.51% Impervious, Inflow Depth > 1.34" for 2y24h event
Inflow = 1.84 cfs @ 12.10 hrs, Volume= 0.135 af
Outflow = 1.84 cfs @ 12.10 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-E : DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: DEP WETLAND W/ VERNAL POOLS

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

Inflow Area = 0.517 ac, 60.31% Impervious, Inflow Depth > 1.28" for 2y24h event
Inflow = 0.68 cfs @ 12.13 hrs, Volume= 0.055 af
Primary = 0.68 cfs @ 12.13 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 0.608 ac, 80.11% Impervious, Inflow Depth > 2.44" for 2y24h event
Inflow = 1.66 cfs @ 12.09 hrs, Volume= 0.124 af
Primary = 1.66 cfs @ 12.09 hrs, Volume= 0.124 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Existing Basin

Inflow Area = 0.118 ac, 47.92% Impervious, Inflow Depth > 0.99" for 2y24h event
Inflow = 0.13 cfs @ 12.10 hrs, Volume= 0.010 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
Routed to Pond W-H :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond W-H :

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 85.98' @ 24.00 hrs Surf.Area= 1,122 sf Storage= 425 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	85.50'	2,145 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)
85.50	652	195.0	0	0	652
86.00	1,139	255.0	442	442	2,804
86.50	1,516	290.0	662	1,104	4,328
87.00	1,884	297.0	848	1,952	4,686
87.10	1,974	299.0	193	2,145	4,785

Device	Routing	Invert	Outlet Devices
#1	Secondary	86.90'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	84.00'	**12.0" Round RCP_Round 12"** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 83.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#3	Device 2	86.47'	**Custom Orifice, Cv= 3.20 (C= 4.00)** Head (feet) 0.00 0.50 Width (feet) 3.00 3.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.50' (Free Discharge)
↑—**2=RCP_Round 12"** (Passes 0.00 cfs of 2.93 cfs potential flow)
↑—**3=Custom Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 4.045 ac, 83.03% Impervious, Inflow Depth > 2.23" for 2y24h event
Inflow = 8.01 cfs @ 12.15 hrs, Volume= 0.752 af
Primary = 8.01 cfs @ 12.15 hrs, Volume= 0.752 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 0.983 ac, 58.43% Impervious, Inflow Depth > 1.68" for 2y24h event
Inflow = 1.71 cfs @ 12.13 hrs, Volume= 0.137 af
Primary = 1.71 cfs @ 12.13 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland -C/D

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-C/D: Wetland -C/D

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

Inflow Area = 2.172 ac, 60.24% Impervious, Inflow Depth > 1.56" for 2y24h event
Inflow = 3.62 cfs @ 12.11 hrs, Volume= 0.282 af
Primary = 3.62 cfs @ 12.11 hrs, Volume= 0.282 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 1.189 ac, 61.74% Impervious, Inflow Depth > 1.46" for 2y24h event
Inflow = 1.92 cfs @ 12.11 hrs, Volume= 0.145 af
Primary = 1.92 cfs @ 12.11 hrs, Volume= 0.145 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland -C/D

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 1.216 ac, 59.51% Impervious, Inflow Depth > 1.34" for 2y24h event
Inflow = 1.84 cfs @ 12.10 hrs, Volume= 0.135 af
Primary = 1.84 cfs @ 12.10 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 1.449 ac, 66.17% Impervious, Inflow Depth > 1.62" for 2y24h event
Inflow = 2.70 cfs @ 12.09 hrs, Volume= 0.196 af
Primary = 2.70 cfs @ 12.09 hrs, Volume= 0.196 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-H:

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

Inflow Area = 6.253 ac, 37.45% Impervious, Inflow Depth > 1.02" for 2y24h event
Inflow = 3.90 cfs @ 12.48 hrs, Volume= 0.531 af
Primary = 3.90 cfs @ 12.48 hrs, Volume= 0.531 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-I: Wetland I

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

Inflow Area = 0.503 ac, 76.18% Impervious, Inflow Depth > 2.26" for 2y24h event
Inflow = 1.29 cfs @ 12.09 hrs, Volume= 0.095 af
Primary = 1.29 cfs @ 12.09 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: EDA Runoff Area=27,790 sf 96.88% Impervious Runoff Depth>4.84"
Tc=6.0 min CN=97 Runoff=3.15 cfs 0.257 af

Subcatchment 2: EDA Runoff Area=11,386 sf 94.54% Impervious Runoff Depth>4.61"
Tc=6.0 min CN=95 Runoff=1.27 cfs 0.101 af

Subcatchment 3: EDA Runoff Area=52,497 sf 81.12% Impervious Runoff Depth>3.96"
Tc=6.0 min CN=89 Runoff=5.30 cfs 0.398 af

Subcatchment 4: EDA Runoff Area=123,722 sf 83.84% Impervious Runoff Depth>4.06"
Tc=13.6 min CN=90 Runoff=10.20 cfs 0.961 af

Subcatchment 5: EDA Runoff Area=22,514 sf 60.31% Impervious Runoff Depth>2.79"
Tc=8.8 min CN=77 Runoff=1.50 cfs 0.120 af

Subcatchment 6: EDA Runoff Area=26,496 sf 80.11% Impervious Runoff Depth>4.28"
Tc=6.0 min CN=92 Runoff=2.83 cfs 0.217 af

Subcatchment 7A: EDA Runoff Area=40,680 sf 65.46% Impervious Runoff Depth>3.26"
Tc=7.0 min CN=82 Runoff=3.39 cfs 0.253 af

Subcatchment 7B: EDA Runoff Area=11,116 sf 48.11% Impervious Runoff Depth>2.18"
Tc=6.0 min CN=70 Runoff=0.63 cfs 0.046 af

Subcatchment 8A: EDA Runoff Area=37,408 sf 66.89% Impervious Runoff Depth>3.65"
Tc=9.0 min CN=86 Runoff=3.21 cfs 0.261 af

Subcatchment 8B: EDA Runoff Area=5,418 sf 0.00% Impervious Runoff Depth>0.14"
Tc=6.0 min CN=36 Runoff=0.00 cfs 0.001 af

Subcatchment 9A: EDA Runoff Area=48,757 sf 59.89% Impervious Runoff Depth>2.88"
Tc=6.0 min CN=78 Runoff=3.71 cfs 0.269 af

Subcatchment 9B: EDA Runoff Area=4,197 sf 55.06% Impervious Runoff Depth>2.70"
Tc=6.0 min CN=76 Runoff=0.30 cfs 0.022 af

Subcatchment 10A: EDA Runoff Area=37,841 sf 70.13% Impervious Runoff Depth>3.45"
Tc=6.0 min CN=84 Runoff=3.41 cfs 0.250 af

Subcatchment 10B: EDA Runoff Area=25,272 sf 60.25% Impervious Runoff Depth>2.97"
Tc=6.0 min CN=79 Runoff=1.98 cfs 0.144 af

Subcatchment 11: EDA Runoff Area=21,893 sf 76.18% Impervious Runoff Depth>4.07"
Tc=6.0 min CN=90 Runoff=2.26 cfs 0.170 af

Subcatchment 12: EDA Runoff Area=14,367 sf 64.65% Impervious Runoff Depth>3.16"
Tc=6.0 min CN=81 Runoff=1.20 cfs 0.087 af

Subcatchment 13: EDA Runoff Area=11,148 sf 19.19% Impervious Runoff Depth>1.42"
Tc=6.0 min CN=60 Runoff=0.38 cfs 0.030 af

Subcatchment 14A: EDA Runoff Area=11,849 sf 73.75% Impervious Runoff Depth>3.55"
Tc=6.0 min CN=85 Runoff=1.10 cfs 0.080 af

Subcatchment 14B: EDA Runoff Area=59,685 sf 67.04% Impervious Runoff Depth>3.07"
Tc=6.1 min CN=80 Runoff=4.81 cfs 0.350 af

Subcatchment 15: EDA Runoff Area=8,734 sf 63.20% Impervious Runoff Depth>3.07"
Tc=6.0 min CN=80 Runoff=0.71 cfs 0.051 af

Subcatchment 16: EDA Runoff Area=11,582 sf 52.73% Impervious Runoff Depth>2.52"
Tc=6.0 min CN=74 Runoff=0.77 cfs 0.056 af

Subcatchment 17: EDA Runoff Area=16,849 sf 63.60% Impervious Runoff Depth>3.45"
Tc=6.0 min CN=84 Runoff=1.52 cfs 0.111 af

Subcatchment 18A: EDA Runoff Area=267,229 sf 37.25% Impervious Runoff Depth>2.42"
Tc=31.7 min CN=73 Runoff=9.59 cfs 1.238 af

Subcatchment 18B: EDA Runoff Area=5,148 sf 47.92% Impervious Runoff Depth>2.35"
Tc=6.0 min CN=72 Runoff=0.32 cfs 0.023 af

Subcatchment 19: EDA Runoff Area=7,862 sf 48.17% Impervious Runoff Depth>1.86"
Tc=6.0 min CN=66 Runoff=0.37 cfs 0.028 af

Subcatchment 20: EDA Runoff Area=217,219 sf 38.40% Impervious Runoff Depth>3.85"
Flow Length=455' Slope=0.0900 '/' Tc=16.1 min CN=88 Runoff=16.22 cfs 1.600 af

Subcatchment 21: EDA Runoff Area=4,489 sf 28.98% Impervious Runoff Depth>3.26"
Tc=6.0 min CN=82 Runoff=0.38 cfs 0.028 af

Reach DP1: Inflow=3.15 cfs 0.257 af
Outflow=3.15 cfs 0.257 af

Reach DP10: Inflow=5.40 cfs 0.394 af
Outflow=5.40 cfs 0.394 af

Reach DP11: Inflow=2.26 cfs 0.170 af
Outflow=2.26 cfs 0.170 af

Reach DP12: Inflow=1.20 cfs 0.087 af
Outflow=1.20 cfs 0.087 af

Reach DP13: Inflow=0.38 cfs 0.030 af
Outflow=0.38 cfs 0.030 af

Reach DP14: Inflow=5.91 cfs 0.430 af
Outflow=5.91 cfs 0.430 af

Reach DP15:	Inflow=0.71 cfs 0.051 af Outflow=0.71 cfs 0.051 af
Reach DP16:	Inflow=0.77 cfs 0.056 af Outflow=0.77 cfs 0.056 af
Reach DP17:	Inflow=1.52 cfs 0.111 af Outflow=1.52 cfs 0.111 af
Reach DP18:	Inflow=9.59 cfs 1.238 af Outflow=9.59 cfs 1.238 af
Reach DP19:	Inflow=0.37 cfs 0.028 af Outflow=0.37 cfs 0.028 af
Reach DP2:	Inflow=1.27 cfs 0.101 af Outflow=1.27 cfs 0.101 af
Reach DP20:	Inflow=16.22 cfs 1.600 af Outflow=16.22 cfs 1.600 af
Reach DP21:	Inflow=0.38 cfs 0.028 af Outflow=0.38 cfs 0.028 af
Reach DP3:	Inflow=5.30 cfs 0.398 af Outflow=5.30 cfs 0.398 af
Reach DP4:	Inflow=10.20 cfs 0.961 af Outflow=10.20 cfs 0.961 af
Reach DP5:	Inflow=1.50 cfs 0.120 af Outflow=1.50 cfs 0.120 af
Reach DP6:	Inflow=2.83 cfs 0.217 af Outflow=2.83 cfs 0.217 af
Reach DP7:	Inflow=4.02 cfs 0.300 af Outflow=4.02 cfs 0.300 af
Reach DP8:	Inflow=3.21 cfs 0.263 af Outflow=3.21 cfs 0.263 af
Reach DP9:	Inflow=4.01 cfs 0.290 af Outflow=4.01 cfs 0.290 af
Pond 1P: DEP WETLAND W/ VERNAL POOLS	Inflow=1.50 cfs 0.120 af Primary=1.50 cfs 0.120 af
Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90	Inflow=2.83 cfs 0.217 af Primary=2.83 cfs 0.217 af

Pond 2P: Existing Basin Peak Elev=86.44' Storage=1,008 cf Inflow=0.32 cfs 0.023 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=14.14 cfs 1.359 af
Primary=14.14 cfs 1.359 af

Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49 Inflow=3.21 cfs 0.263 af
Primary=3.21 cfs 0.263 af

Pond W-C/D: Wetland -C/D Inflow=7.20 cfs 0.562 af
Primary=7.20 cfs 0.562 af

Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49 Inflow=4.02 cfs 0.300 af
Primary=4.02 cfs 0.300 af

Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=4.01 cfs 0.290 af
Primary=4.01 cfs 0.290 af

Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=5.40 cfs 0.394 af
Primary=5.40 cfs 0.394 af

Pond W-H: Inflow=9.59 cfs 1.238 af
Primary=9.59 cfs 1.238 af

Pond W-I: Wetland I Inflow=2.26 cfs 0.170 af
Primary=2.26 cfs 0.170 af

Total Runoff Area = 26.013 ac Runoff Volume = 7.153 af Average Runoff Depth = 3.30"
43.63% Pervious = 11.349 ac 56.37% Impervious = 14.665 ac

Summary for Subcatchment 1: EDA

Runoff = 3.15 cfs @ 12.09 hrs, Volume= 0.257 af, Depth> 4.84"
Routed to Reach DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
26,924	98	Paved roads w/curbs & sewers, HSG A
866	68	<50% Grass cover, Poor, HSG A
27,790	97	Weighted Average
866		3.12% Pervious Area
26,924		96.88% Impervious Area

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

Summary for Subcatchment 2: EDA

Runoff = 1.27 cfs @ 12.09 hrs, Volume= 0.101 af, Depth> 4.61"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
10,764	98	Paved roads w/curbs & sewers, HSG A
622	49	50-75% Grass cover, Fair, HSG A
11,386	95	Weighted Average
622		5.46% Pervious Area
10,764		94.54% Impervious Area

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

Summary for Subcatchment 3: EDA

Runoff = 5.30 cfs @ 12.09 hrs, Volume= 0.398 af, Depth> 3.96"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
42,583	98	Paved roads w/curbs & sewers, HSG A
6,681	49	50-75% Grass cover, Fair, HSG A
3,233	45	Woods, Poor, HSG A
52,497	89	Weighted Average
9,914		18.88% Pervious Area
42,583		81.12% Impervious Area

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

Summary for Subcatchment 4: EDA

Runoff = 10.20 cfs @ 12.18 hrs, Volume= 0.961 af, Depth> 4.06"
Routed to Reach DP4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
103,725	98	Paved roads w/curbs & sewers, HSG A
18,190	49	50-75% Grass cover, Fair, HSG A
1,807	36	Woods, Fair, HSG A
123,722	90	Weighted Average
19,997		16.16% Pervious Area
103,725		83.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 5: EDA

Runoff = 1.50 cfs @ 12.13 hrs, Volume= 0.120 af, Depth> 2.79"
Routed to Reach DP5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
13,579	98	Paved roads w/curbs & sewers, HSG A
1,652	49	50-75% Grass cover, Fair, HSG A
7,283	45	Woods, Poor, HSG A
22,514	77	Weighted Average
8,935		39.69% Pervious Area
13,579		60.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 6: EDA

Runoff = 2.83 cfs @ 12.09 hrs, Volume= 0.217 af, Depth> 4.28"
Routed to Reach DP6 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
21,227	98	Paved roads w/curbs & sewers, HSG B
2,835	69	50-75% Grass cover, Fair, HSG B
2,434	65	Woods/grass comb., Fair, HSG B
26,496	92	Weighted Average
5,269		19.89% Pervious Area
21,227		80.11% Impervious Area

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

Summary for Subcatchment 7A: EDA

Runoff = 3.39 cfs @ 12.10 hrs, Volume= 0.253 af, Depth> 3.26"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
26,629	98	Paved roads w/curbs & sewers, HSG A
2,718	49	50-75% Grass cover, Fair, HSG A
6,904	36	Woods, Fair, HSG A
4,429	76	Gravel roads, HSG A
40,680	82	Weighted Average
14,051		34.54% Pervious Area
26,629		65.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 7B: EDA

Runoff = 0.63 cfs @ 12.10 hrs, Volume= 0.046 af, Depth> 2.18"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
5,348	98	Paved roads w/curbs & sewers, HSG A
3,154	49	50-75% Grass cover, Fair, HSG A
2,614	36	Woods, Fair, HSG A
11,116	70	Weighted Average
5,768		51.89% Pervious Area
5,348		48.11% Impervious Area

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

Summary for Subcatchment 8A: EDA

Runoff = 3.21 cfs @ 12.13 hrs, Volume= 0.261 af, Depth> 3.65"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
25,023	98	Paved roads w/curbs & sewers, HSG B
4,412	69	50-75% Grass cover, Fair, HSG B
7,973	60	Woods, Fair, HSG B
37,408	86	Weighted Average
12,385		33.11% Pervious Area
25,023		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 8B: EDA

Runoff = 0.00 cfs @ 14.61 hrs, Volume= 0.001 af, Depth> 0.14"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
5,418	36	Woods, Fair, HSG A
5,418		100.00% Pervious Area

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

Summary for Subcatchment 9A: EDA

Runoff = 3.71 cfs @ 12.09 hrs, Volume= 0.269 af, Depth> 2.88"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
29,203	98	Paved roads w/curbs & sewers, HSG A
19,554	49	50-75% Grass cover, Fair, HSG A
48,757	78	Weighted Average
19,554		40.11% Pervious Area
29,203		59.89% Impervious Area

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

Summary for Subcatchment 9B: EDA

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.022 af, Depth> 2.70"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
2,311	98	Paved roads w/curbs & sewers, HSG A
1,886	49	50-75% Grass cover, Fair, HSG A
4,197	76	Weighted Average
1,886		44.94% Pervious Area
2,311		55.06% Impervious Area

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

Summary for Subcatchment 10A: EDA

Runoff = 3.41 cfs @ 12.09 hrs, Volume= 0.250 af, Depth> 3.45"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
26,539	98	Paved roads w/curbs & sewers, HSG A
11,094	49	50-75% Grass cover, Fair, HSG A
208	76	Gravel roads, HSG A
37,841	84	Weighted Average
11,302		29.87% Pervious Area
26,539		70.13% Impervious Area

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

Summary for Subcatchment 10B: EDA

Runoff = 1.98 cfs @ 12.09 hrs, Volume= 0.144 af, Depth> 2.97"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
15,226	98	Paved roads w/curbs & sewers, HSG A
10,046	49	50-75% Grass cover, Fair, HSG A
25,272	79	Weighted Average
10,046		39.75% Pervious Area
15,226		60.25% Impervious Area

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

Summary for Subcatchment 11: EDA

Runoff = 2.26 cfs @ 12.09 hrs, Volume= 0.170 af, Depth> 4.07"
Routed to Reach DP11 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
16,677	98	Paved roads w/curbs & sewers, HSG B
3,572	69	50-75% Grass cover, Fair, HSG B
1,644	60	Woods, Fair, HSG B
21,893	90	Weighted Average
5,216		23.82% Pervious Area
16,677		76.18% Impervious Area

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

Summary for Subcatchment 12: EDA

Runoff = 1.20 cfs @ 12.09 hrs, Volume= 0.087 af, Depth> 3.16"
Routed to Reach DP12 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
9,288	98	Paved roads w/curbs & sewers, HSG A
5,079	49	50-75% Grass cover, Fair, HSG A
14,367	81	Weighted Average
5,079		35.35% Pervious Area
9,288		64.65% Impervious Area

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

Summary for Subcatchment 13: EDA

Runoff = 0.38 cfs @ 12.10 hrs, Volume= 0.030 af, Depth> 1.42"
Routed to Reach DP13 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
2,139	98	Paved roads w/curbs & sewers, HSG A
8,245	49	50-75% Grass cover, Fair, HSG A
764	76	Gravel roads, HSG A
11,148	60	Weighted Average
9,009		80.81% Pervious Area
2,139		19.19% Impervious Area

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

Summary for Subcatchment 14A: EDA

Runoff = 1.10 cfs @ 12.09 hrs, Volume= 0.080 af, Depth> 3.55"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
8,739	98	Paved roads w/curbs & sewers, HSG A
3,110	49	50-75% Grass cover, Fair, HSG A
11,849	85	Weighted Average
3,110		26.25% Pervious Area
8,739		73.75% Impervious Area

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

Summary for Subcatchment 14B: EDA

Runoff = 4.81 cfs @ 12.09 hrs, Volume= 0.350 af, Depth> 3.07"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
40,012	98	Paved roads w/curbs & sewers, HSG A
10,242	49	50-75% Grass cover, Fair, HSG A
9,431	36	Woods, Fair, HSG A
59,685	80	Weighted Average
19,673		32.96% Pervious Area
40,012		67.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 15: EDA

Runoff = 0.71 cfs @ 12.09 hrs, Volume= 0.051 af, Depth> 3.07"
Routed to Reach DP15 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
5,520	98	Paved roads w/curbs & sewers, HSG A
3,214	49	50-75% Grass cover, Fair, HSG A
8,734	80	Weighted Average
3,214		36.80% Pervious Area
5,520		63.20% Impervious Area

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

Summary for Subcatchment 16: EDA

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 0.056 af, Depth> 2.52"
Routed to Reach DP16 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
6,107	98	Paved roads w/curbs & sewers, HSG A
4,630	49	50-75% Grass cover, Fair, HSG A
845	36	Woods, Fair, HSG A
11,582	74	Weighted Average
5,475		47.27% Pervious Area
6,107		52.73% Impervious Area

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

Summary for Subcatchment 17: EDA

Runoff = 1.52 cfs @ 12.09 hrs, Volume= 0.111 af, Depth> 3.45"
Routed to Reach DP17 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
10,716	98	Paved roads w/curbs & sewers, HSG A
3,641	49	50-75% Grass cover, Fair, HSG A
2,492	76	Gravel roads, HSG A
16,849	84	Weighted Average
6,133		36.40% Pervious Area
10,716		63.60% Impervious Area

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

Summary for Subcatchment 18A: EDA

Runoff = 9.59 cfs @ 12.46 hrs, Volume= 1.238 af, Depth> 2.42"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
99,544	98	Paved roads w/curbs & sewers, HSG A
37,004	49	50-75% Grass cover, Fair, HSG A
56,609	36	Woods, Fair, HSG A
31,170	79	Woods, Fair, HSG D
26,944	76	Gravel roads, HSG A
15,958	91	Gravel roads, HSG D
267,229	73	Weighted Average
167,685		62.75% Pervious Area
99,544		37.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18B: EDA

AREA GOING TO THE EXISTING BMP

Runoff = 0.32 cfs @ 12.10 hrs, Volume= 0.023 af, Depth> 2.35"
Routed to Pond 2P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
2,467	98	Paved roads w/curbs & sewers, HSG A
2,681	49	50-75% Grass cover, Fair, HSG A
5,148	72	Weighted Average
2,681		52.08% Pervious Area
2,467		47.92% Impervious Area

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

Summary for Subcatchment 19: EDA

Runoff = 0.37 cfs @ 12.10 hrs, Volume= 0.028 af, Depth> 1.86"
Routed to Reach DP19 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
3,787	98	Unconnected pavement, HSG A
4,075	36	Woods, Fair, HSG A
7,862	66	Weighted Average
4,075		51.83% Pervious Area
3,787		48.17% Impervious Area
3,787		100.00% Unconnected

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

Summary for Subcatchment 20: EDA

Runoff = 16.22 cfs @ 12.22 hrs, Volume= 1.600 af, Depth> 3.85"
Routed to Reach DP20 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

	Area (sf)	CN	Description
*	83,409	98	Impervious
	8,137	74	>75% Grass cover, Good, HSG C
	9,133	80	>75% Grass cover, Good, HSG D
	23,541	70	Woods, Good, HSG C
	41,329	77	Woods, Good, HSG D
	51,670	91	Gravel roads, HSG D
	217,219	88	Weighted Average
	133,810		61.60% Pervious Area
	83,409		38.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0900	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
4.5	405	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	455	Total			

Summary for Subcatchment 21: EDA

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Depth> 3.26"
Routed to Reach DP21 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
1,301	98	Paved roads w/curbs & sewers, HSG C
1,640	79	50-75% Grass cover, Fair, HSG C
1,548	73	Woods, Fair, HSG C
4,489	82	Weighted Average
3,188		71.02% Pervious Area
1,301		28.98% Impervious Area

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

Summary for Reach DP1:

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

Inflow Area = 0.638 ac, 96.88% Impervious, Inflow Depth > 4.84" for 10y24h event
Inflow = 3.15 cfs @ 12.09 hrs, Volume= 0.257 af
Outflow = 3.15 cfs @ 12.09 hrs, Volume= 0.257 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP10:

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

Inflow Area = 1.449 ac, 66.17% Impervious, Inflow Depth > 3.26" for 10y24h event
Inflow = 5.40 cfs @ 12.09 hrs, Volume= 0.394 af
Outflow = 5.40 cfs @ 12.09 hrs, Volume= 0.394 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-G : UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP11:

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

Inflow Area = 0.503 ac, 76.18% Impervious, Inflow Depth > 4.07" for 10y24h event
Inflow = 2.26 cfs @ 12.09 hrs, Volume= 0.170 af
Outflow = 2.26 cfs @ 12.09 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-I : Wetland I

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP12:

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

Inflow Area = 0.330 ac, 64.65% Impervious, Inflow Depth > 3.16" for 10y24h event
Inflow = 1.20 cfs @ 12.09 hrs, Volume= 0.087 af
Outflow = 1.20 cfs @ 12.09 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP13:

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

Inflow Area = 0.256 ac, 19.19% Impervious, Inflow Depth > 1.42" for 10y24h event
Inflow = 0.38 cfs @ 12.10 hrs, Volume= 0.030 af
Outflow = 0.38 cfs @ 12.10 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP14:

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

Inflow Area = 1.642 ac, 68.15% Impervious, Inflow Depth > 3.15" for 10y24h event
Inflow = 5.91 cfs @ 12.09 hrs, Volume= 0.430 af
Outflow = 5.91 cfs @ 12.09 hrs, Volume= 0.430 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP15:

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

Inflow Area = 0.201 ac, 63.20% Impervious, Inflow Depth > 3.07" for 10y24h event
Inflow = 0.71 cfs @ 12.09 hrs, Volume= 0.051 af
Outflow = 0.71 cfs @ 12.09 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP16:

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

Inflow Area = 0.266 ac, 52.73% Impervious, Inflow Depth > 2.52" for 10y24h event
Inflow = 0.77 cfs @ 12.09 hrs, Volume= 0.056 af
Outflow = 0.77 cfs @ 12.09 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP17:

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

Inflow Area = 0.387 ac, 63.60% Impervious, Inflow Depth > 3.45" for 10y24h event
Inflow = 1.52 cfs @ 12.09 hrs, Volume= 0.111 af
Outflow = 1.52 cfs @ 12.09 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP18:

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

Inflow Area = 6.135 ac, 37.25% Impervious, Inflow Depth > 2.42" for 10y24h event
Inflow = 9.59 cfs @ 12.46 hrs, Volume= 1.238 af
Outflow = 9.59 cfs @ 12.46 hrs, Volume= 1.238 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-H :

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP19:

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

Inflow Area = 0.180 ac, 48.17% Impervious, Inflow Depth > 1.86" for 10y24h event
Inflow = 0.37 cfs @ 12.10 hrs, Volume= 0.028 af
Outflow = 0.37 cfs @ 12.10 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP2:

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

Inflow Area = 0.261 ac, 94.54% Impervious, Inflow Depth > 4.61" for 10y24h event
Inflow = 1.27 cfs @ 12.09 hrs, Volume= 0.101 af
Outflow = 1.27 cfs @ 12.09 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP20:

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

Inflow Area = 4.987 ac, 38.40% Impervious, Inflow Depth > 3.85" for 10y24h event
Inflow = 16.22 cfs @ 12.22 hrs, Volume= 1.600 af
Outflow = 16.22 cfs @ 12.22 hrs, Volume= 1.600 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP21:

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

Inflow Area = 0.103 ac, 28.98% Impervious, Inflow Depth > 3.26" for 10y24h event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af
Outflow = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP3:

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

Inflow Area = 1.205 ac, 81.12% Impervious, Inflow Depth > 3.96" for 10y24h event
Inflow = 5.30 cfs @ 12.09 hrs, Volume= 0.398 af
Outflow = 5.30 cfs @ 12.09 hrs, Volume= 0.398 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP4:

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

Inflow Area = 2.840 ac, 83.84% Impervious, Inflow Depth > 4.06" for 10y24h event
Inflow = 10.20 cfs @ 12.18 hrs, Volume= 0.961 af
Outflow = 10.20 cfs @ 12.18 hrs, Volume= 0.961 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP5:

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

Inflow Area = 0.517 ac, 60.31% Impervious, Inflow Depth > 2.79" for 10y24h event
Inflow = 1.50 cfs @ 12.13 hrs, Volume= 0.120 af
Outflow = 1.50 cfs @ 12.13 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : DEP WETLAND W/ VERNAL POOLS

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP6:

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

Inflow Area = 0.608 ac, 80.11% Impervious, Inflow Depth > 4.28" for 10y24h event
Inflow = 2.83 cfs @ 12.09 hrs, Volume= 0.217 af
Outflow = 2.83 cfs @ 12.09 hrs, Volume= 0.217 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1W : DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP7:

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

Inflow Area = 1.189 ac, 61.74% Impervious, Inflow Depth > 3.03" for 10y24h event
Inflow = 4.02 cfs @ 12.10 hrs, Volume= 0.300 af
Outflow = 4.02 cfs @ 12.10 hrs, Volume= 0.300 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-D : DOWNSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP8:

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

Inflow Area = 0.983 ac, 58.43% Impervious, Inflow Depth > 3.21" for 10y24h event
Inflow = 3.21 cfs @ 12.13 hrs, Volume= 0.263 af
Outflow = 3.21 cfs @ 12.13 hrs, Volume= 0.263 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C : UPSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP9:

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

Inflow Area = 1.216 ac, 59.51% Impervious, Inflow Depth > 2.87" for 10y24h event
Inflow = 4.01 cfs @ 12.09 hrs, Volume= 0.290 af
Outflow = 4.01 cfs @ 12.09 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-E : DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: DEP WETLAND W/ VERNAL POOLS

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

Inflow Area = 0.517 ac, 60.31% Impervious, Inflow Depth > 2.79" for 10y24h event
Inflow = 1.50 cfs @ 12.13 hrs, Volume= 0.120 af
Primary = 1.50 cfs @ 12.13 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 0.608 ac, 80.11% Impervious, Inflow Depth > 4.28" for 10y24h event
Inflow = 2.83 cfs @ 12.09 hrs, Volume= 0.217 af
Primary = 2.83 cfs @ 12.09 hrs, Volume= 0.217 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Existing Basin

Inflow Area = 0.118 ac, 47.92% Impervious, Inflow Depth > 2.35" for 10y24h event
Inflow = 0.32 cfs @ 12.10 hrs, Volume= 0.023 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
Routed to Pond W-H :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond W-H :

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 86.44' @ 24.00 hrs Surf.Area= 1,465 sf Storage= 1,008 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	85.50'	2,145 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)
85.50	652	195.0	0	0	652
86.00	1,139	255.0	442	442	2,804
86.50	1,516	290.0	662	1,104	4,328
87.00	1,884	297.0	848	1,952	4,686
87.10	1,974	299.0	193	2,145	4,785

Device	Routing	Invert	Outlet Devices
#1	Secondary	86.90'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	84.00'	**12.0" Round RCP_Round 12"** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 83.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#3	Device 2	86.47'	**Custom Orifice, Cv= 3.20 (C= 4.00)** Head (feet) 0.00 0.50 Width (feet) 3.00 3.00

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.50' (Free Discharge)
└─**2=RCP_Round 12"** (Passes 0.00 cfs of 2.93 cfs potential flow)
└─**3=Custom Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.50' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 4.045 ac, 83.03% Impervious, Inflow Depth > 4.03" for 10y24h event
Inflow = 14.14 cfs @ 12.14 hrs, Volume= 1.359 af
Primary = 14.14 cfs @ 12.14 hrs, Volume= 1.359 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 0.983 ac, 58.43% Impervious, Inflow Depth > 3.21" for 10y24h event
Inflow = 3.21 cfs @ 12.13 hrs, Volume= 0.263 af
Primary = 3.21 cfs @ 12.13 hrs, Volume= 0.263 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland -C/D

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-C/D: Wetland -C/D

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

Inflow Area = 2.172 ac, 60.24% Impervious, Inflow Depth > 3.11" for 10y24h event
Inflow = 7.20 cfs @ 12.11 hrs, Volume= 0.562 af
Primary = 7.20 cfs @ 12.11 hrs, Volume= 0.562 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 1.189 ac, 61.74% Impervious, Inflow Depth > 3.03" for 10y24h event
Inflow = 4.02 cfs @ 12.10 hrs, Volume= 0.300 af
Primary = 4.02 cfs @ 12.10 hrs, Volume= 0.300 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland -C/D

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 1.216 ac, 59.51% Impervious, Inflow Depth > 2.87" for 10y24h event
Inflow = 4.01 cfs @ 12.09 hrs, Volume= 0.290 af
Primary = 4.01 cfs @ 12.09 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 1.449 ac, 66.17% Impervious, Inflow Depth > 3.26" for 10y24h event
Inflow = 5.40 cfs @ 12.09 hrs, Volume= 0.394 af
Primary = 5.40 cfs @ 12.09 hrs, Volume= 0.394 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-H:

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

Inflow Area = 6.253 ac, 37.45% Impervious, Inflow Depth > 2.38" for 10y24h event
Inflow = 9.59 cfs @ 12.46 hrs, Volume= 1.238 af
Primary = 9.59 cfs @ 12.46 hrs, Volume= 1.238 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-I: Wetland I

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

Inflow Area = 0.503 ac, 76.18% Impervious, Inflow Depth > 4.07" for 10y24h event
Inflow = 2.26 cfs @ 12.09 hrs, Volume= 0.170 af
Primary = 2.26 cfs @ 12.09 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: EDA Runoff Area=27,790 sf 96.88% Impervious Runoff Depth>6.03"
Tc=6.0 min CN=97 Runoff=3.89 cfs 0.321 af

Subcatchment 2: EDA Runoff Area=11,386 sf 94.54% Impervious Runoff Depth>5.80"
Tc=6.0 min CN=95 Runoff=1.57 cfs 0.126 af

Subcatchment 3: EDA Runoff Area=52,497 sf 81.12% Impervious Runoff Depth>5.11"
Tc=6.0 min CN=89 Runoff=6.75 cfs 0.513 af

Subcatchment 4: EDA Runoff Area=123,722 sf 83.84% Impervious Runoff Depth>5.22"
Tc=13.6 min CN=90 Runoff=12.93 cfs 1.235 af

Subcatchment 5: EDA Runoff Area=22,514 sf 60.31% Impervious Runoff Depth>3.82"
Tc=8.8 min CN=77 Runoff=2.06 cfs 0.164 af

Subcatchment 6: EDA Runoff Area=26,496 sf 80.11% Impervious Runoff Depth>5.45"
Tc=6.0 min CN=92 Runoff=3.55 cfs 0.276 af

Subcatchment 7A: EDA Runoff Area=40,680 sf 65.46% Impervious Runoff Depth>4.34"
Tc=7.0 min CN=82 Runoff=4.49 cfs 0.338 af

Subcatchment 7B: EDA Runoff Area=11,116 sf 48.11% Impervious Runoff Depth>3.11"
Tc=6.0 min CN=70 Runoff=0.91 cfs 0.066 af

Subcatchment 8A: EDA Runoff Area=37,408 sf 66.89% Impervious Runoff Depth>4.78"
Tc=9.0 min CN=86 Runoff=4.17 cfs 0.342 af

Subcatchment 8B: EDA Runoff Area=5,418 sf 0.00% Impervious Runoff Depth>0.39"
Tc=6.0 min CN=36 Runoff=0.02 cfs 0.004 af

Subcatchment 9A: EDA Runoff Area=48,757 sf 59.89% Impervious Runoff Depth>3.92"
Tc=6.0 min CN=78 Runoff=5.03 cfs 0.366 af

Subcatchment 9B: EDA Runoff Area=4,197 sf 55.06% Impervious Runoff Depth>3.72"
Tc=6.0 min CN=76 Runoff=0.41 cfs 0.030 af

Subcatchment 10A: EDA Runoff Area=37,841 sf 70.13% Impervious Runoff Depth>4.56"
Tc=6.0 min CN=84 Runoff=4.46 cfs 0.330 af

Subcatchment 10B: EDA Runoff Area=25,272 sf 60.25% Impervious Runoff Depth>4.03"
Tc=6.0 min CN=79 Runoff=2.67 cfs 0.195 af

Subcatchment 11: EDA Runoff Area=21,893 sf 76.18% Impervious Runoff Depth>5.22"
Tc=6.0 min CN=90 Runoff=2.86 cfs 0.219 af

Subcatchment 12: EDA Runoff Area=14,367 sf 64.65% Impervious Runoff Depth>4.24"
Tc=6.0 min CN=81 Runoff=1.59 cfs 0.116 af

Subcatchment 13: EDA Runoff Area=11,148 sf 19.19% Impervious Runoff Depth>2.18"
Tc=6.0 min CN=60 Runoff=0.62 cfs 0.046 af

Subcatchment 14A: EDA Runoff Area=11,849 sf 73.75% Impervious Runoff Depth>4.67"
Tc=6.0 min CN=85 Runoff=1.42 cfs 0.106 af

Subcatchment 14B: EDA Runoff Area=59,685 sf 67.04% Impervious Runoff Depth>4.13"
Tc=6.1 min CN=80 Runoff=6.45 cfs 0.472 af

Subcatchment 15: EDA Runoff Area=8,734 sf 63.20% Impervious Runoff Depth>4.13"
Tc=6.0 min CN=80 Runoff=0.95 cfs 0.069 af

Subcatchment 16: EDA Runoff Area=11,582 sf 52.73% Impervious Runoff Depth>3.51"
Tc=6.0 min CN=74 Runoff=1.07 cfs 0.078 af

Subcatchment 17: EDA Runoff Area=16,849 sf 63.60% Impervious Runoff Depth>4.56"
Tc=6.0 min CN=84 Runoff=1.99 cfs 0.147 af

Subcatchment 18A: EDA Runoff Area=267,229 sf 37.25% Impervious Runoff Depth>3.39"
Tc=31.7 min CN=73 Runoff=13.52 cfs 1.734 af

Subcatchment 18B: EDA Runoff Area=5,148 sf 47.92% Impervious Runoff Depth>3.31"
Tc=6.0 min CN=72 Runoff=0.45 cfs 0.033 af

Subcatchment 19: EDA Runoff Area=7,862 sf 48.17% Impervious Runoff Depth>2.73"
Tc=6.0 min CN=66 Runoff=0.56 cfs 0.041 af

Subcatchment 20: EDA Runoff Area=217,219 sf 38.40% Impervious Runoff Depth>4.99"
Flow Length=455' Slope=0.0900 '/' Tc=16.1 min CN=88 Runoff=20.78 cfs 2.074 af

Subcatchment 21: EDA Runoff Area=4,489 sf 28.98% Impervious Runoff Depth>4.34"
Tc=6.0 min CN=82 Runoff=0.51 cfs 0.037 af

Reach DP1: Inflow=3.89 cfs 0.321 af
Outflow=3.89 cfs 0.321 af

Reach DP10: Inflow=7.13 cfs 0.525 af
Outflow=7.13 cfs 0.525 af

Reach DP11: Inflow=2.86 cfs 0.219 af
Outflow=2.86 cfs 0.219 af

Reach DP12: Inflow=1.59 cfs 0.116 af
Outflow=1.59 cfs 0.116 af

Reach DP13: Inflow=0.62 cfs 0.046 af
Outflow=0.62 cfs 0.046 af

Reach DP14: Inflow=7.87 cfs 0.578 af
Outflow=7.87 cfs 0.578 af

Reach DP15: Inflow=0.95 cfs 0.069 af
Outflow=0.95 cfs 0.069 af

Reach DP16: Inflow=1.07 cfs 0.078 af
Outflow=1.07 cfs 0.078 af

Reach DP17: Inflow=1.99 cfs 0.147 af
Outflow=1.99 cfs 0.147 af

Reach DP18: Inflow=13.52 cfs 1.734 af
Outflow=13.52 cfs 1.734 af

Reach DP19: Inflow=0.56 cfs 0.041 af
Outflow=0.56 cfs 0.041 af

Reach DP2: Inflow=1.57 cfs 0.126 af
Outflow=1.57 cfs 0.126 af

Reach DP20: Inflow=20.78 cfs 2.074 af
Outflow=20.78 cfs 2.074 af

Reach DP21: Inflow=0.51 cfs 0.037 af
Outflow=0.51 cfs 0.037 af

Reach DP3: Inflow=6.75 cfs 0.513 af
Outflow=6.75 cfs 0.513 af

Reach DP4: Inflow=12.93 cfs 1.235 af
Outflow=12.93 cfs 1.235 af

Reach DP5: Inflow=2.06 cfs 0.164 af
Outflow=2.06 cfs 0.164 af

Reach DP6: Inflow=3.55 cfs 0.276 af
Outflow=3.55 cfs 0.276 af

Reach DP7: Inflow=5.40 cfs 0.404 af
Outflow=5.40 cfs 0.404 af

Reach DP8: Inflow=4.17 cfs 0.346 af
Outflow=4.17 cfs 0.346 af

Reach DP9: Inflow=5.44 cfs 0.396 af
Outflow=5.44 cfs 0.396 af

Pond 1P: DEP WETLAND W/ VERNAL POOLS Inflow=2.06 cfs 0.164 af
Primary=2.06 cfs 0.164 af

Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=3.55 cfs 0.276 af
Primary=3.55 cfs 0.276 af

Pond 2P: Existing Basin Peak Elev=86.48' Storage=1,079 cf Inflow=0.45 cfs 0.033 af
Primary=0.02 cfs 0.008 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.008 af

Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=17.95 cfs 1.748 af
Primary=17.95 cfs 1.748 af

Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49 Inflow=4.17 cfs 0.346 af
Primary=4.17 cfs 0.346 af

Pond W-C/D: Wetland -C/D Inflow=9.51 cfs 0.750 af
Primary=9.51 cfs 0.750 af

Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49 Inflow=5.40 cfs 0.404 af
Primary=5.40 cfs 0.404 af

Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=5.44 cfs 0.396 af
Primary=5.44 cfs 0.396 af

Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=7.13 cfs 0.525 af
Primary=7.13 cfs 0.525 af

Pond W-H: Inflow=13.52 cfs 1.743 af
Primary=13.52 cfs 1.743 af

Pond W-I: Wetland I Inflow=2.86 cfs 0.219 af
Primary=2.86 cfs 0.219 af

Total Runoff Area = 26.013 ac Runoff Volume = 9.478 af Average Runoff Depth = 4.37"
43.63% Pervious = 11.349 ac 56.37% Impervious = 14.665 ac

Summary for Subcatchment 1: EDA

Runoff = 3.89 cfs @ 12.09 hrs, Volume= 0.321 af, Depth> 6.03"
Routed to Reach DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
26,924	98	Paved roads w/curbs & sewers, HSG A
866	68	<50% Grass cover, Poor, HSG A
27,790	97	Weighted Average
866		3.12% Pervious Area
26,924		96.88% Impervious Area

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

Summary for Subcatchment 2: EDA

Runoff = 1.57 cfs @ 12.09 hrs, Volume= 0.126 af, Depth> 5.80"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
10,764	98	Paved roads w/curbs & sewers, HSG A
622	49	50-75% Grass cover, Fair, HSG A
11,386	95	Weighted Average
622		5.46% Pervious Area
10,764		94.54% Impervious Area

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

Summary for Subcatchment 3: EDA

Runoff = 6.75 cfs @ 12.09 hrs, Volume= 0.513 af, Depth> 5.11"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
42,583	98	Paved roads w/curbs & sewers, HSG A
6,681	49	50-75% Grass cover, Fair, HSG A
3,233	45	Woods, Poor, HSG A
52,497	89	Weighted Average
9,914		18.88% Pervious Area
42,583		81.12% Impervious Area

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

Summary for Subcatchment 4: EDA

Runoff = 12.93 cfs @ 12.18 hrs, Volume= 1.235 af, Depth> 5.22"
Routed to Reach DP4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
103,725	98	Paved roads w/curbs & sewers, HSG A
18,190	49	50-75% Grass cover, Fair, HSG A
1,807	36	Woods, Fair, HSG A
123,722	90	Weighted Average
19,997		16.16% Pervious Area
103,725		83.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 5: EDA

Runoff = 2.06 cfs @ 12.13 hrs, Volume= 0.164 af, Depth> 3.82"
Routed to Reach DP5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
13,579	98	Paved roads w/curbs & sewers, HSG A
1,652	49	50-75% Grass cover, Fair, HSG A
7,283	45	Woods, Poor, HSG A
22,514	77	Weighted Average
8,935		39.69% Pervious Area
13,579		60.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 6: EDA

Runoff = 3.55 cfs @ 12.09 hrs, Volume= 0.276 af, Depth> 5.45"
Routed to Reach DP6 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
21,227	98	Paved roads w/curbs & sewers, HSG B
2,835	69	50-75% Grass cover, Fair, HSG B
2,434	65	Woods/grass comb., Fair, HSG B
26,496	92	Weighted Average
5,269		19.89% Pervious Area
21,227		80.11% Impervious Area

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

Summary for Subcatchment 7A: EDA

Runoff = 4.49 cfs @ 12.10 hrs, Volume= 0.338 af, Depth> 4.34"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
26,629	98	Paved roads w/curbs & sewers, HSG A
2,718	49	50-75% Grass cover, Fair, HSG A
6,904	36	Woods, Fair, HSG A
4,429	76	Gravel roads, HSG A
40,680	82	Weighted Average
14,051		34.54% Pervious Area
26,629		65.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 7B: EDA

Runoff = 0.91 cfs @ 12.09 hrs, Volume= 0.066 af, Depth> 3.11"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
5,348	98	Paved roads w/curbs & sewers, HSG A
3,154	49	50-75% Grass cover, Fair, HSG A
2,614	36	Woods, Fair, HSG A
11,116	70	Weighted Average
5,768		51.89% Pervious Area
5,348		48.11% Impervious Area

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

Summary for Subcatchment 8A: EDA

Runoff = 4.17 cfs @ 12.12 hrs, Volume= 0.342 af, Depth> 4.78"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
25,023	98	Paved roads w/curbs & sewers, HSG B
4,412	69	50-75% Grass cover, Fair, HSG B
7,973	60	Woods, Fair, HSG B
37,408	86	Weighted Average
12,385		33.11% Pervious Area
25,023		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 8B: EDA

Runoff = 0.02 cfs @ 12.39 hrs, Volume= 0.004 af, Depth> 0.39"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
5,418	36	Woods, Fair, HSG A
5,418		100.00% Pervious Area

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

Summary for Subcatchment 9A: EDA

Runoff = 5.03 cfs @ 12.09 hrs, Volume= 0.366 af, Depth> 3.92"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
29,203	98	Paved roads w/curbs & sewers, HSG A
19,554	49	50-75% Grass cover, Fair, HSG A
48,757	78	Weighted Average
19,554		40.11% Pervious Area
29,203		59.89% Impervious Area

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

Summary for Subcatchment 9B: EDA

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.030 af, Depth> 3.72"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
2,311	98	Paved roads w/curbs & sewers, HSG A
1,886	49	50-75% Grass cover, Fair, HSG A
4,197	76	Weighted Average
1,886		44.94% Pervious Area
2,311		55.06% Impervious Area

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

Summary for Subcatchment 10A: EDA

Runoff = 4.46 cfs @ 12.09 hrs, Volume= 0.330 af, Depth> 4.56"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
26,539	98	Paved roads w/curbs & sewers, HSG A
11,094	49	50-75% Grass cover, Fair, HSG A
208	76	Gravel roads, HSG A
37,841	84	Weighted Average
11,302		29.87% Pervious Area
26,539		70.13% Impervious Area

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

Summary for Subcatchment 10B: EDA

Runoff = 2.67 cfs @ 12.09 hrs, Volume= 0.195 af, Depth> 4.03"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
15,226	98	Paved roads w/curbs & sewers, HSG A
10,046	49	50-75% Grass cover, Fair, HSG A
25,272	79	Weighted Average
10,046		39.75% Pervious Area
15,226		60.25% Impervious Area

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

Summary for Subcatchment 11: EDA

Runoff = 2.86 cfs @ 12.09 hrs, Volume= 0.219 af, Depth> 5.22"
Routed to Reach DP11 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
16,677	98	Paved roads w/curbs & sewers, HSG B
3,572	69	50-75% Grass cover, Fair, HSG B
1,644	60	Woods, Fair, HSG B
21,893	90	Weighted Average
5,216		23.82% Pervious Area
16,677		76.18% Impervious Area

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

Summary for Subcatchment 12: EDA

Runoff = 1.59 cfs @ 12.09 hrs, Volume= 0.116 af, Depth> 4.24"
Routed to Reach DP12 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
9,288	98	Paved roads w/curbs & sewers, HSG A
5,079	49	50-75% Grass cover, Fair, HSG A
14,367	81	Weighted Average
5,079		35.35% Pervious Area
9,288		64.65% Impervious Area

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

Summary for Subcatchment 13: EDA

Runoff = 0.62 cfs @ 12.10 hrs, Volume= 0.046 af, Depth> 2.18"
Routed to Reach DP13 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
2,139	98	Paved roads w/curbs & sewers, HSG A
8,245	49	50-75% Grass cover, Fair, HSG A
764	76	Gravel roads, HSG A
11,148	60	Weighted Average
9,009		80.81% Pervious Area
2,139		19.19% Impervious Area

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

Summary for Subcatchment 14A: EDA

Runoff = 1.42 cfs @ 12.09 hrs, Volume= 0.106 af, Depth> 4.67"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
8,739	98	Paved roads w/curbs & sewers, HSG A
3,110	49	50-75% Grass cover, Fair, HSG A
11,849	85	Weighted Average
3,110		26.25% Pervious Area
8,739		73.75% Impervious Area

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

Summary for Subcatchment 14B: EDA

Runoff = 6.45 cfs @ 12.09 hrs, Volume= 0.472 af, Depth> 4.13"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
40,012	98	Paved roads w/curbs & sewers, HSG A
10,242	49	50-75% Grass cover, Fair, HSG A
9,431	36	Woods, Fair, HSG A
59,685	80	Weighted Average
19,673		32.96% Pervious Area
40,012		67.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 15: EDA

Runoff = 0.95 cfs @ 12.09 hrs, Volume= 0.069 af, Depth> 4.13"
Routed to Reach DP15 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
5,520	98	Paved roads w/curbs & sewers, HSG A
3,214	49	50-75% Grass cover, Fair, HSG A
8,734	80	Weighted Average
3,214		36.80% Pervious Area
5,520		63.20% Impervious Area

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

Summary for Subcatchment 16: EDA

Runoff = 1.07 cfs @ 12.09 hrs, Volume= 0.078 af, Depth> 3.51"
Routed to Reach DP16 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
6,107	98	Paved roads w/curbs & sewers, HSG A
4,630	49	50-75% Grass cover, Fair, HSG A
845	36	Woods, Fair, HSG A
11,582	74	Weighted Average
5,475		47.27% Pervious Area
6,107		52.73% Impervious Area

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

Summary for Subcatchment 17: EDA

Runoff = 1.99 cfs @ 12.09 hrs, Volume= 0.147 af, Depth> 4.56"
Routed to Reach DP17 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
10,716	98	Paved roads w/curbs & sewers, HSG A
3,641	49	50-75% Grass cover, Fair, HSG A
2,492	76	Gravel roads, HSG A
16,849	84	Weighted Average
6,133		36.40% Pervious Area
10,716		63.60% Impervious Area

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

Summary for Subcatchment 18A: EDA

Runoff = 13.52 cfs @ 12.45 hrs, Volume= 1.734 af, Depth> 3.39"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
99,544	98	Paved roads w/curbs & sewers, HSG A
37,004	49	50-75% Grass cover, Fair, HSG A
56,609	36	Woods, Fair, HSG A
31,170	79	Woods, Fair, HSG D
26,944	76	Gravel roads, HSG A
15,958	91	Gravel roads, HSG D
267,229	73	Weighted Average
167,685		62.75% Pervious Area
99,544		37.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18B: EDA

AREA GOING TO THE EXISTING BMP

Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.033 af, Depth> 3.31"
Routed to Pond 2P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
2,467	98	Paved roads w/curbs & sewers, HSG A
2,681	49	50-75% Grass cover, Fair, HSG A
5,148	72	Weighted Average
2,681		52.08% Pervious Area
2,467		47.92% Impervious Area

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

Summary for Subcatchment 19: EDA

Runoff = 0.56 cfs @ 12.10 hrs, Volume= 0.041 af, Depth> 2.73"
Routed to Reach DP19 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
3,787	98	Unconnected pavement, HSG A
4,075	36	Woods, Fair, HSG A
7,862	66	Weighted Average
4,075		51.83% Pervious Area
3,787		48.17% Impervious Area
3,787		100.00% Unconnected

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

Summary for Subcatchment 20: EDA

Runoff = 20.78 cfs @ 12.21 hrs, Volume= 2.074 af, Depth> 4.99"
Routed to Reach DP20 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

	Area (sf)	CN	Description
*	83,409	98	Impervious
	8,137	74	>75% Grass cover, Good, HSG C
	9,133	80	>75% Grass cover, Good, HSG D
	23,541	70	Woods, Good, HSG C
	41,329	77	Woods, Good, HSG D
	51,670	91	Gravel roads, HSG D
	217,219	88	Weighted Average
	133,810		61.60% Pervious Area
	83,409		38.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0900	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
4.5	405	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	455	Total			

Summary for Subcatchment 21: EDA

Runoff = 0.51 cfs @ 12.09 hrs, Volume= 0.037 af, Depth> 4.34"
Routed to Reach DP21 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
1,301	98	Paved roads w/curbs & sewers, HSG C
1,640	79	50-75% Grass cover, Fair, HSG C
1,548	73	Woods, Fair, HSG C
4,489	82	Weighted Average
3,188		71.02% Pervious Area
1,301		28.98% Impervious Area

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

Summary for Reach DP1:

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

Inflow Area = 0.638 ac, 96.88% Impervious, Inflow Depth > 6.03" for 25y24h event
Inflow = 3.89 cfs @ 12.09 hrs, Volume= 0.321 af
Outflow = 3.89 cfs @ 12.09 hrs, Volume= 0.321 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP10:

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

Inflow Area = 1.449 ac, 66.17% Impervious, Inflow Depth > 4.35" for 25y24h event
Inflow = 7.13 cfs @ 12.09 hrs, Volume= 0.525 af
Outflow = 7.13 cfs @ 12.09 hrs, Volume= 0.525 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-G : UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP11:

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

Inflow Area = 0.503 ac, 76.18% Impervious, Inflow Depth > 5.22" for 25y24h event
Inflow = 2.86 cfs @ 12.09 hrs, Volume= 0.219 af
Outflow = 2.86 cfs @ 12.09 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-I : Wetland I

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP12:

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

Inflow Area = 0.330 ac, 64.65% Impervious, Inflow Depth > 4.24" for 25y24h event
Inflow = 1.59 cfs @ 12.09 hrs, Volume= 0.116 af
Outflow = 1.59 cfs @ 12.09 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP13:

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

Inflow Area = 0.256 ac, 19.19% Impervious, Inflow Depth > 2.18" for 25y24h event
Inflow = 0.62 cfs @ 12.10 hrs, Volume= 0.046 af
Outflow = 0.62 cfs @ 12.10 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP14:

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

Inflow Area = 1.642 ac, 68.15% Impervious, Inflow Depth > 4.22" for 25y24h event
Inflow = 7.87 cfs @ 12.09 hrs, Volume= 0.578 af
Outflow = 7.87 cfs @ 12.09 hrs, Volume= 0.578 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP15:

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

Inflow Area = 0.201 ac, 63.20% Impervious, Inflow Depth > 4.13" for 25y24h event
Inflow = 0.95 cfs @ 12.09 hrs, Volume= 0.069 af
Outflow = 0.95 cfs @ 12.09 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP16:

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

Inflow Area = 0.266 ac, 52.73% Impervious, Inflow Depth > 3.51" for 25y24h event
Inflow = 1.07 cfs @ 12.09 hrs, Volume= 0.078 af
Outflow = 1.07 cfs @ 12.09 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP17:

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

Inflow Area = 0.387 ac, 63.60% Impervious, Inflow Depth > 4.56" for 25y24h event
Inflow = 1.99 cfs @ 12.09 hrs, Volume= 0.147 af
Outflow = 1.99 cfs @ 12.09 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP18:

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

Inflow Area = 6.135 ac, 37.25% Impervious, Inflow Depth > 3.39" for 25y24h event
Inflow = 13.52 cfs @ 12.45 hrs, Volume= 1.734 af
Outflow = 13.52 cfs @ 12.45 hrs, Volume= 1.734 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-H :

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP19:

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

Inflow Area = 0.180 ac, 48.17% Impervious, Inflow Depth > 2.73" for 25y24h event
Inflow = 0.56 cfs @ 12.10 hrs, Volume= 0.041 af
Outflow = 0.56 cfs @ 12.10 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP2:

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

Inflow Area = 0.261 ac, 94.54% Impervious, Inflow Depth > 5.80" for 25y24h event
Inflow = 1.57 cfs @ 12.09 hrs, Volume= 0.126 af
Outflow = 1.57 cfs @ 12.09 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP20:

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

Inflow Area = 4.987 ac, 38.40% Impervious, Inflow Depth > 4.99" for 25y24h event
Inflow = 20.78 cfs @ 12.21 hrs, Volume= 2.074 af
Outflow = 20.78 cfs @ 12.21 hrs, Volume= 2.074 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP21:

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

Inflow Area = 0.103 ac, 28.98% Impervious, Inflow Depth > 4.34" for 25y24h event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 0.037 af
Outflow = 0.51 cfs @ 12.09 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP3:

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

Inflow Area = 1.205 ac, 81.12% Impervious, Inflow Depth > 5.11" for 25y24h event
Inflow = 6.75 cfs @ 12.09 hrs, Volume= 0.513 af
Outflow = 6.75 cfs @ 12.09 hrs, Volume= 0.513 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP4:

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

Inflow Area = 2.840 ac, 83.84% Impervious, Inflow Depth > 5.22" for 25y24h event
Inflow = 12.93 cfs @ 12.18 hrs, Volume= 1.235 af
Outflow = 12.93 cfs @ 12.18 hrs, Volume= 1.235 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP5:

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

Inflow Area = 0.517 ac, 60.31% Impervious, Inflow Depth > 3.82" for 25y24h event
Inflow = 2.06 cfs @ 12.13 hrs, Volume= 0.164 af
Outflow = 2.06 cfs @ 12.13 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : DEP WETLAND W/ VERNAL POOLS

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP6:

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

Inflow Area = 0.608 ac, 80.11% Impervious, Inflow Depth > 5.45" for 25y24h event
Inflow = 3.55 cfs @ 12.09 hrs, Volume= 0.276 af
Outflow = 3.55 cfs @ 12.09 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1W : DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP7:

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

Inflow Area = 1.189 ac, 61.74% Impervious, Inflow Depth > 4.08" for 25y24h event
Inflow = 5.40 cfs @ 12.10 hrs, Volume= 0.404 af
Outflow = 5.40 cfs @ 12.10 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-D : DOWNSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP8:

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

Inflow Area = 0.983 ac, 58.43% Impervious, Inflow Depth > 4.22" for 25y24h event
Inflow = 4.17 cfs @ 12.12 hrs, Volume= 0.346 af
Outflow = 4.17 cfs @ 12.12 hrs, Volume= 0.346 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C : UPSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP9:

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

Inflow Area = 1.216 ac, 59.51% Impervious, Inflow Depth > 3.91" for 25y24h event
Inflow = 5.44 cfs @ 12.09 hrs, Volume= 0.396 af
Outflow = 5.44 cfs @ 12.09 hrs, Volume= 0.396 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-E : DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: DEP WETLAND W/ VERNAL POOLS

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

Inflow Area = 0.517 ac, 60.31% Impervious, Inflow Depth > 3.82" for 25y24h event
Inflow = 2.06 cfs @ 12.13 hrs, Volume= 0.164 af
Primary = 2.06 cfs @ 12.13 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 0.608 ac, 80.11% Impervious, Inflow Depth > 5.45" for 25y24h event
Inflow = 3.55 cfs @ 12.09 hrs, Volume= 0.276 af
Primary = 3.55 cfs @ 12.09 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Existing Basin

Inflow Area = 0.118 ac, 47.92% Impervious, Inflow Depth > 3.31" for 25y24h event
Inflow = 0.45 cfs @ 12.09 hrs, Volume= 0.033 af
Outflow = 0.02 cfs @ 15.31 hrs, Volume= 0.008 af, Atten= 95%, Lag= 193.0 min
Primary = 0.02 cfs @ 15.31 hrs, Volume= 0.008 af
Routed to Pond W-H :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond W-H :

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 86.48' @ 15.31 hrs Surf.Area= 1,503 sf Storage= 1,079 cf

Plug-Flow detention time= 407.6 min calculated for 0.008 af (25% of inflow)
Center-of-Mass det. time= 271.8 min (1,101.8 - 830.0)

Volume	Invert	Avail.Storage	Storage Description
#1	85.50'	2,145 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)
85.50	652	195.0	0	0	652
86.00	1,139	255.0	442	442	2,804
86.50	1,516	290.0	662	1,104	4,328
87.00	1,884	297.0	848	1,952	4,686
87.10	1,974	299.0	193	2,145	4,785

Device	Routing	Invert	Outlet Devices
#1	Secondary	86.90'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	84.00'	**12.0" Round RCP_Round 12"** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 83.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#3	Device 2	86.47'	**Custom Orifice, Cv= 3.20 (C= 4.00)** Head (feet) 0.00 0.50 Width (feet) 3.00 3.00

Primary OutFlow Max=0.02 cfs @ 15.31 hrs HW=86.48' (Free Discharge)
└**2=RCP_Round 12"** (Passes 0.02 cfs of 4.12 cfs potential flow)
└**3=Custom Orifice** (Weir Controls 0.02 cfs @ 0.46 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.50' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 4.045 ac, 83.03% Impervious, Inflow Depth > 5.18" for 25y24h event
Inflow = 17.95 cfs @ 12.14 hrs, Volume= 1.748 af
Primary = 17.95 cfs @ 12.14 hrs, Volume= 1.748 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 0.983 ac, 58.43% Impervious, Inflow Depth > 4.22" for 25y24h event
Inflow = 4.17 cfs @ 12.12 hrs, Volume= 0.346 af
Primary = 4.17 cfs @ 12.12 hrs, Volume= 0.346 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland -C/D

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-C/D: Wetland -C/D

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

Inflow Area = 2.172 ac, 60.24% Impervious, Inflow Depth > 4.14" for 25y24h event
Inflow = 9.51 cfs @ 12.11 hrs, Volume= 0.750 af
Primary = 9.51 cfs @ 12.11 hrs, Volume= 0.750 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 1.189 ac, 61.74% Impervious, Inflow Depth > 4.08" for 25y24h event
Inflow = 5.40 cfs @ 12.10 hrs, Volume= 0.404 af
Primary = 5.40 cfs @ 12.10 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland -C/D

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 1.216 ac, 59.51% Impervious, Inflow Depth > 3.91" for 25y24h event
Inflow = 5.44 cfs @ 12.09 hrs, Volume= 0.396 af
Primary = 5.44 cfs @ 12.09 hrs, Volume= 0.396 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 1.449 ac, 66.17% Impervious, Inflow Depth > 4.35" for 25y24h event
Inflow = 7.13 cfs @ 12.09 hrs, Volume= 0.525 af
Primary = 7.13 cfs @ 12.09 hrs, Volume= 0.525 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-H:

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

Inflow Area = 6.253 ac, 37.45% Impervious, Inflow Depth > 3.34" for 25y24h event
Inflow = 13.52 cfs @ 12.45 hrs, Volume= 1.743 af
Primary = 13.52 cfs @ 12.45 hrs, Volume= 1.743 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-I: Wetland I

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

Inflow Area = 0.503 ac, 76.18% Impervious, Inflow Depth > 5.22" for 25y24h event
Inflow = 2.86 cfs @ 12.09 hrs, Volume= 0.219 af
Primary = 2.86 cfs @ 12.09 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: EDA Runoff Area=27,790 sf 96.88% Impervious Runoff Depth>7.87"
Tc=6.0 min CN=97 Runoff=5.02 cfs 0.418 af

Subcatchment 2: EDA Runoff Area=11,386 sf 94.54% Impervious Runoff Depth>7.63"
Tc=6.0 min CN=95 Runoff=2.04 cfs 0.166 af

Subcatchment 3: EDA Runoff Area=52,497 sf 81.12% Impervious Runoff Depth>6.91"
Tc=6.0 min CN=89 Runoff=8.97 cfs 0.694 af

Subcatchment 4: EDA Runoff Area=123,722 sf 83.84% Impervious Runoff Depth>7.02"
Tc=13.6 min CN=90 Runoff=17.12 cfs 1.661 af

Subcatchment 5: EDA Runoff Area=22,514 sf 60.31% Impervious Runoff Depth>5.48"
Tc=8.8 min CN=77 Runoff=2.95 cfs 0.236 af

Subcatchment 6: EDA Runoff Area=26,496 sf 80.11% Impervious Runoff Depth>7.27"
Tc=6.0 min CN=92 Runoff=4.65 cfs 0.368 af

Subcatchment 7A: EDA Runoff Area=40,680 sf 65.46% Impervious Runoff Depth>6.07"
Tc=7.0 min CN=82 Runoff=6.19 cfs 0.473 af

Subcatchment 7B: EDA Runoff Area=11,116 sf 48.11% Impervious Runoff Depth>4.66"
Tc=6.0 min CN=70 Runoff=1.37 cfs 0.099 af

Subcatchment 8A: EDA Runoff Area=37,408 sf 66.89% Impervious Runoff Depth>6.55"
Tc=9.0 min CN=86 Runoff=5.63 cfs 0.469 af

Subcatchment 8B: EDA Runoff Area=5,418 sf 0.00% Impervious Runoff Depth>0.97"
Tc=6.0 min CN=36 Runoff=0.07 cfs 0.010 af

Subcatchment 9A: EDA Runoff Area=48,757 sf 59.89% Impervious Runoff Depth>5.60"
Tc=6.0 min CN=78 Runoff=7.11 cfs 0.522 af

Subcatchment 9B: EDA Runoff Area=4,197 sf 55.06% Impervious Runoff Depth>5.36"
Tc=6.0 min CN=76 Runoff=0.59 cfs 0.043 af

Subcatchment 10A: EDA Runoff Area=37,841 sf 70.13% Impervious Runoff Depth>6.31"
Tc=6.0 min CN=84 Runoff=6.08 cfs 0.457 af

Subcatchment 10B: EDA Runoff Area=25,272 sf 60.25% Impervious Runoff Depth>5.72"
Tc=6.0 min CN=79 Runoff=3.75 cfs 0.276 af

Subcatchment 11: EDA Runoff Area=21,893 sf 76.18% Impervious Runoff Depth>7.03"
Tc=6.0 min CN=90 Runoff=3.78 cfs 0.294 af

Subcatchment 12: EDA Runoff Area=14,367 sf 64.65% Impervious Runoff Depth>5.96"
Tc=6.0 min CN=81 Runoff=2.21 cfs 0.164 af

Subcatchment 13: EDA Runoff Area=11,148 sf 19.19% Impervious Runoff Depth>3.50"
Tc=6.0 min CN=60 Runoff=1.02 cfs 0.075 af

Subcatchment 14A: EDA Runoff Area=11,849 sf 73.75% Impervious Runoff Depth>6.43"
Tc=6.0 min CN=85 Runoff=1.93 cfs 0.146 af

Subcatchment 14B: EDA Runoff Area=59,685 sf 67.04% Impervious Runoff Depth>5.84"
Tc=6.1 min CN=80 Runoff=9.00 cfs 0.666 af

Subcatchment 15: EDA Runoff Area=8,734 sf 63.20% Impervious Runoff Depth>5.84"
Tc=6.0 min CN=80 Runoff=1.32 cfs 0.098 af

Subcatchment 16: EDA Runoff Area=11,582 sf 52.73% Impervious Runoff Depth>5.13"
Tc=6.0 min CN=74 Runoff=1.56 cfs 0.114 af

Subcatchment 17: EDA Runoff Area=16,849 sf 63.60% Impervious Runoff Depth>6.31"
Tc=6.0 min CN=84 Runoff=2.71 cfs 0.203 af

Subcatchment 18A: EDA Runoff Area=267,229 sf 37.25% Impervious Runoff Depth>4.98"
Tc=31.7 min CN=73 Runoff=19.84 cfs 2.548 af

Subcatchment 18B: EDA Runoff Area=5,148 sf 47.92% Impervious Runoff Depth>4.89"
Tc=6.0 min CN=72 Runoff=0.66 cfs 0.048 af

Subcatchment 19: EDA Runoff Area=7,862 sf 48.17% Impervious Runoff Depth>4.19"
Tc=6.0 min CN=66 Runoff=0.87 cfs 0.063 af

Subcatchment 20: EDA Runoff Area=217,219 sf 38.40% Impervious Runoff Depth>6.78"
Flow Length=455' Slope=0.0900 '/' Tc=16.1 min CN=88 Runoff=27.78 cfs 2.816 af

Subcatchment 21: EDA Runoff Area=4,489 sf 28.98% Impervious Runoff Depth>6.07"
Tc=6.0 min CN=82 Runoff=0.70 cfs 0.052 af

Reach DP1: Inflow=5.02 cfs 0.418 af
Outflow=5.02 cfs 0.418 af

Reach DP10: Inflow=9.84 cfs 0.733 af
Outflow=9.84 cfs 0.733 af

Reach DP11: Inflow=3.78 cfs 0.294 af
Outflow=3.78 cfs 0.294 af

Reach DP12: Inflow=2.21 cfs 0.164 af
Outflow=2.21 cfs 0.164 af

Reach DP13: Inflow=1.02 cfs 0.075 af
Outflow=1.02 cfs 0.075 af

Reach DP14: Inflow=10.93 cfs 0.812 af
Outflow=10.93 cfs 0.812 af

Reach DP15: Inflow=1.32 cfs 0.098 af
Outflow=1.32 cfs 0.098 af

Reach DP16: Inflow=1.56 cfs 0.114 af
Outflow=1.56 cfs 0.114 af

Reach DP17: Inflow=2.71 cfs 0.203 af
Outflow=2.71 cfs 0.203 af

Reach DP18: Inflow=19.84 cfs 2.548 af
Outflow=19.84 cfs 2.548 af

Reach DP19: Inflow=0.87 cfs 0.063 af
Outflow=0.87 cfs 0.063 af

Reach DP2: Inflow=2.04 cfs 0.166 af
Outflow=2.04 cfs 0.166 af

Reach DP20: Inflow=27.78 cfs 2.816 af
Outflow=27.78 cfs 2.816 af

Reach DP21: Inflow=0.70 cfs 0.052 af
Outflow=0.70 cfs 0.052 af

Reach DP3: Inflow=8.97 cfs 0.694 af
Outflow=8.97 cfs 0.694 af

Reach DP4: Inflow=17.12 cfs 1.661 af
Outflow=17.12 cfs 1.661 af

Reach DP5: Inflow=2.95 cfs 0.236 af
Outflow=2.95 cfs 0.236 af

Reach DP6: Inflow=4.65 cfs 0.368 af
Outflow=4.65 cfs 0.368 af

Reach DP7: Inflow=7.55 cfs 0.572 af
Outflow=7.55 cfs 0.572 af

Reach DP8: Inflow=5.71 cfs 0.479 af
Outflow=5.71 cfs 0.479 af

Reach DP9: Inflow=7.70 cfs 0.565 af
Outflow=7.70 cfs 0.565 af

Pond 1P: DEP WETLAND W/ VERNAL POOLS Inflow=2.95 cfs 0.236 af
Primary=2.95 cfs 0.236 af

Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=4.65 cfs 0.368 af
Primary=4.65 cfs 0.368 af

Pond 2P: Existing Basin Peak Elev=86.52' Storage=1,131 cf Inflow=0.66 cfs 0.048 af
Primary=0.13 cfs 0.024 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.024 af

Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=23.80 cfs 2.355 af
Primary=23.80 cfs 2.355 af

Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49 Inflow=5.71 cfs 0.479 af
Primary=5.71 cfs 0.479 af

Pond W-C/D: Wetland -C/D Inflow=13.16 cfs 1.050 af
Primary=13.16 cfs 1.050 af

Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49 Inflow=7.55 cfs 0.572 af
Primary=7.55 cfs 0.572 af

Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=7.70 cfs 0.565 af
Primary=7.70 cfs 0.565 af

Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=9.84 cfs 0.733 af
Primary=9.84 cfs 0.733 af

Pond W-H: Inflow=19.92 cfs 2.572 af
Primary=19.92 cfs 2.572 af

Pond W-I: Wetland I Inflow=3.78 cfs 0.294 af
Primary=3.78 cfs 0.294 af

Total Runoff Area = 26.013 ac Runoff Volume = 13.180 af Average Runoff Depth = 6.08"
43.63% Pervious = 11.349 ac 56.37% Impervious = 14.665 ac

Summary for Subcatchment 1: EDA

Runoff = 5.02 cfs @ 12.09 hrs, Volume= 0.418 af, Depth> 7.87"
Routed to Reach DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
26,924	98	Paved roads w/curbs & sewers, HSG A
866	68	<50% Grass cover, Poor, HSG A
27,790	97	Weighted Average
866		3.12% Pervious Area
26,924		96.88% Impervious Area

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

Summary for Subcatchment 2: EDA

Runoff = 2.04 cfs @ 12.09 hrs, Volume= 0.166 af, Depth> 7.63"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
10,764	98	Paved roads w/curbs & sewers, HSG A
622	49	50-75% Grass cover, Fair, HSG A
11,386	95	Weighted Average
622		5.46% Pervious Area
10,764		94.54% Impervious Area

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

Summary for Subcatchment 3: EDA

Runoff = 8.97 cfs @ 12.09 hrs, Volume= 0.694 af, Depth> 6.91"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
42,583	98	Paved roads w/curbs & sewers, HSG A
6,681	49	50-75% Grass cover, Fair, HSG A
3,233	45	Woods, Poor, HSG A
52,497	89	Weighted Average
9,914		18.88% Pervious Area
42,583		81.12% Impervious Area

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

Summary for Subcatchment 4: EDA

Runoff = 17.12 cfs @ 12.18 hrs, Volume= 1.661 af, Depth> 7.02"
Routed to Reach DP4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
103,725	98	Paved roads w/curbs & sewers, HSG A
18,190	49	50-75% Grass cover, Fair, HSG A
1,807	36	Woods, Fair, HSG A
123,722	90	Weighted Average
19,997		16.16% Pervious Area
103,725		83.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 5: EDA

Runoff = 2.95 cfs @ 12.12 hrs, Volume= 0.236 af, Depth> 5.48"
Routed to Reach DP5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
13,579	98	Paved roads w/curbs & sewers, HSG A
1,652	49	50-75% Grass cover, Fair, HSG A
7,283	45	Woods, Poor, HSG A
22,514	77	Weighted Average
8,935		39.69% Pervious Area
13,579		60.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 6: EDA

Runoff = 4.65 cfs @ 12.09 hrs, Volume= 0.368 af, Depth> 7.27"
Routed to Reach DP6 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
21,227	98	Paved roads w/curbs & sewers, HSG B
2,835	69	50-75% Grass cover, Fair, HSG B
2,434	65	Woods/grass comb., Fair, HSG B
26,496	92	Weighted Average
5,269		19.89% Pervious Area
21,227		80.11% Impervious Area

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

Summary for Subcatchment 7A: EDA

Runoff = 6.19 cfs @ 12.10 hrs, Volume= 0.473 af, Depth> 6.07"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
26,629	98	Paved roads w/curbs & sewers, HSG A
2,718	49	50-75% Grass cover, Fair, HSG A
6,904	36	Woods, Fair, HSG A
4,429	76	Gravel roads, HSG A
40,680	82	Weighted Average
14,051		34.54% Pervious Area
26,629		65.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 7B: EDA

Runoff = 1.37 cfs @ 12.09 hrs, Volume= 0.099 af, Depth> 4.66"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
5,348	98	Paved roads w/curbs & sewers, HSG A
3,154	49	50-75% Grass cover, Fair, HSG A
2,614	36	Woods, Fair, HSG A
11,116	70	Weighted Average
5,768		51.89% Pervious Area
5,348		48.11% Impervious Area

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

Summary for Subcatchment 8A: EDA

Runoff = 5.63 cfs @ 12.12 hrs, Volume= 0.469 af, Depth> 6.55"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
25,023	98	Paved roads w/curbs & sewers, HSG B
4,412	69	50-75% Grass cover, Fair, HSG B
7,973	60	Woods, Fair, HSG B
37,408	86	Weighted Average
12,385		33.11% Pervious Area
25,023		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 8B: EDA

Runoff = 0.07 cfs @ 12.15 hrs, Volume= 0.010 af, Depth> 0.97"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
5,418	36	Woods, Fair, HSG A
5,418		100.00% Pervious Area

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

Summary for Subcatchment 9A: EDA

Runoff = 7.11 cfs @ 12.09 hrs, Volume= 0.522 af, Depth> 5.60"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
29,203	98	Paved roads w/curbs & sewers, HSG A
19,554	49	50-75% Grass cover, Fair, HSG A
48,757	78	Weighted Average
19,554		40.11% Pervious Area
29,203		59.89% Impervious Area

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

Summary for Subcatchment 9B: EDA

Runoff = 0.59 cfs @ 12.09 hrs, Volume= 0.043 af, Depth> 5.36"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
2,311	98	Paved roads w/curbs & sewers, HSG A
1,886	49	50-75% Grass cover, Fair, HSG A
4,197	76	Weighted Average
1,886		44.94% Pervious Area
2,311		55.06% Impervious Area

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

Summary for Subcatchment 10A: EDA

Runoff = 6.08 cfs @ 12.09 hrs, Volume= 0.457 af, Depth> 6.31"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
26,539	98	Paved roads w/curbs & sewers, HSG A
11,094	49	50-75% Grass cover, Fair, HSG A
208	76	Gravel roads, HSG A
37,841	84	Weighted Average
11,302		29.87% Pervious Area
26,539		70.13% Impervious Area

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

Summary for Subcatchment 10B: EDA

Runoff = 3.75 cfs @ 12.09 hrs, Volume= 0.276 af, Depth> 5.72"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
15,226	98	Paved roads w/curbs & sewers, HSG A
10,046	49	50-75% Grass cover, Fair, HSG A
25,272	79	Weighted Average
10,046		39.75% Pervious Area
15,226		60.25% Impervious Area

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

Summary for Subcatchment 11: EDA

Runoff = 3.78 cfs @ 12.09 hrs, Volume= 0.294 af, Depth> 7.03"
Routed to Reach DP11 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
16,677	98	Paved roads w/curbs & sewers, HSG B
3,572	69	50-75% Grass cover, Fair, HSG B
1,644	60	Woods, Fair, HSG B
21,893	90	Weighted Average
5,216		23.82% Pervious Area
16,677		76.18% Impervious Area

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

Summary for Subcatchment 12: EDA

Runoff = 2.21 cfs @ 12.09 hrs, Volume= 0.164 af, Depth> 5.96"
Routed to Reach DP12 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
9,288	98	Paved roads w/curbs & sewers, HSG A
5,079	49	50-75% Grass cover, Fair, HSG A
14,367	81	Weighted Average
5,079		35.35% Pervious Area
9,288		64.65% Impervious Area

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

Summary for Subcatchment 13: EDA

Runoff = 1.02 cfs @ 12.10 hrs, Volume= 0.075 af, Depth> 3.50"
Routed to Reach DP13 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
2,139	98	Paved roads w/curbs & sewers, HSG A
8,245	49	50-75% Grass cover, Fair, HSG A
764	76	Gravel roads, HSG A
11,148	60	Weighted Average
9,009		80.81% Pervious Area
2,139		19.19% Impervious Area

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

Summary for Subcatchment 14A: EDA

Runoff = 1.93 cfs @ 12.09 hrs, Volume= 0.146 af, Depth> 6.43"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
8,739	98	Paved roads w/curbs & sewers, HSG A
3,110	49	50-75% Grass cover, Fair, HSG A
11,849	85	Weighted Average
3,110		26.25% Pervious Area
8,739		73.75% Impervious Area

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

Summary for Subcatchment 14B: EDA

Runoff = 9.00 cfs @ 12.09 hrs, Volume= 0.666 af, Depth> 5.84"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
40,012	98	Paved roads w/curbs & sewers, HSG A
10,242	49	50-75% Grass cover, Fair, HSG A
9,431	36	Woods, Fair, HSG A
59,685	80	Weighted Average
19,673		32.96% Pervious Area
40,012		67.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 15: EDA

Runoff = 1.32 cfs @ 12.09 hrs, Volume= 0.098 af, Depth> 5.84"
Routed to Reach DP15 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
5,520	98	Paved roads w/curbs & sewers, HSG A
3,214	49	50-75% Grass cover, Fair, HSG A
8,734	80	Weighted Average
3,214		36.80% Pervious Area
5,520		63.20% Impervious Area

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

Summary for Subcatchment 16: EDA

Runoff = 1.56 cfs @ 12.09 hrs, Volume= 0.114 af, Depth> 5.13"
Routed to Reach DP16 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
6,107	98	Paved roads w/curbs & sewers, HSG A
4,630	49	50-75% Grass cover, Fair, HSG A
845	36	Woods, Fair, HSG A
11,582	74	Weighted Average
5,475		47.27% Pervious Area
6,107		52.73% Impervious Area

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

Summary for Subcatchment 17: EDA

Runoff = 2.71 cfs @ 12.09 hrs, Volume= 0.203 af, Depth> 6.31"
Routed to Reach DP17 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
10,716	98	Paved roads w/curbs & sewers, HSG A
3,641	49	50-75% Grass cover, Fair, HSG A
2,492	76	Gravel roads, HSG A
16,849	84	Weighted Average
6,133		36.40% Pervious Area
10,716		63.60% Impervious Area

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

Summary for Subcatchment 18A: EDA

Runoff = 19.84 cfs @ 12.44 hrs, Volume= 2.548 af, Depth> 4.98"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
99,544	98	Paved roads w/curbs & sewers, HSG A
37,004	49	50-75% Grass cover, Fair, HSG A
56,609	36	Woods, Fair, HSG A
31,170	79	Woods, Fair, HSG D
26,944	76	Gravel roads, HSG A
15,958	91	Gravel roads, HSG D
267,229	73	Weighted Average
167,685		62.75% Pervious Area
99,544		37.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18B: EDA

AREA GOING TO THE EXISTING BMP

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af, Depth> 4.89"
Routed to Pond 2P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
2,467	98	Paved roads w/curbs & sewers, HSG A
2,681	49	50-75% Grass cover, Fair, HSG A
5,148	72	Weighted Average
2,681		52.08% Pervious Area
2,467		47.92% Impervious Area

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

Summary for Subcatchment 19: EDA

Runoff = 0.87 cfs @ 12.09 hrs, Volume= 0.063 af, Depth> 4.19"
Routed to Reach DP19 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
3,787	98	Unconnected pavement, HSG A
4,075	36	Woods, Fair, HSG A
7,862	66	Weighted Average
4,075		51.83% Pervious Area
3,787		48.17% Impervious Area
3,787		100.00% Unconnected

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

Summary for Subcatchment 20: EDA

Runoff = 27.78 cfs @ 12.21 hrs, Volume= 2.816 af, Depth> 6.78"
Routed to Reach DP20 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

	Area (sf)	CN	Description
*	83,409	98	Impervious
	8,137	74	>75% Grass cover, Good, HSG C
	9,133	80	>75% Grass cover, Good, HSG D
	23,541	70	Woods, Good, HSG C
	41,329	77	Woods, Good, HSG D
	51,670	91	Gravel roads, HSG D
	217,219	88	Weighted Average
	133,810		61.60% Pervious Area
	83,409		38.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0900	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
4.5	405	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	455	Total			

Summary for Subcatchment 21: EDA

Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.052 af, Depth> 6.07"
Routed to Reach DP21 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
1,301	98	Paved roads w/curbs & sewers, HSG C
1,640	79	50-75% Grass cover, Fair, HSG C
1,548	73	Woods, Fair, HSG C
4,489	82	Weighted Average
3,188		71.02% Pervious Area
1,301		28.98% Impervious Area

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

Summary for Reach DP1:

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

Inflow Area = 0.638 ac, 96.88% Impervious, Inflow Depth > 7.87" for 100y24h event
Inflow = 5.02 cfs @ 12.09 hrs, Volume= 0.418 af
Outflow = 5.02 cfs @ 12.09 hrs, Volume= 0.418 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP10:

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

Inflow Area = 1.449 ac, 66.17% Impervious, Inflow Depth > 6.07" for 100y24h event
Inflow = 9.84 cfs @ 12.09 hrs, Volume= 0.733 af
Outflow = 9.84 cfs @ 12.09 hrs, Volume= 0.733 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-G : UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP11:

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

Inflow Area = 0.503 ac, 76.18% Impervious, Inflow Depth > 7.03" for 100y24h event
Inflow = 3.78 cfs @ 12.09 hrs, Volume= 0.294 af
Outflow = 3.78 cfs @ 12.09 hrs, Volume= 0.294 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-I : Wetland I

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP12:

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

Inflow Area = 0.330 ac, 64.65% Impervious, Inflow Depth > 5.96" for 100y24h event
Inflow = 2.21 cfs @ 12.09 hrs, Volume= 0.164 af
Outflow = 2.21 cfs @ 12.09 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP13:

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

Inflow Area = 0.256 ac, 19.19% Impervious, Inflow Depth > 3.50" for 100y24h event
Inflow = 1.02 cfs @ 12.10 hrs, Volume= 0.075 af
Outflow = 1.02 cfs @ 12.10 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP14:

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

Inflow Area = 1.642 ac, 68.15% Impervious, Inflow Depth > 5.93" for 100y24h event
Inflow = 10.93 cfs @ 12.09 hrs, Volume= 0.812 af
Outflow = 10.93 cfs @ 12.09 hrs, Volume= 0.812 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP15:

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

Inflow Area = 0.201 ac, 63.20% Impervious, Inflow Depth > 5.84" for 100y24h event
Inflow = 1.32 cfs @ 12.09 hrs, Volume= 0.098 af
Outflow = 1.32 cfs @ 12.09 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP16:

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

Inflow Area = 0.266 ac, 52.73% Impervious, Inflow Depth > 5.13" for 100y24h event
Inflow = 1.56 cfs @ 12.09 hrs, Volume= 0.114 af
Outflow = 1.56 cfs @ 12.09 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP17:

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

Inflow Area = 0.387 ac, 63.60% Impervious, Inflow Depth > 6.31" for 100y24h event
Inflow = 2.71 cfs @ 12.09 hrs, Volume= 0.203 af
Outflow = 2.71 cfs @ 12.09 hrs, Volume= 0.203 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP18:

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

Inflow Area = 6.135 ac, 37.25% Impervious, Inflow Depth > 4.98" for 100y24h event
Inflow = 19.84 cfs @ 12.44 hrs, Volume= 2.548 af
Outflow = 19.84 cfs @ 12.44 hrs, Volume= 2.548 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-H :

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP19:

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

Inflow Area = 0.180 ac, 48.17% Impervious, Inflow Depth > 4.19" for 100y24h event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 0.87 cfs @ 12.09 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP2:

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

Inflow Area = 0.261 ac, 94.54% Impervious, Inflow Depth > 7.63" for 100y24h event
Inflow = 2.04 cfs @ 12.09 hrs, Volume= 0.166 af
Outflow = 2.04 cfs @ 12.09 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP20:

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

Inflow Area = 4.987 ac, 38.40% Impervious, Inflow Depth > 6.78" for 100y24h event
Inflow = 27.78 cfs @ 12.21 hrs, Volume= 2.816 af
Outflow = 27.78 cfs @ 12.21 hrs, Volume= 2.816 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP21:

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

Inflow Area = 0.103 ac, 28.98% Impervious, Inflow Depth > 6.07" for 100y24h event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 0.052 af
Outflow = 0.70 cfs @ 12.09 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP3:

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

Inflow Area = 1.205 ac, 81.12% Impervious, Inflow Depth > 6.91" for 100y24h event
Inflow = 8.97 cfs @ 12.09 hrs, Volume= 0.694 af
Outflow = 8.97 cfs @ 12.09 hrs, Volume= 0.694 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP4:

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

Inflow Area = 2.840 ac, 83.84% Impervious, Inflow Depth > 7.02" for 100y24h event
Inflow = 17.12 cfs @ 12.18 hrs, Volume= 1.661 af
Outflow = 17.12 cfs @ 12.18 hrs, Volume= 1.661 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP5:

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

Inflow Area = 0.517 ac, 60.31% Impervious, Inflow Depth > 5.48" for 100y24h event
Inflow = 2.95 cfs @ 12.12 hrs, Volume= 0.236 af
Outflow = 2.95 cfs @ 12.12 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : DEP WETLAND W/ VERNAL POOLS

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP6:

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

Inflow Area = 0.608 ac, 80.11% Impervious, Inflow Depth > 7.27" for 100y24h event
Inflow = 4.65 cfs @ 12.09 hrs, Volume= 0.368 af
Outflow = 4.65 cfs @ 12.09 hrs, Volume= 0.368 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1W : DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP7:

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

Inflow Area = 1.189 ac, 61.74% Impervious, Inflow Depth > 5.77" for 100y24h event
Inflow = 7.55 cfs @ 12.10 hrs, Volume= 0.572 af
Outflow = 7.55 cfs @ 12.10 hrs, Volume= 0.572 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-D : DOWNSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP8:

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

Inflow Area = 0.983 ac, 58.43% Impervious, Inflow Depth > 5.84" for 100y24h event
Inflow = 5.71 cfs @ 12.12 hrs, Volume= 0.479 af
Outflow = 5.71 cfs @ 12.12 hrs, Volume= 0.479 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C : UPSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach DP9:

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

Inflow Area = 1.216 ac, 59.51% Impervious, Inflow Depth > 5.58" for 100y24h event
Inflow = 7.70 cfs @ 12.09 hrs, Volume= 0.565 af
Outflow = 7.70 cfs @ 12.09 hrs, Volume= 0.565 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-E : DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: DEP WETLAND W/ VERNAL POOLS

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

Inflow Area = 0.517 ac, 60.31% Impervious, Inflow Depth > 5.48" for 100y24h event
Inflow = 2.95 cfs @ 12.12 hrs, Volume= 0.236 af
Primary = 2.95 cfs @ 12.12 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 0.608 ac, 80.11% Impervious, Inflow Depth > 7.27" for 100y24h event
Inflow = 4.65 cfs @ 12.09 hrs, Volume= 0.368 af
Primary = 4.65 cfs @ 12.09 hrs, Volume= 0.368 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Existing Basin

Inflow Area = 0.118 ac, 47.92% Impervious, Inflow Depth > 4.89" for 100y24h event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af
Outflow = 0.13 cfs @ 12.56 hrs, Volume= 0.024 af, Atten= 81%, Lag= 27.8 min
Primary = 0.13 cfs @ 12.56 hrs, Volume= 0.024 af
Routed to Pond W-H :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond W-H :

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 86.52' @ 12.56 hrs Surf.Area= 1,529 sf Storage= 1,131 cf

Plug-Flow detention time= 238.3 min calculated for 0.024 af (49% of inflow)
Center-of-Mass det. time= 125.0 min (943.9 - 818.8)

Volume	Invert	Avail.Storage	Storage Description
#1	85.50'	2,145 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)
85.50	652	195.0	0	0	652
86.00	1,139	255.0	442	442	2,804
86.50	1,516	290.0	662	1,104	4,328
87.00	1,884	297.0	848	1,952	4,686
87.10	1,974	299.0	193	2,145	4,785

Device	Routing	Invert	Outlet Devices
#1	Secondary	86.90'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	84.00'	**12.0" Round RCP_Round 12"** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 83.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#3	Device 2	86.47'	**Custom Orifice, Cv= 3.20 (C= 4.00)** Head (feet) 0.00 0.50 Width (feet) 3.00 3.00

Primary OutFlow Max=0.13 cfs @ 12.56 hrs HW=86.52' (Free Discharge)
↑—**2=RCP_Round 12"** (Passes 0.13 cfs of 4.16 cfs potential flow)
↑—**3=Custom Orifice** (Weir Controls 0.13 cfs @ 0.88 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 4.045 ac, 83.03% Impervious, Inflow Depth > 6.99" for 100y24h event
Inflow = 23.80 cfs @ 12.14 hrs, Volume= 2.355 af
Primary = 23.80 cfs @ 12.14 hrs, Volume= 2.355 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 0.983 ac, 58.43% Impervious, Inflow Depth > 5.84" for 100y24h event
Inflow = 5.71 cfs @ 12.12 hrs, Volume= 0.479 af
Primary = 5.71 cfs @ 12.12 hrs, Volume= 0.479 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland -C/D

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-C/D: Wetland -C/D

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

Inflow Area = 2.172 ac, 60.24% Impervious, Inflow Depth > 5.80" for 100y24h event
Inflow = 13.16 cfs @ 12.11 hrs, Volume= 1.050 af
Primary = 13.16 cfs @ 12.11 hrs, Volume= 1.050 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 1.189 ac, 61.74% Impervious, Inflow Depth > 5.77" for 100y24h event
Inflow = 7.55 cfs @ 12.10 hrs, Volume= 0.572 af
Primary = 7.55 cfs @ 12.10 hrs, Volume= 0.572 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland -C/D

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 1.216 ac, 59.51% Impervious, Inflow Depth > 5.58" for 100y24h event
Inflow = 7.70 cfs @ 12.09 hrs, Volume= 0.565 af
Primary = 7.70 cfs @ 12.09 hrs, Volume= 0.565 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 1.449 ac, 66.17% Impervious, Inflow Depth > 6.07" for 100y24h event
Inflow = 9.84 cfs @ 12.09 hrs, Volume= 0.733 af
Primary = 9.84 cfs @ 12.09 hrs, Volume= 0.733 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-H:

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

Inflow Area = 6.253 ac, 37.45% Impervious, Inflow Depth > 4.94" for 100y24h event
Inflow = 19.92 cfs @ 12.44 hrs, Volume= 2.572 af
Primary = 19.92 cfs @ 12.44 hrs, Volume= 2.572 af, Atten= 0%, Lag= 0.0 min

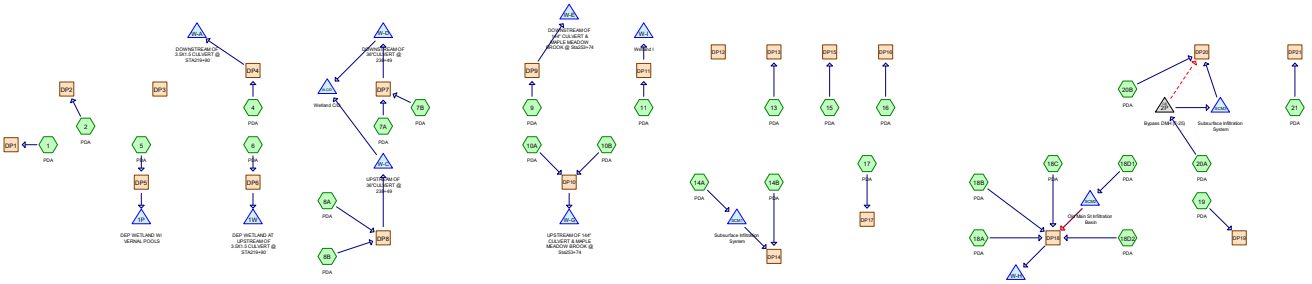
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond W-I: Wetland I

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

Inflow Area = 0.503 ac, 76.18% Impervious, Inflow Depth > 7.03" for 100y24h event
Inflow = 3.78 cfs @ 12.09 hrs, Volume= 0.294 af
Primary = 3.78 cfs @ 12.09 hrs, Volume= 0.294 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Subcat Reach Pond Link

Routing Diagram for Proposed Condition
Prepared by Green International Affiliates, Printed 2/25/2025
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Proposed Condition

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2y24h	Type III 24-hr		Default	24.00	1	3.30	2
2	10y24h	Type III 24-hr		Default	24.00	1	5.20	2
3	25y24h	Type III 24-hr		Default	24.00	1	6.39	2
4	100y24h	Type III 24-hr		Default	24.00	1	8.23	2

Proposed Condition

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.959	49	50-75% Grass cover, Fair, HSG A (2, 4, 5, 7A, 7B, 8A, 8B, 9, 10A, 10B, 13, 14B, 15, 16, 17, 18A, 18B, 18C, 18D2, 19)
0.188	69	50-75% Grass cover, Fair, HSG B (4, 8A, 11)
0.021	79	50-75% Grass cover, Fair, HSG C (21)
0.020	68	<50% Grass cover, Poor, HSG A (1)
0.303	39	>75% Grass cover, Good, HSG A (14A, 18D1)
0.193	74	>75% Grass cover, Good, HSG C (20B)
0.188	80	>75% Grass cover, Good, HSG D (20A, 20B)
0.737	76	Gravel roads, HSG A (7A, 9, 10B, 13, 14A, 18D1)
0.001	85	Gravel roads, HSG B (8A)
1.526	91	Gravel roads, HSG D (18D1, 20A)
4.332	98	Impervious (18B, 18C, 18D1, 20A, 20B)
11.121	98	Paved roads w/curbs & sewers, HSG A (1, 2, 4, 5, 7A, 7B, 8B, 9, 10A, 10B, 13, 14A, 14B, 15, 16, 17, 18A, 18D2)
0.530	98	Paved roads w/curbs & sewers, HSG B (6, 8A, 11)
0.035	98	Paved roads w/curbs & sewers, HSG C (21)
0.087	98	Unconnected pavement, HSG A (19)
1.099	36	Woods, Fair, HSG A (4, 7A, 8B, 18B, 18C, 18D1)
0.038	73	Woods, Fair, HSG C (21)
1.042	79	Woods, Fair, HSG D (18C, 18D1)
0.540	70	Woods, Good, HSG C (20B)
0.949	77	Woods, Good, HSG D (20A, 20B)
0.103	45	Woods, Poor, HSG A (5)
26.014	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
16.430	HSG A	1, 2, 4, 5, 7A, 7B, 8A, 8B, 9, 10A, 10B, 13, 14A, 14B, 15, 16, 17, 18A, 18B, 18C, 18D1, 18D2, 19
0.719	HSG B	4, 6, 8A, 11
0.827	HSG C	20B, 21
3.705	HSG D	18C, 18D1, 20A, 20B
4.332	Other	18B, 18C, 18D1, 20A, 20B
26.014		**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: PDA Runoff Area=27,674 sf 96.83% Impervious Runoff Depth=2.96"
Tc=6.0 min CN=97 Runoff=1.96 cfs 0.156 af

Subcatchment 2: PDA Runoff Area=11,386 sf 94.57% Impervious Runoff Depth=2.74"
Tc=6.0 min CN=95 Runoff=0.77 cfs 0.060 af

Subcatchment 4: PDA Runoff Area=211,460 sf 86.63% Impervious Runoff Depth=2.45"
Tc=13.6 min CN=92 Runoff=10.61 cfs 0.989 af

Subcatchment 5: PDA Runoff Area=14,264 sf 44.18% Impervious Runoff Depth=0.84"
Tc=8.8 min CN=69 Runoff=0.25 cfs 0.023 af

Subcatchment 6: PDA Runoff Area=422 sf 100.00% Impervious Runoff Depth=3.07"
Tc=6.0 min CN=98 Runoff=0.03 cfs 0.002 af

Subcatchment 7A: PDA Runoff Area=49,587 sf 89.44% Impervious Runoff Depth=2.64"
Tc=7.0 min CN=94 Runoff=3.21 cfs 0.251 af

Subcatchment 7B: PDA Runoff Area=15,958 sf 75.99% Impervious Runoff Depth=1.92"
Tc=6.0 min CN=86 Runoff=0.81 cfs 0.059 af

Subcatchment 8A: PDA Runoff Area=15,255 sf 17.73% Impervious Runoff Depth=0.56"
Tc=9.0 min CN=63 Runoff=0.15 cfs 0.016 af

Subcatchment 8B: PDA Runoff Area=12,986 sf 93.02% Impervious Runoff Depth=2.64"
Tc=0.0 min CN=94 Runoff=1.01 cfs 0.066 af

Subcatchment 9: PDA Runoff Area=91,916 sf 85.59% Impervious Runoff Depth=2.35"
Tc=7.8 min CN=91 Runoff=5.31 cfs 0.414 af

Subcatchment 10A: PDA Runoff Area=16,304 sf 37.19% Impervious Runoff Depth=0.74"
Tc=6.0 min CN=67 Runoff=0.27 cfs 0.023 af

Subcatchment 10B: PDA Runoff Area=7,913 sf 9.19% Impervious Runoff Depth=0.89"
Tc=6.0 min CN=70 Runoff=0.17 cfs 0.013 af

Subcatchment 11: PDA Runoff Area=21,783 sf 91.70% Impervious Runoff Depth=2.85"
Tc=6.0 min CN=96 Runoff=1.52 cfs 0.119 af

Subcatchment 13: PDA Runoff Area=10,374 sf 18.59% Impervious Runoff Depth=0.45"
Tc=6.0 min CN=60 Runoff=0.07 cfs 0.009 af

Subcatchment 14A: PDA Runoff Area=31,146 sf 74.91% Impervious Runoff Depth=1.84"
Tc=6.0 min CN=85 Runoff=1.51 cfs 0.110 af

Subcatchment 14B: PDA Runoff Area=68,323 sf 83.25% Impervious Runoff Depth=2.26"
Tc=12.0 min CN=90 Runoff=3.36 cfs 0.296 af

Subcatchment 15: PDA Runoff Area=8,441 sf 93.70% Impervious Runoff Depth=2.74"
Tc=6.0 min CN=95 Runoff=0.57 cfs 0.044 af

Subcatchment 16: PDA Runoff Area=10,846 sf 57.10% Impervious Runoff Depth=1.28"
Tc=6.0 min CN=77 Runoff=0.36 cfs 0.027 af

Subcatchment 17: PDA Runoff Area=4,936 sf 27.21% Impervious Runoff Depth=0.52"
Tc=6.0 min CN=62 Runoff=0.05 cfs 0.005 af

Subcatchment 18A: PDA Runoff Area=16,246 sf 29.48% Impervious Runoff Depth=0.56"
Tc=7.0 min CN=63 Runoff=0.17 cfs 0.018 af

Subcatchment 18B: PDA Runoff Area=95,678 sf 74.30% Impervious Runoff Depth=1.84"
Tc=7.8 min CN=85 Runoff=4.41 cfs 0.337 af

Subcatchment 18C: PDA Runoff Area=83,629 sf 26.75% Impervious Runoff Depth=0.99"
Tc=31.7 min CN=72 Runoff=1.14 cfs 0.159 af

Subcatchment 18D1: PDA Runoff Area=78,460 sf 11.48% Impervious Runoff Depth=0.84"
Flow Length=1,330' Slope=0.0410 '/' Tc=21.6 min CN=69 Runoff=1.02 cfs 0.126 af

Subcatchment 18D2: PDA Runoff Area=1,103 sf 91.12% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=94 Runoff=0.07 cfs 0.006 af

Subcatchment 19: PDA Runoff Area=4,847 sf 78.54% Impervious Runoff Depth=2.00"
Tc=0.0 min CN=87 Runoff=0.30 cfs 0.019 af

Subcatchment 20A: PDA Runoff Area=83,763 sf 14.91% Impervious Runoff Depth=2.17"
Tc=6.0 min CN=89 Runoff=4.76 cfs 0.348 af

Subcatchment 20B: PDA Runoff Area=134,369 sf 54.88% Impervious Runoff Depth=2.00"
Flow Length=455' Slope=0.0900 '/' Tc=16.1 min CN=87 Runoff=5.32 cfs 0.515 af

Subcatchment 21: PDA Runoff Area=4,080 sf 37.13% Impervious Runoff Depth=1.77"
Tc=6.0 min CN=84 Runoff=0.19 cfs 0.014 af

Reach DP1: Inflow=1.96 cfs 0.156 af
Outflow=1.96 cfs 0.156 af

Reach DP10: Inflow=0.44 cfs 0.037 af
Outflow=0.44 cfs 0.037 af

Reach DP11: Inflow=1.52 cfs 0.119 af
Outflow=1.52 cfs 0.119 af

Reach DP12:

Reach DP13: Inflow=0.07 cfs 0.009 af
Outflow=0.07 cfs 0.009 af

Reach DP14: Inflow=3.36 cfs 0.325 af
Outflow=3.36 cfs 0.325 af

Reach DP15: Inflow=0.57 cfs 0.044 af
Outflow=0.57 cfs 0.044 af

Reach DP16: Inflow=0.36 cfs 0.027 af
Outflow=0.36 cfs 0.027 af

Reach DP17: Inflow=0.05 cfs 0.005 af
Outflow=0.05 cfs 0.005 af

Reach DP18: Inflow=5.00 cfs 0.623 af
Outflow=5.00 cfs 0.623 af

Reach DP19: Inflow=0.30 cfs 0.019 af
Outflow=0.30 cfs 0.019 af

Reach DP2: Inflow=0.77 cfs 0.060 af
Outflow=0.77 cfs 0.060 af

Reach DP20: Inflow=6.34 cfs 0.806 af
Outflow=6.34 cfs 0.806 af

Reach DP21: Inflow=0.19 cfs 0.014 af
Outflow=0.19 cfs 0.014 af

Reach DP3:

Reach DP4: Inflow=10.61 cfs 0.989 af
Outflow=10.61 cfs 0.989 af

Reach DP5: Inflow=0.25 cfs 0.023 af
Outflow=0.25 cfs 0.023 af

Reach DP6: Inflow=0.03 cfs 0.002 af
Outflow=0.03 cfs 0.002 af

Reach DP7: Inflow=4.02 cfs 0.309 af
Outflow=4.02 cfs 0.309 af

Reach DP8: Inflow=1.05 cfs 0.082 af
Outflow=1.05 cfs 0.082 af

Reach DP9: Inflow=5.31 cfs 0.414 af
Outflow=5.31 cfs 0.414 af

Pond 1P: DEP WETLAND W/ VERNAL POOLS Inflow=0.25 cfs 0.023 af
Primary=0.25 cfs 0.023 af

Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=0.03 cfs 0.002 af
Primary=0.03 cfs 0.002 af

Pond 2P: Bypass DMH (7-25) Peak Elev=86.49' Inflow=4.76 cfs 0.348 af
Primary=4.55 cfs 0.347 af Secondary=0.22 cfs 0.001 af Outflow=4.76 cfs 0.348 af

Pond SCM1: Subsurface Infiltration System Peak Elev=88.12' Storage=3,870 cf Inflow=1.51 cfs 0.110 af
Outflow=0.04 cfs 0.029 af

Pond SCM2: Old Main St Infiltration Basin Peak Elev=87.15' Storage=1,430 cf Inflow=1.02 cfs 0.126 af
Outflow=0.63 cfs 0.104 af

Pond SCM3: Subsurface Infiltration System Peak Elev=85.92' Storage=6,775 cf Inflow=4.55 cfs 0.347 af
Outflow=1.22 cfs 0.290 af

Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=10.61 cfs 0.989 af
Primary=10.61 cfs 0.989 af

Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49 Inflow=1.05 cfs 0.082 af
Primary=1.05 cfs 0.082 af

Pond W-C/D: Wetland C/D Inflow=4.63 cfs 0.391 af
Primary=4.63 cfs 0.391 af

Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49 Inflow=4.02 cfs 0.309 af
Primary=4.02 cfs 0.309 af

Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=5.31 cfs 0.414 af
Primary=5.31 cfs 0.414 af

Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=0.44 cfs 0.037 af
Primary=0.44 cfs 0.037 af

Pond W-H: Inflow=5.00 cfs 0.623 af
Primary=5.00 cfs 0.623 af

Pond W-I: Wetland I Inflow=1.52 cfs 0.119 af
Primary=1.52 cfs 0.119 af

Total Runoff Area = 26.014 ac Runoff Volume = 4.222 af Average Runoff Depth = 1.95"
38.09% Pervious = 9.908 ac 61.91% Impervious = 16.106 ac

Summary for Subcatchment 1: PDA

Runoff = 1.96 cfs @ 12.09 hrs, Volume= 0.156 af, Depth= 2.96"
Routed to Reach DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
26,797	98	Paved roads w/curbs & sewers, HSG A
877	68	<50% Grass cover, Poor, HSG A
27,674	97	Weighted Average
877		3.17% Pervious Area
26,797		96.83% Impervious Area

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

Summary for Subcatchment 2: PDA

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 0.060 af, Depth= 2.74"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
10,768	98	Paved roads w/curbs & sewers, HSG A
618	49	50-75% Grass cover, Fair, HSG A
11,386	95	Weighted Average
618		5.43% Pervious Area
10,768		94.57% Impervious Area

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

Summary for Subcatchment 4: PDA

Runoff = 10.61 cfs @ 12.18 hrs, Volume= 0.989 af, Depth= 2.45"
Routed to Reach DP4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
183,183	98	Paved roads w/curbs & sewers, HSG A
23,753	49	50-75% Grass cover, Fair, HSG A
2,716	69	50-75% Grass cover, Fair, HSG B
1,808	36	Woods, Fair, HSG A
211,460	92	Weighted Average
28,277		13.37% Pervious Area
183,183		86.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 5: PDA

Runoff = 0.25 cfs @ 12.15 hrs, Volume= 0.023 af, Depth= 0.84"
Routed to Reach DP5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
6,302	98	Paved roads w/curbs & sewers, HSG A
3,465	49	50-75% Grass cover, Fair, HSG A
4,497	45	Woods, Poor, HSG A
14,264	69	Weighted Average
7,962		55.82% Pervious Area
6,302		44.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 6: PDA

Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 3.07"
Routed to Reach DP6 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
422	98	Paved roads w/curbs & sewers, HSG B
422		100.00% Impervious Area

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

Summary for Subcatchment 7A: PDA

Runoff = 3.21 cfs @ 12.10 hrs, Volume= 0.251 af, Depth= 2.64"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
44,349	98	Paved roads w/curbs & sewers, HSG A
2,465	49	50-75% Grass cover, Fair, HSG A
388	36	Woods, Fair, HSG A
2,385	76	Gravel roads, HSG A
49,587	94	Weighted Average
5,238		10.56% Pervious Area
44,349		89.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 7B: PDA

Runoff = 0.81 cfs @ 12.09 hrs, Volume= 0.059 af, Depth= 1.92"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
12,126	98	Paved roads w/curbs & sewers, HSG A
3,832	49	50-75% Grass cover, Fair, HSG A
15,958	86	Weighted Average
3,832		24.01% Pervious Area
12,126		75.99% Impervious Area

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

Summary for Subcatchment 8A: PDA

Runoff = 0.15 cfs @ 12.16 hrs, Volume= 0.016 af, Depth= 0.56"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
2,704	98	Paved roads w/curbs & sewers, HSG B
8,860	49	50-75% Grass cover, Fair, HSG A
3,647	69	50-75% Grass cover, Fair, HSG B
44	85	Gravel roads, HSG B
0	60	Woods, Fair, HSG B
15,255	63	Weighted Average
12,551		82.27% Pervious Area
2,704		17.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 8B: PDA

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.01 cfs @ 12.00 hrs, Volume= 0.066 af, Depth= 2.64"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
735	36	Woods, Fair, HSG A
172	49	50-75% Grass cover, Fair, HSG A
12,079	98	Paved roads w/curbs & sewers, HSG A
12,986	94	Weighted Average
907		6.98% Pervious Area
12,079		93.02% Impervious Area

Summary for Subcatchment 9: PDA

Runoff = 5.31 cfs @ 12.11 hrs, Volume= 0.414 af, Depth= 2.35"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
78,674	98	Paved roads w/curbs & sewers, HSG A
1,850	76	Gravel roads, HSG A
11,392	49	50-75% Grass cover, Fair, HSG A
91,916	91	Weighted Average
13,242		14.41% Pervious Area
78,674		85.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 10A: PDA

Runoff = 0.27 cfs @ 12.11 hrs, Volume= 0.023 af, Depth= 0.74"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
6,063	98	Paved roads w/curbs & sewers, HSG A
10,241	49	50-75% Grass cover, Fair, HSG A
16,304	67	Weighted Average
10,241		62.81% Pervious Area
6,063		37.19% Impervious Area

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

Summary for Subcatchment 10B: PDA

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 0.013 af, Depth= 0.89"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
727	98	Paved roads w/curbs & sewers, HSG A
2,461	49	50-75% Grass cover, Fair, HSG A
4,725	76	Gravel roads, HSG A
7,913	70	Weighted Average
7,186		90.81% Pervious Area
727		9.19% Impervious Area

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

Summary for Subcatchment 11: PDA

Runoff = 1.52 cfs @ 12.09 hrs, Volume= 0.119 af, Depth= 2.85"
Routed to Reach DP11 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
19,976	98	Paved roads w/curbs & sewers, HSG B
1,807	69	50-75% Grass cover, Fair, HSG B
21,783	96	Weighted Average
1,807		8.30% Pervious Area
19,976		91.70% Impervious Area

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

Summary for Subcatchment 13: PDA

Runoff = 0.07 cfs @ 12.13 hrs, Volume= 0.009 af, Depth= 0.45"
Routed to Reach DP13 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
1,929	98	Paved roads w/curbs & sewers, HSG A
7,698	49	50-75% Grass cover, Fair, HSG A
747	76	Gravel roads, HSG A
10,374	60	Weighted Average
8,445		81.41% Pervious Area
1,929		18.59% Impervious Area

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

Summary for Subcatchment 14A: PDA

Runoff = 1.51 cfs @ 12.09 hrs, Volume= 0.110 af, Depth= 1.84"
Routed to Pond SCM1 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
23,330	98	Paved roads w/curbs & sewers, HSG A
6,350	39	>75% Grass cover, Good, HSG A
1,466	76	Gravel roads, HSG A
31,146	85	Weighted Average
7,816		25.09% Pervious Area
23,330		74.91% Impervious Area

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

Summary for Subcatchment 14B: PDA

Runoff = 3.36 cfs @ 12.16 hrs, Volume= 0.296 af, Depth= 2.26"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
56,877	98	Paved roads w/curbs & sewers, HSG A
11,446	49	50-75% Grass cover, Fair, HSG A
68,323	90	Weighted Average
11,446		16.75% Pervious Area
56,877		83.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 15: PDA

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.044 af, Depth= 2.74"
Routed to Reach DP15 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
7,909	98	Paved roads w/curbs & sewers, HSG A
532	49	50-75% Grass cover, Fair, HSG A
8,441	95	Weighted Average
532		6.30% Pervious Area
7,909		93.70% Impervious Area

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

Summary for Subcatchment 16: PDA

Runoff = 0.36 cfs @ 12.10 hrs, Volume= 0.027 af, Depth= 1.28"
Routed to Reach DP16 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
6,193	98	Paved roads w/curbs & sewers, HSG A
4,653	49	50-75% Grass cover, Fair, HSG A
10,846	77	Weighted Average
4,653		42.90% Pervious Area
6,193		57.10% Impervious Area

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

Summary for Subcatchment 17: PDA

Runoff = 0.05 cfs @ 12.12 hrs, Volume= 0.005 af, Depth= 0.52"
Routed to Reach DP17 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
1,343	98	Paved roads w/curbs & sewers, HSG A
3,593	49	50-75% Grass cover, Fair, HSG A
0	76	Gravel roads, HSG A
4,936	62	Weighted Average
3,593		72.79% Pervious Area
1,343		27.21% Impervious Area

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

Summary for Subcatchment 18A: PDA

Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.018 af, Depth= 0.56"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
4,790	98	Paved roads w/curbs & sewers, HSG A
11,456	49	50-75% Grass cover, Fair, HSG A
16,246	63	Weighted Average
11,456		70.52% Pervious Area
4,790		29.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18B: PDA

Runoff = 4.41 cfs @ 12.11 hrs, Volume= 0.337 af, Depth= 1.84"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

	Area (sf)	CN	Description
*	71,087	98	Impervious
	20,290	49	50-75% Grass cover, Fair, HSG A
	4,301	36	Woods, Fair, HSG A
	95,678	85	Weighted Average
	24,591		25.70% Pervious Area
	71,087		74.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18C: PDA

Runoff = 1.14 cfs @ 12.49 hrs, Volume= 0.159 af, Depth= 0.99"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

	Area (sf)	CN	Description
*	22,372	98	Impervious
	850	49	50-75% Grass cover, Fair, HSG A
	22,494	36	Woods, Fair, HSG A
	37,913	79	Woods, Fair, HSG D
	83,629	72	Weighted Average
	61,257		73.25% Pervious Area
	22,372		26.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18D1: PDA

Runoff = 1.02 cfs @ 12.34 hrs, Volume= 0.126 af, Depth= 0.84"
Routed to Pond SCM2 : Old Main St Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

	Area (sf)	CN	Description
*	9,006	98	Impervious
	6,850	39	>75% Grass cover, Good, HSG A
	18,155	36	Woods, Fair, HSG A
	7,463	79	Woods, Fair, HSG D
	20,912	76	Gravel roads, HSG A
	16,074	91	Gravel roads, HSG D
	78,460	69	Weighted Average
	69,454		88.52% Pervious Area
	9,006		11.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0410	1.62		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
21.1	1,280	0.0410	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.6	1,330	Total			

Summary for Subcatchment 18D2: PDA

AREA GOING TO THE EXISTING BMP

Runoff = 0.07 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 2.64"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
1,005	98	Paved roads w/curbs & sewers, HSG A
98	49	50-75% Grass cover, Fair, HSG A
1,103	94	Weighted Average
98		8.88% Pervious Area
1,005		91.12% Impervious Area

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

Summary for Subcatchment 19: PDA

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.30 cfs @ 12.00 hrs, Volume= 0.019 af, Depth= 2.00"
Routed to Reach DP19 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
3,807	98	Unconnected pavement, HSG A
1,040	49	50-75% Grass cover, Fair, HSG A
4,847	87	Weighted Average
1,040		21.46% Pervious Area
3,807		78.54% Impervious Area
3,807		100.00% Unconnected

Summary for Subcatchment 20A: PDA

Runoff = 4.76 cfs @ 12.09 hrs, Volume= 0.348 af, Depth= 2.17"
Routed to Pond 2P : Bypass DMH (7-25)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

	Area (sf)	CN	Description
*	12,491	98	Impervious
	2,679	80	>75% Grass cover, Good, HSG D
	18,187	77	Woods, Good, HSG D
	50,406	91	Gravel roads, HSG D
	83,763	89	Weighted Average
	71,272		85.09% Pervious Area
	12,491		14.91% Impervious Area

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

Summary for Subcatchment 20B: PDA

Runoff = 5.32 cfs @ 12.22 hrs, Volume= 0.515 af, Depth= 2.00"
Routed to Reach DP20 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

	Area (sf)	CN	Description
*	73,748	98	Impervious
	8,414	74	>75% Grass cover, Good, HSG C
	5,511	80	>75% Grass cover, Good, HSG D
	23,542	70	Woods, Good, HSG C
	23,154	77	Woods, Good, HSG D
	0	91	Gravel roads, HSG D
	134,369	87	Weighted Average
	60,621		45.12% Pervious Area
	73,748		54.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0900	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
4.5	405	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	455	Total			

Summary for Subcatchment 21: PDA

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 1.77"
Routed to Reach DP21 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2y24h Rainfall=3.30"

Area (sf)	CN	Description
1,515	98	Paved roads w/curbs & sewers, HSG C
917	79	50-75% Grass cover, Fair, HSG C
1,648	73	Woods, Fair, HSG C
4,080	84	Weighted Average
2,565		62.87% Pervious Area
1,515		37.13% Impervious Area

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

Summary for Reach DP1:

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

Inflow Area = 0.635 ac, 96.83% Impervious, Inflow Depth = 2.96" for 2y24h event
Inflow = 1.96 cfs @ 12.09 hrs, Volume= 0.156 af
Outflow = 1.96 cfs @ 12.09 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP10:

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

Inflow Area = 0.556 ac, 28.04% Impervious, Inflow Depth = 0.79" for 2y24h event
Inflow = 0.44 cfs @ 12.11 hrs, Volume= 0.037 af
Outflow = 0.44 cfs @ 12.11 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-G : UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP11:

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

Inflow Area = 0.500 ac, 91.70% Impervious, Inflow Depth = 2.85" for 2y24h event
Inflow = 1.52 cfs @ 12.09 hrs, Volume= 0.119 af
Outflow = 1.52 cfs @ 12.09 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-I : Wetland I

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP12:

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

Summary for Reach DP13:

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

Inflow Area = 0.238 ac, 18.59% Impervious, Inflow Depth = 0.45" for 2y24h event
Inflow = 0.07 cfs @ 12.13 hrs, Volume= 0.009 af
Outflow = 0.07 cfs @ 12.13 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP14:

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

Inflow Area = 2.283 ac, 80.64% Impervious, Inflow Depth = 1.71" for 2y24h event
Inflow = 3.36 cfs @ 12.16 hrs, Volume= 0.325 af
Outflow = 3.36 cfs @ 12.16 hrs, Volume= 0.325 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP15:

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

Inflow Area = 0.194 ac, 93.70% Impervious, Inflow Depth = 2.74" for 2y24h event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 0.044 af
Outflow = 0.57 cfs @ 12.09 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP16:

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

Inflow Area = 0.249 ac, 57.10% Impervious, Inflow Depth = 1.28" for 2y24h event
Inflow = 0.36 cfs @ 12.10 hrs, Volume= 0.027 af
Outflow = 0.36 cfs @ 12.10 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP17:

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

Inflow Area = 0.113 ac, 27.21% Impervious, Inflow Depth = 0.52" for 2y24h event
Inflow = 0.05 cfs @ 12.12 hrs, Volume= 0.005 af
Outflow = 0.05 cfs @ 12.12 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP18:

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

Inflow Area = 6.316 ac, 39.35% Impervious, Inflow Depth = 1.18" for 2y24h event
Inflow = 5.00 cfs @ 12.12 hrs, Volume= 0.623 af
Outflow = 5.00 cfs @ 12.12 hrs, Volume= 0.623 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-H :

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP19:

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

Inflow Area = 0.111 ac, 78.54% Impervious, Inflow Depth = 2.00" for 2y24h event
Inflow = 0.30 cfs @ 12.00 hrs, Volume= 0.019 af
Outflow = 0.30 cfs @ 12.00 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2:

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

Inflow Area = 0.261 ac, 94.57% Impervious, Inflow Depth = 2.74" for 2y24h event
Inflow = 0.77 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.77 cfs @ 12.09 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP20:

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

Inflow Area = 5.008 ac, 39.54% Impervious, Inflow Depth = 1.93" for 2y24h event
Inflow = 6.34 cfs @ 12.23 hrs, Volume= 0.806 af
Outflow = 6.34 cfs @ 12.23 hrs, Volume= 0.806 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP21:

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

Inflow Area = 0.094 ac, 37.13% Impervious, Inflow Depth = 1.77" for 2y24h event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3:

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

Summary for Reach DP4:

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

Inflow Area = 4.854 ac, 86.63% Impervious, Inflow Depth = 2.45" for 2y24h event
Inflow = 10.61 cfs @ 12.18 hrs, Volume= 0.989 af
Outflow = 10.61 cfs @ 12.18 hrs, Volume= 0.989 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5:

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

Inflow Area = 0.327 ac, 44.18% Impervious, Inflow Depth = 0.84" for 2y24h event
Inflow = 0.25 cfs @ 12.15 hrs, Volume= 0.023 af
Outflow = 0.25 cfs @ 12.15 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : DEP WETLAND W/ VERNAL POOLS

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6:

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

Inflow Area = 0.010 ac,100.00% Impervious, Inflow Depth = 3.07" for 2y24h event
Inflow = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af
Outflow = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1W : DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP7:

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

Inflow Area = 1.505 ac, 86.16% Impervious, Inflow Depth = 2.47" for 2y24h event
Inflow = 4.02 cfs @ 12.10 hrs, Volume= 0.309 af
Outflow = 4.02 cfs @ 12.10 hrs, Volume= 0.309 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-D : DOWNSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP8:

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

Inflow Area = 0.648 ac, 52.35% Impervious, Inflow Depth = 1.52" for 2y24h event
Inflow = 1.05 cfs @ 12.00 hrs, Volume= 0.082 af
Outflow = 1.05 cfs @ 12.00 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C : UPSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP9:

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

Inflow Area = 2.110 ac, 85.59% Impervious, Inflow Depth = 2.35" for 2y24h event
Inflow = 5.31 cfs @ 12.11 hrs, Volume= 0.414 af
Outflow = 5.31 cfs @ 12.11 hrs, Volume= 0.414 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-E : DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: DEP WETLAND W/ VERNAL POOLS

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

Inflow Area = 0.327 ac, 44.18% Impervious, Inflow Depth = 0.84" for 2y24h event
Inflow = 0.25 cfs @ 12.15 hrs, Volume= 0.023 af
Primary = 0.25 cfs @ 12.15 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 0.010 ac,100.00% Impervious, Inflow Depth = 3.07" for 2y24h event
Inflow = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af
Primary = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Bypass DMH (7-25)

Inflow Area = 1.923 ac, 14.91% Impervious, Inflow Depth = 2.17" for 2y24h event
Inflow = 4.76 cfs @ 12.09 hrs, Volume= 0.348 af
Outflow = 4.76 cfs @ 12.09 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.0 min
Primary = 4.55 cfs @ 12.09 hrs, Volume= 0.347 af
Routed to Pond SCM3 : Subsurface Infiltration System
Secondary = 0.22 cfs @ 12.10 hrs, Volume= 0.001 af
Routed to Reach DP20 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 86.49' @ 12.09 hrs
Flood Elev= 89.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**12.0" Round Culvert** L= 104.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 84.00' / 83.42' S= 0.0056 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Secondary	85.00'	**18.0" Round Culvert** L= 114.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 85.00' / 84.45' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#3	Device 2	86.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=4.46 cfs @ 12.09 hrs HW=86.41' (Free Discharge)
└**1=Culvert** (Barrel Controls 4.46 cfs @ 5.68 fps)

Secondary OutFlow Max=0.21 cfs @ 12.10 hrs HW=86.46' (Free Discharge)
└**2=Culvert** (Passes 0.21 cfs of 6.25 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.21 cfs @ 0.83 fps)

Summary for Pond SCM1: Subsurface Infiltration System

Inflow Area = 0.715 ac, 74.91% Impervious, Inflow Depth = 1.84" for 2y24h event
Inflow = 1.51 cfs @ 12.09 hrs, Volume= 0.110 af
Outflow = 0.04 cfs @ 17.13 hrs, Volume= 0.029 af, Atten= 97%, Lag= 302.5 min
Primary = 0.04 cfs @ 17.13 hrs, Volume= 0.029 af
Routed to Reach DP14 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 88.12' @ 17.13 hrs Surf.Area= 3,941 sf Storage= 3,870 cf

Plug-Flow detention time= 594.5 min calculated for 0.029 af (27% of inflow)
Center-of-Mass det. time= 459.2 min (1,283.9 - 824.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	86.55'	3,240 cf	**44.25'W x 89.06'L x 4.00'H Field A** 15,763 cf Overall - 4,962 cf Embedded = 10,802 cf x 30.0% Voids
#2A	87.05'	4,962 cf	**ADS_StormTech SC-740 +Cap** x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 108 Chambers in 9 Rows
		8,202 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.50'	**15.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 87.50' / 86.10' S= 0.0093 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	89.85'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#3	Device 1	88.00'	**5.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.04 cfs @ 17.13 hrs HW=88.12' (Free Discharge)
└**1=Culvert** (Passes 0.04 cfs of 1.65 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice** (Orifice Controls 0.04 cfs @ 1.20 fps)

Summary for Pond SCM2: Old Main St Infiltration Basin

Inflow Area = 1.801 ac, 11.48% Impervious, Inflow Depth = 0.84" for 2y24h event
Inflow = 1.02 cfs @ 12.34 hrs, Volume= 0.126 af
Outflow = 0.63 cfs @ 12.66 hrs, Volume= 0.104 af, Atten= 38%, Lag= 19.0 min
Primary = 0.63 cfs @ 12.66 hrs, Volume= 0.104 af
Routed to Reach DP18 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 87.15' @ 12.66 hrs Surf.Area= 1,175 sf Storage= 1,430 cf

Plug-Flow detention time= 134.6 min calculated for 0.104 af (82% of inflow)
Center-of-Mass det. time= 59.9 min (951.4 - 891.4)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	4,546 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)
85.00	235	113.0	0	0	235
86.00	620	160.0	412	412	1,265
87.00	1,100	201.0	849	1,261	2,457
88.00	1,651	240.0	1,366	2,627	3,843
89.00	2,200	259.0	1,919	4,546	4,638

Device	Routing	Invert	Outlet Devices
#1	Primary	84.75'	**12.0" Round RCP_Round 12"** L= 24.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.75' / 84.50' S= 0.0104 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	88.30'	**2.0" x 2.0" Horiz. Inlet Grate X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#3	Device 1	86.70'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.63 cfs @ 12.66 hrs HW=87.15' (Free Discharge)
└─**1=RCP_Round 12"** (Passes 0.63 cfs of 5.21 cfs potential flow)
  ├─**2=Inlet Grate** (Controls 0.00 cfs)
  └─**3=Orifice** (Orifice Controls 0.63 cfs @ 2.28 fps)

Summary for Pond SCM3: Subsurface Infiltration System

[81] Warning: Exceeded Pond 2P by 1.36' @ 12.55 hrs

Inflow Area = 1.923 ac, 14.91% Impervious, Inflow Depth = 2.17" for 2y24h event
Inflow = 4.55 cfs @ 12.09 hrs, Volume= 0.347 af
Outflow = 1.22 cfs @ 12.47 hrs, Volume= 0.290 af, Atten= 73%, Lag= 23.3 min
Primary = 1.22 cfs @ 12.47 hrs, Volume= 0.290 af
Routed to Reach DP20 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 85.92' @ 12.47 hrs Surf.Area= 3,740 sf Storage= 6,775 cf

Plug-Flow detention time= 171.1 min calculated for 0.290 af (84% of inflow)
Center-of-Mass det. time= 103.1 min (913.1 - 810.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	82.80'	3,175 cf	**30.00'W x 124.66'L x 4.08'H Field A** 15,270 cf Overall - 4,686 cf Embedded = 10,585 cf x 30.0% Voids
#2A	83.38'	4,686 cf	**ADS_StormTech SC-740 +Cap** x 102 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 102 Chambers in 6 Rows
		7,861 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	83.94'	**12.0" Round Culvert** L= 31.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 83.94' / 83.77' S= 0.0055 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	86.40'	**3.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#3	Device 1	84.00'	**6.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.22 cfs @ 12.47 hrs HW=85.91' (Free Discharge)
└**1=Culvert** (Passes 1.22 cfs of 4.41 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice** (Orifice Controls 1.22 cfs @ 6.20 fps)

Summary for Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 4.854 ac, 86.63% Impervious, Inflow Depth = 2.45" for 2y24h event
Inflow = 10.61 cfs @ 12.18 hrs, Volume= 0.989 af
Primary = 10.61 cfs @ 12.18 hrs, Volume= 0.989 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 0.648 ac, 52.35% Impervious, Inflow Depth = 1.52" for 2y24h event
Inflow = 1.05 cfs @ 12.00 hrs, Volume= 0.082 af
Primary = 1.05 cfs @ 12.00 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland C/D

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-C/D: Wetland C/D

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

Inflow Area = 2.153 ac, 75.98% Impervious, Inflow Depth = 2.18" for 2y24h event
Inflow = 4.63 cfs @ 12.09 hrs, Volume= 0.391 af
Primary = 4.63 cfs @ 12.09 hrs, Volume= 0.391 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 1.505 ac, 86.16% Impervious, Inflow Depth = 2.47" for 2y24h event
Inflow = 4.02 cfs @ 12.10 hrs, Volume= 0.309 af
Primary = 4.02 cfs @ 12.10 hrs, Volume= 0.309 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland C/D

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 2.110 ac, 85.59% Impervious, Inflow Depth = 2.35" for 2y24h event
Inflow = 5.31 cfs @ 12.11 hrs, Volume= 0.414 af
Primary = 5.31 cfs @ 12.11 hrs, Volume= 0.414 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 0.556 ac, 28.04% Impervious, Inflow Depth = 0.79" for 2y24h event
Inflow = 0.44 cfs @ 12.11 hrs, Volume= 0.037 af
Primary = 0.44 cfs @ 12.11 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-H:

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

Inflow Area = 6.316 ac, 39.35% Impervious, Inflow Depth = 1.18" for 2y24h event
Inflow = 5.00 cfs @ 12.12 hrs, Volume= 0.623 af
Primary = 5.00 cfs @ 12.12 hrs, Volume= 0.623 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-I: Wetland I

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

Inflow Area = 0.500 ac, 91.70% Impervious, Inflow Depth = 2.85" for 2y24h event
Inflow = 1.52 cfs @ 12.09 hrs, Volume= 0.119 af
Primary = 1.52 cfs @ 12.09 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: PDA Runoff Area=27,674 sf 96.83% Impervious Runoff Depth=4.85"
Tc=6.0 min CN=97 Runoff=3.14 cfs 0.257 af

Subcatchment 2: PDA Runoff Area=11,386 sf 94.57% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=95 Runoff=1.27 cfs 0.101 af

Subcatchment 4: PDA Runoff Area=211,460 sf 86.63% Impervious Runoff Depth=4.28"
Tc=13.6 min CN=92 Runoff=18.07 cfs 1.733 af

Subcatchment 5: PDA Runoff Area=14,264 sf 44.18% Impervious Runoff Depth=2.10"
Tc=8.8 min CN=69 Runoff=0.70 cfs 0.057 af

Subcatchment 6: PDA Runoff Area=422 sf 100.00% Impervious Runoff Depth=4.96"
Tc=6.0 min CN=98 Runoff=0.05 cfs 0.004 af

Subcatchment 7A: PDA Runoff Area=49,587 sf 89.44% Impervious Runoff Depth=4.51"
Tc=7.0 min CN=94 Runoff=5.32 cfs 0.427 af

Subcatchment 7B: PDA Runoff Area=15,958 sf 75.99% Impervious Runoff Depth=3.65"
Tc=6.0 min CN=86 Runoff=1.51 cfs 0.112 af

Subcatchment 8A: PDA Runoff Area=15,255 sf 17.73% Impervious Runoff Depth=1.64"
Tc=9.0 min CN=63 Runoff=0.56 cfs 0.048 af

Subcatchment 8B: PDA Runoff Area=12,986 sf 93.02% Impervious Runoff Depth=4.51"
Tc=0.0 min CN=94 Runoff=1.67 cfs 0.112 af

Subcatchment 9: PDA Runoff Area=91,916 sf 85.59% Impervious Runoff Depth=4.18"
Tc=7.8 min CN=91 Runoff=9.17 cfs 0.734 af

Subcatchment 10A: PDA Runoff Area=16,304 sf 37.19% Impervious Runoff Depth=1.94"
Tc=6.0 min CN=67 Runoff=0.81 cfs 0.061 af

Subcatchment 10B: PDA Runoff Area=7,913 sf 9.19% Impervious Runoff Depth=2.19"
Tc=6.0 min CN=70 Runoff=0.45 cfs 0.033 af

Subcatchment 11: PDA Runoff Area=21,783 sf 91.70% Impervious Runoff Depth=4.73"
Tc=6.0 min CN=96 Runoff=2.45 cfs 0.197 af

Subcatchment 13: PDA Runoff Area=10,374 sf 18.59% Impervious Runoff Depth=1.42"
Tc=6.0 min CN=60 Runoff=0.36 cfs 0.028 af

Subcatchment 14A: PDA Runoff Area=31,146 sf 74.91% Impervious Runoff Depth=3.55"
Tc=6.0 min CN=85 Runoff=2.88 cfs 0.212 af

Subcatchment 14B: PDA Runoff Area=68,323 sf 83.25% Impervious Runoff Depth=4.07"
Tc=12.0 min CN=90 Runoff=5.90 cfs 0.532 af

Subcatchment 15: PDA Runoff Area=8,441 sf 93.70% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=95 Runoff=0.94 cfs 0.075 af

Subcatchment 16: PDA Runoff Area=10,846 sf 57.10% Impervious Runoff Depth=2.79"
Tc=6.0 min CN=77 Runoff=0.80 cfs 0.058 af

Subcatchment 17: PDA Runoff Area=4,936 sf 27.21% Impervious Runoff Depth=1.56"
Tc=6.0 min CN=62 Runoff=0.19 cfs 0.015 af

Subcatchment 18A: PDA Runoff Area=16,246 sf 29.48% Impervious Runoff Depth=1.64"
Tc=7.0 min CN=63 Runoff=0.64 cfs 0.051 af

Subcatchment 18B: PDA Runoff Area=95,678 sf 74.30% Impervious Runoff Depth=3.55"
Tc=7.8 min CN=85 Runoff=8.40 cfs 0.650 af

Subcatchment 18C: PDA Runoff Area=83,629 sf 26.75% Impervious Runoff Depth=2.35"
Tc=31.7 min CN=72 Runoff=2.89 cfs 0.376 af

Subcatchment 18D1: PDA Runoff Area=78,460 sf 11.48% Impervious Runoff Depth=2.10"
Flow Length=1,330' Slope=0.0410 '/' Tc=21.6 min CN=69 Runoff=2.83 cfs 0.316 af

Subcatchment 18D2: PDA Runoff Area=1,103 sf 91.12% Impervious Runoff Depth=4.51"
Tc=6.0 min CN=94 Runoff=0.12 cfs 0.010 af

Subcatchment 19: PDA Runoff Area=4,847 sf 78.54% Impervious Runoff Depth=3.76"
Tc=0.0 min CN=87 Runoff=0.55 cfs 0.035 af

Subcatchment 20A: PDA Runoff Area=83,763 sf 14.91% Impervious Runoff Depth=3.96"
Tc=6.0 min CN=89 Runoff=8.46 cfs 0.635 af

Subcatchment 20B: PDA Runoff Area=134,369 sf 54.88% Impervious Runoff Depth=3.76"
Flow Length=455' Slope=0.0900 '/' Tc=16.1 min CN=87 Runoff=9.81 cfs 0.966 af

Subcatchment 21: PDA Runoff Area=4,080 sf 37.13% Impervious Runoff Depth=3.45"
Tc=6.0 min CN=84 Runoff=0.37 cfs 0.027 af

Reach DP1: Inflow=3.14 cfs 0.257 af
Outflow=3.14 cfs 0.257 af

Reach DP10: Inflow=1.27 cfs 0.094 af
Outflow=1.27 cfs 0.094 af

Reach DP11: Inflow=2.45 cfs 0.197 af
Outflow=2.45 cfs 0.197 af

Reach DP12:

Reach DP13: Inflow=0.36 cfs 0.028 af
Outflow=0.36 cfs 0.028 af

Reach DP14: Inflow=5.96 cfs 0.663 af
Outflow=5.96 cfs 0.663 af

Reach DP15: Inflow=0.94 cfs 0.075 af
Outflow=0.94 cfs 0.075 af

Reach DP16: Inflow=0.80 cfs 0.058 af
Outflow=0.80 cfs 0.058 af

Reach DP17: Inflow=0.19 cfs 0.015 af
Outflow=0.19 cfs 0.015 af

Reach DP18: Inflow=10.82 cfs 1.381 af
Outflow=10.82 cfs 1.381 af

Reach DP19: Inflow=0.55 cfs 0.035 af
Outflow=0.55 cfs 0.035 af

Reach DP2: Inflow=1.27 cfs 0.101 af
Outflow=1.27 cfs 0.101 af

Reach DP20: Inflow=15.42 cfs 1.544 af
Outflow=15.42 cfs 1.544 af

Reach DP21: Inflow=0.37 cfs 0.027 af
Outflow=0.37 cfs 0.027 af

Reach DP3:

Reach DP4: Inflow=18.07 cfs 1.733 af
Outflow=18.07 cfs 1.733 af

Reach DP5: Inflow=0.70 cfs 0.057 af
Outflow=0.70 cfs 0.057 af

Reach DP6: Inflow=0.05 cfs 0.004 af
Outflow=0.05 cfs 0.004 af

Reach DP7: Inflow=6.82 cfs 0.539 af
Outflow=6.82 cfs 0.539 af

Reach DP8: Inflow=1.91 cfs 0.160 af
Outflow=1.91 cfs 0.160 af

Reach DP9: Inflow=9.17 cfs 0.734 af
Outflow=9.17 cfs 0.734 af

Pond 1P: DEP WETLAND W/ VERNAL POOLS Inflow=0.70 cfs 0.057 af
Primary=0.70 cfs 0.057 af

Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=0.05 cfs 0.004 af
Primary=0.05 cfs 0.004 af

Pond 2P: Bypass DMH (7-25) Peak Elev=86.80' Inflow=8.46 cfs 0.635 af
Primary=4.88 cfs 0.596 af Secondary=3.59 cfs 0.040 af Outflow=8.46 cfs 0.635 af

Pond SCM1: Subsurface Infiltration System Peak Elev=88.58' Storage=5,095 cf Inflow=2.88 cfs 0.212 af
Outflow=0.40 cfs 0.131 af

Pond SCM2: Old Main St Infiltration Basin Peak Elev=88.01' Storage=2,639 cf Inflow=2.83 cfs 0.316 af
Outflow=2.05 cfs 0.294 af

Pond SCM3: Subsurface Infiltration System Peak Elev=86.80' Storage=7,770 cf Inflow=4.88 cfs 0.596 af
Outflow=4.65 cfs 0.539 af

Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=18.07 cfs 1.733 af
Primary=18.07 cfs 1.733 af

Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49 Inflow=1.91 cfs 0.160 af
Primary=1.91 cfs 0.160 af

Pond W-C/D: Wetland C/D Inflow=8.14 cfs 0.699 af
Primary=8.14 cfs 0.699 af

Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49 Inflow=6.82 cfs 0.539 af
Primary=6.82 cfs 0.539 af

Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=9.17 cfs 0.734 af
Primary=9.17 cfs 0.734 af

Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=1.27 cfs 0.094 af
Primary=1.27 cfs 0.094 af

Pond W-H: Inflow=10.82 cfs 1.381 af
Primary=10.82 cfs 1.381 af

Pond W-I: Wetland I Inflow=2.45 cfs 0.197 af
Primary=2.45 cfs 0.197 af

Total Runoff Area = 26.014 ac Runoff Volume = 7.860 af Average Runoff Depth = 3.63"
38.09% Pervious = 9.908 ac 61.91% Impervious = 16.106 ac

Summary for Subcatchment 1: PDA

Runoff = 3.14 cfs @ 12.09 hrs, Volume= 0.257 af, Depth= 4.85"
Routed to Reach DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
26,797	98	Paved roads w/curbs & sewers, HSG A
877	68	<50% Grass cover, Poor, HSG A
27,674	97	Weighted Average
877		3.17% Pervious Area
26,797		96.83% Impervious Area

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

Summary for Subcatchment 2: PDA

Runoff = 1.27 cfs @ 12.09 hrs, Volume= 0.101 af, Depth= 4.62"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
10,768	98	Paved roads w/curbs & sewers, HSG A
618	49	50-75% Grass cover, Fair, HSG A
11,386	95	Weighted Average
618		5.43% Pervious Area
10,768		94.57% Impervious Area

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

Summary for Subcatchment 4: PDA

Runoff = 18.07 cfs @ 12.18 hrs, Volume= 1.733 af, Depth= 4.28"
Routed to Reach DP4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
183,183	98	Paved roads w/curbs & sewers, HSG A
23,753	49	50-75% Grass cover, Fair, HSG A
2,716	69	50-75% Grass cover, Fair, HSG B
1,808	36	Woods, Fair, HSG A
211,460	92	Weighted Average
28,277		13.37% Pervious Area
183,183		86.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 5: PDA

Runoff = 0.70 cfs @ 12.13 hrs, Volume= 0.057 af, Depth= 2.10"
Routed to Reach DP5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
6,302	98	Paved roads w/curbs & sewers, HSG A
3,465	49	50-75% Grass cover, Fair, HSG A
4,497	45	Woods, Poor, HSG A
14,264	69	Weighted Average
7,962		55.82% Pervious Area
6,302		44.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 6: PDA

Runoff = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af, Depth= 4.96"
Routed to Reach DP6 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
422	98	Paved roads w/curbs & sewers, HSG B
422		100.00% Impervious Area

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

Summary for Subcatchment 7A: PDA

Runoff = 5.32 cfs @ 12.10 hrs, Volume= 0.427 af, Depth= 4.51"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
44,349	98	Paved roads w/curbs & sewers, HSG A
2,465	49	50-75% Grass cover, Fair, HSG A
388	36	Woods, Fair, HSG A
2,385	76	Gravel roads, HSG A
49,587	94	Weighted Average
5,238		10.56% Pervious Area
44,349		89.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 7B: PDA

Runoff = 1.51 cfs @ 12.09 hrs, Volume= 0.112 af, Depth= 3.65"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
12,126	98	Paved roads w/curbs & sewers, HSG A
3,832	49	50-75% Grass cover, Fair, HSG A
15,958	86	Weighted Average
3,832		24.01% Pervious Area
12,126		75.99% Impervious Area

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

Summary for Subcatchment 8A: PDA

Runoff = 0.56 cfs @ 12.14 hrs, Volume= 0.048 af, Depth= 1.64"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
2,704	98	Paved roads w/curbs & sewers, HSG B
8,860	49	50-75% Grass cover, Fair, HSG A
3,647	69	50-75% Grass cover, Fair, HSG B
44	85	Gravel roads, HSG B
0	60	Woods, Fair, HSG B
15,255	63	Weighted Average
12,551		82.27% Pervious Area
2,704		17.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 8B: PDA

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.67 cfs @ 12.00 hrs, Volume= 0.112 af, Depth= 4.51"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
735	36	Woods, Fair, HSG A
172	49	50-75% Grass cover, Fair, HSG A
12,079	98	Paved roads w/curbs & sewers, HSG A
12,986	94	Weighted Average
907		6.98% Pervious Area
12,079		93.02% Impervious Area

Summary for Subcatchment 9: PDA

Runoff = 9.17 cfs @ 12.11 hrs, Volume= 0.734 af, Depth= 4.18"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
78,674	98	Paved roads w/curbs & sewers, HSG A
1,850	76	Gravel roads, HSG A
11,392	49	50-75% Grass cover, Fair, HSG A
91,916	91	Weighted Average
13,242		14.41% Pervious Area
78,674		85.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 10A: PDA

Runoff = 0.81 cfs @ 12.10 hrs, Volume= 0.061 af, Depth= 1.94"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
6,063	98	Paved roads w/curbs & sewers, HSG A
10,241	49	50-75% Grass cover, Fair, HSG A
16,304	67	Weighted Average
10,241		62.81% Pervious Area
6,063		37.19% Impervious Area

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

Summary for Subcatchment 10B: PDA

Runoff = 0.45 cfs @ 12.10 hrs, Volume= 0.033 af, Depth= 2.19"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
727	98	Paved roads w/curbs & sewers, HSG A
2,461	49	50-75% Grass cover, Fair, HSG A
4,725	76	Gravel roads, HSG A
7,913	70	Weighted Average
7,186		90.81% Pervious Area
727		9.19% Impervious Area

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

Summary for Subcatchment 11: PDA

Runoff = 2.45 cfs @ 12.09 hrs, Volume= 0.197 af, Depth= 4.73"
Routed to Reach DP11 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
19,976	98	Paved roads w/curbs & sewers, HSG B
1,807	69	50-75% Grass cover, Fair, HSG B
21,783	96	Weighted Average
1,807		8.30% Pervious Area
19,976		91.70% Impervious Area

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

Summary for Subcatchment 13: PDA

Runoff = 0.36 cfs @ 12.10 hrs, Volume= 0.028 af, Depth= 1.42"
Routed to Reach DP13 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
1,929	98	Paved roads w/curbs & sewers, HSG A
7,698	49	50-75% Grass cover, Fair, HSG A
747	76	Gravel roads, HSG A
10,374	60	Weighted Average
8,445		81.41% Pervious Area
1,929		18.59% Impervious Area

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

Summary for Subcatchment 14A: PDA

Runoff = 2.88 cfs @ 12.09 hrs, Volume= 0.212 af, Depth= 3.55"
Routed to Pond SCM1 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
23,330	98	Paved roads w/curbs & sewers, HSG A
6,350	39	>75% Grass cover, Good, HSG A
1,466	76	Gravel roads, HSG A
31,146	85	Weighted Average
7,816		25.09% Pervious Area
23,330		74.91% Impervious Area

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

Summary for Subcatchment 14B: PDA

Runoff = 5.90 cfs @ 12.16 hrs, Volume= 0.532 af, Depth= 4.07"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
56,877	98	Paved roads w/curbs & sewers, HSG A
11,446	49	50-75% Grass cover, Fair, HSG A
68,323	90	Weighted Average
11,446		16.75% Pervious Area
56,877		83.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 15: PDA

Runoff = 0.94 cfs @ 12.09 hrs, Volume= 0.075 af, Depth= 4.62"
Routed to Reach DP15 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
7,909	98	Paved roads w/curbs & sewers, HSG A
532	49	50-75% Grass cover, Fair, HSG A
8,441	95	Weighted Average
532		6.30% Pervious Area
7,909		93.70% Impervious Area

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

Summary for Subcatchment 16: PDA

Runoff = 0.80 cfs @ 12.09 hrs, Volume= 0.058 af, Depth= 2.79"
Routed to Reach DP16 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
6,193	98	Paved roads w/curbs & sewers, HSG A
4,653	49	50-75% Grass cover, Fair, HSG A
10,846	77	Weighted Average
4,653		42.90% Pervious Area
6,193		57.10% Impervious Area

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

Summary for Subcatchment 17: PDA

Runoff = 0.19 cfs @ 12.10 hrs, Volume= 0.015 af, Depth= 1.56"
Routed to Reach DP17 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
1,343	98	Paved roads w/curbs & sewers, HSG A
3,593	49	50-75% Grass cover, Fair, HSG A
0	76	Gravel roads, HSG A
4,936	62	Weighted Average
3,593		72.79% Pervious Area
1,343		27.21% Impervious Area

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

Summary for Subcatchment 18A: PDA

Runoff = 0.64 cfs @ 12.11 hrs, Volume= 0.051 af, Depth= 1.64"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
4,790	98	Paved roads w/curbs & sewers, HSG A
11,456	49	50-75% Grass cover, Fair, HSG A
16,246	63	Weighted Average
11,456		70.52% Pervious Area
4,790		29.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18B: PDA

Runoff = 8.40 cfs @ 12.11 hrs, Volume= 0.650 af, Depth= 3.55"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

	Area (sf)	CN	Description
*	71,087	98	Impervious
	20,290	49	50-75% Grass cover, Fair, HSG A
	4,301	36	Woods, Fair, HSG A
	95,678	85	Weighted Average
	24,591		25.70% Pervious Area
	71,087		74.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18C: PDA

Runoff = 2.89 cfs @ 12.46 hrs, Volume= 0.376 af, Depth= 2.35"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

	Area (sf)	CN	Description
*	22,372	98	Impervious
	850	49	50-75% Grass cover, Fair, HSG A
	22,494	36	Woods, Fair, HSG A
	37,913	79	Woods, Fair, HSG D
	83,629	72	Weighted Average
	61,257		73.25% Pervious Area
	22,372		26.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18D1: PDA

Runoff = 2.83 cfs @ 12.31 hrs, Volume= 0.316 af, Depth= 2.10"
Routed to Pond SCM2 : Old Main St Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

	Area (sf)	CN	Description
*	9,006	98	Impervious
	6,850	39	>75% Grass cover, Good, HSG A
	18,155	36	Woods, Fair, HSG A
	7,463	79	Woods, Fair, HSG D
	20,912	76	Gravel roads, HSG A
	16,074	91	Gravel roads, HSG D
	78,460	69	Weighted Average
	69,454		88.52% Pervious Area
	9,006		11.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0410	1.62		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
21.1	1,280	0.0410	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.6	1,330	Total			

Summary for Subcatchment 18D2: PDA

AREA GOING TO THE EXISTING BMP

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 4.51"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
1,005	98	Paved roads w/curbs & sewers, HSG A
98	49	50-75% Grass cover, Fair, HSG A
1,103	94	Weighted Average
98		8.88% Pervious Area
1,005		91.12% Impervious Area

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

Summary for Subcatchment 19: PDA

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.55 cfs @ 12.00 hrs, Volume= 0.035 af, Depth= 3.76"
Routed to Reach DP19 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
3,807	98	Unconnected pavement, HSG A
1,040	49	50-75% Grass cover, Fair, HSG A
4,847	87	Weighted Average
1,040		21.46% Pervious Area
3,807		78.54% Impervious Area
3,807		100.00% Unconnected

Summary for Subcatchment 20A: PDA

Runoff = 8.46 cfs @ 12.09 hrs, Volume= 0.635 af, Depth= 3.96"
Routed to Pond 2P : Bypass DMH (7-25)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

	Area (sf)	CN	Description
*	12,491	98	Impervious
	2,679	80	>75% Grass cover, Good, HSG D
	18,187	77	Woods, Good, HSG D
	50,406	91	Gravel roads, HSG D
	83,763	89	Weighted Average
	71,272		85.09% Pervious Area
	12,491		14.91% Impervious Area

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

Summary for Subcatchment 20B: PDA

Runoff = 9.81 cfs @ 12.22 hrs, Volume= 0.966 af, Depth= 3.76"
Routed to Reach DP20 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

	Area (sf)	CN	Description
*	73,748	98	Impervious
	8,414	74	>75% Grass cover, Good, HSG C
	5,511	80	>75% Grass cover, Good, HSG D
	23,542	70	Woods, Good, HSG C
	23,154	77	Woods, Good, HSG D
	0	91	Gravel roads, HSG D
	134,369	87	Weighted Average
	60,621		45.12% Pervious Area
	73,748		54.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0900	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
4.5	405	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	455	Total			

Summary for Subcatchment 21: PDA

Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 3.45"
Routed to Reach DP21 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10y24h Rainfall=5.20"

Area (sf)	CN	Description
1,515	98	Paved roads w/curbs & sewers, HSG C
917	79	50-75% Grass cover, Fair, HSG C
1,648	73	Woods, Fair, HSG C
4,080	84	Weighted Average
2,565		62.87% Pervious Area
1,515		37.13% Impervious Area

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

Summary for Reach DP1:

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

Inflow Area = 0.635 ac, 96.83% Impervious, Inflow Depth = 4.85" for 10y24h event
Inflow = 3.14 cfs @ 12.09 hrs, Volume= 0.257 af
Outflow = 3.14 cfs @ 12.09 hrs, Volume= 0.257 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP10:

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

Inflow Area = 0.556 ac, 28.04% Impervious, Inflow Depth = 2.02" for 10y24h event
Inflow = 1.27 cfs @ 12.10 hrs, Volume= 0.094 af
Outflow = 1.27 cfs @ 12.10 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-G : UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP11:

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

Inflow Area = 0.500 ac, 91.70% Impervious, Inflow Depth = 4.73" for 10y24h event
Inflow = 2.45 cfs @ 12.09 hrs, Volume= 0.197 af
Outflow = 2.45 cfs @ 12.09 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-I : Wetland I

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP12:

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

Summary for Reach DP13:

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

Inflow Area = 0.238 ac, 18.59% Impervious, Inflow Depth = 1.42" for 10y24h event
Inflow = 0.36 cfs @ 12.10 hrs, Volume= 0.028 af
Outflow = 0.36 cfs @ 12.10 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP14:

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

Inflow Area = 2.283 ac, 80.64% Impervious, Inflow Depth = 3.48" for 10y24h event
Inflow = 5.96 cfs @ 12.17 hrs, Volume= 0.663 af
Outflow = 5.96 cfs @ 12.17 hrs, Volume= 0.663 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP15:

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

Inflow Area = 0.194 ac, 93.70% Impervious, Inflow Depth = 4.62" for 10y24h event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 0.075 af
Outflow = 0.94 cfs @ 12.09 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP16:

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

Inflow Area = 0.249 ac, 57.10% Impervious, Inflow Depth = 2.79" for 10y24h event
Inflow = 0.80 cfs @ 12.09 hrs, Volume= 0.058 af
Outflow = 0.80 cfs @ 12.09 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP17:

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

Inflow Area = 0.113 ac, 27.21% Impervious, Inflow Depth = 1.56" for 10y24h event
Inflow = 0.19 cfs @ 12.10 hrs, Volume= 0.015 af
Outflow = 0.19 cfs @ 12.10 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP18:

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

Inflow Area = 6.316 ac, 39.35% Impervious, Inflow Depth = 2.62" for 10y24h event
Inflow = 10.82 cfs @ 12.12 hrs, Volume= 1.381 af
Outflow = 10.82 cfs @ 12.12 hrs, Volume= 1.381 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-H :

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP19:

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

Inflow Area = 0.111 ac, 78.54% Impervious, Inflow Depth = 3.76" for 10y24h event
Inflow = 0.55 cfs @ 12.00 hrs, Volume= 0.035 af
Outflow = 0.55 cfs @ 12.00 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2:

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

Inflow Area = 0.261 ac, 94.57% Impervious, Inflow Depth = 4.62" for 10y24h event
Inflow = 1.27 cfs @ 12.09 hrs, Volume= 0.101 af
Outflow = 1.27 cfs @ 12.09 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP20:

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

Inflow Area = 5.008 ac, 39.54% Impervious, Inflow Depth = 3.70" for 10y24h event
Inflow = 15.42 cfs @ 12.16 hrs, Volume= 1.544 af
Outflow = 15.42 cfs @ 12.16 hrs, Volume= 1.544 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP21:

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

Inflow Area = 0.094 ac, 37.13% Impervious, Inflow Depth = 3.45" for 10y24h event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 0.027 af
Outflow = 0.37 cfs @ 12.09 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3:

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

Summary for Reach DP4:

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

Inflow Area = 4.854 ac, 86.63% Impervious, Inflow Depth = 4.28" for 10y24h event
Inflow = 18.07 cfs @ 12.18 hrs, Volume= 1.733 af
Outflow = 18.07 cfs @ 12.18 hrs, Volume= 1.733 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5:

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

Inflow Area = 0.327 ac, 44.18% Impervious, Inflow Depth = 2.10" for 10y24h event
Inflow = 0.70 cfs @ 12.13 hrs, Volume= 0.057 af
Outflow = 0.70 cfs @ 12.13 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : DEP WETLAND W/ VERNAL POOLS

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6:

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

Inflow Area = 0.010 ac,100.00% Impervious, Inflow Depth = 4.96" for 10y24h event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af
Outflow = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1W : DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP7:

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

Inflow Area = 1.505 ac, 86.16% Impervious, Inflow Depth = 4.30" for 10y24h event
Inflow = 6.82 cfs @ 12.10 hrs, Volume= 0.539 af
Outflow = 6.82 cfs @ 12.10 hrs, Volume= 0.539 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-D : DOWNSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP8:

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

Inflow Area = 0.648 ac, 52.35% Impervious, Inflow Depth = 2.96" for 10y24h event
Inflow = 1.91 cfs @ 12.01 hrs, Volume= 0.160 af
Outflow = 1.91 cfs @ 12.01 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C : UPSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP9:

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

Inflow Area = 2.110 ac, 85.59% Impervious, Inflow Depth = 4.18" for 10y24h event
Inflow = 9.17 cfs @ 12.11 hrs, Volume= 0.734 af
Outflow = 9.17 cfs @ 12.11 hrs, Volume= 0.734 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-E : DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: DEP WETLAND W/ VERNAL POOLS

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

Inflow Area = 0.327 ac, 44.18% Impervious, Inflow Depth = 2.10" for 10y24h event
Inflow = 0.70 cfs @ 12.13 hrs, Volume= 0.057 af
Primary = 0.70 cfs @ 12.13 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 0.010 ac,100.00% Impervious, Inflow Depth = 4.96" for 10y24h event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af
Primary = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Bypass DMH (7-25)

Inflow Area = 1.923 ac, 14.91% Impervious, Inflow Depth = 3.96" for 10y24h event
Inflow = 8.46 cfs @ 12.09 hrs, Volume= 0.635 af
Outflow = 8.46 cfs @ 12.09 hrs, Volume= 0.635 af, Atten= 0%, Lag= 0.0 min
Primary = 4.88 cfs @ 12.09 hrs, Volume= 0.596 af
Routed to Pond SCM3 : Subsurface Infiltration System
Secondary = 3.59 cfs @ 12.09 hrs, Volume= 0.040 af
Routed to Reach DP20 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 86.80' @ 12.09 hrs
Flood Elev= 89.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**12.0" Round Culvert** L= 104.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 84.00' / 83.42' S= 0.0056 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Secondary	85.00'	**18.0" Round Culvert** L= 114.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 85.00' / 84.45' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#3	Device 2	86.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=4.86 cfs @ 12.09 hrs HW=86.79' (Free Discharge)
└**1=Culvert** (Barrel Controls 4.86 cfs @ 6.19 fps)

Secondary OutFlow Max=3.39 cfs @ 12.09 hrs HW=86.79' (Free Discharge)
└**2=Culvert** (Passes 3.39 cfs of 7.84 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 3.39 cfs @ 2.23 fps)

Summary for Pond SCM1: Subsurface Infiltration System

Inflow Area = 0.715 ac, 74.91% Impervious, Inflow Depth = 3.55" for 10y24h event
Inflow = 2.88 cfs @ 12.09 hrs, Volume= 0.212 af
Outflow = 0.40 cfs @ 12.64 hrs, Volume= 0.131 af, Atten= 86%, Lag= 33.0 min
Primary = 0.40 cfs @ 12.64 hrs, Volume= 0.131 af
Routed to Reach DP14 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 88.58' @ 12.64 hrs Surf.Area= 3,941 sf Storage= 5,095 cf

Plug-Flow detention time= 276.4 min calculated for 0.131 af (62% of inflow)
Center-of-Mass det. time= 175.9 min (981.9 - 806.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	86.55'	3,240 cf	**44.25'W x 89.06'L x 4.00'H Field A** 15,763 cf Overall - 4,962 cf Embedded = 10,802 cf x 30.0% Voids
#2A	87.05'	4,962 cf	**ADS_StormTech SC-740 +Cap** x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 108 Chambers in 9 Rows
		8,202 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.50'	**15.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 87.50' / 86.10' S= 0.0093 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	89.85'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#3	Device 1	88.00'	**5.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.40 cfs @ 12.64 hrs HW=88.58' (Free Discharge)
└**1=Culvert** (Passes 0.40 cfs of 3.97 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice** (Orifice Controls 0.40 cfs @ 2.92 fps)

Summary for Pond SCM2: Old Main St Infiltration Basin

Inflow Area = 1.801 ac, 11.48% Impervious, Inflow Depth = 2.10" for 10y24h event
Inflow = 2.83 cfs @ 12.31 hrs, Volume= 0.316 af
Outflow = 2.05 cfs @ 12.54 hrs, Volume= 0.294 af, Atten= 27%, Lag= 13.3 min
Primary = 2.05 cfs @ 12.54 hrs, Volume= 0.294 af
Routed to Reach DP18 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 88.01' @ 12.54 hrs Surf.Area= 1,655 sf Storage= 2,639 cf

Plug-Flow detention time= 66.6 min calculated for 0.294 af (93% of inflow)
Center-of-Mass det. time= 29.9 min (892.5 - 862.6)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	4,546 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)
85.00	235	113.0	0	0	235
86.00	620	160.0	412	412	1,265
87.00	1,100	201.0	849	1,261	2,457
88.00	1,651	240.0	1,366	2,627	3,843
89.00	2,200	259.0	1,919	4,546	4,638

Device	Routing	Invert	Outlet Devices
#1	Primary	84.75'	**12.0" Round RCP_Round 12"** L= 24.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.75' / 84.50' S= 0.0104 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	88.30'	**2.0" x 2.0" Horiz. Inlet Grate X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#3	Device 1	86.70'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.05 cfs @ 12.54 hrs HW=88.01' (Free Discharge)
└**1=RCP_Round 12"** (Passes 2.05 cfs of 6.28 cfs potential flow)
  └**2=Inlet Grate** (Controls 0.00 cfs)
  └**3=Orifice** (Orifice Controls 2.05 cfs @ 4.64 fps)

Summary for Pond SCM3: Subsurface Infiltration System

[81] Warning: Exceeded Pond 2P by 1.83' @ 12.60 hrs

Inflow Area = 1.923 ac, 14.91% Impervious, Inflow Depth = 3.72" for 10y24h event
Inflow = 4.88 cfs @ 12.09 hrs, Volume= 0.596 af
Outflow = 4.65 cfs @ 12.18 hrs, Volume= 0.539 af, Atten= 5%, Lag= 5.5 min
Primary = 4.65 cfs @ 12.18 hrs, Volume= 0.539 af
Routed to Reach DP20 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 86.80' @ 12.18 hrs Surf.Area= 3,740 sf Storage= 7,770 cf

Plug-Flow detention time= 127.5 min calculated for 0.539 af (90% of inflow)
Center-of-Mass det. time= 81.6 min (879.1 - 797.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	82.80'	3,175 cf	**30.00'W x 124.66'L x 4.08'H Field A** 15,270 cf Overall - 4,686 cf Embedded = 10,585 cf x 30.0% Voids
#2A	83.38'	4,686 cf	**ADS_StormTech SC-740 +Cap** x 102 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 102 Chambers in 6 Rows
		7,861 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	83.94'	**12.0" Round Culvert** L= 31.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 83.94' / 83.77' S= 0.0055 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	86.40'	**3.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#3	Device 1	84.00'	**6.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.60 cfs @ 12.18 hrs HW=86.80' (Free Discharge)
└**1=Culvert** (Passes 4.60 cfs of 5.81 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 3.09 cfs @ 2.27 fps)
  └**3=Orifice** (Orifice Controls 1.51 cfs @ 7.69 fps)

Summary for Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 4.854 ac, 86.63% Impervious, Inflow Depth = 4.28" for 10y24h event
Inflow = 18.07 cfs @ 12.18 hrs, Volume= 1.733 af
Primary = 18.07 cfs @ 12.18 hrs, Volume= 1.733 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 0.648 ac, 52.35% Impervious, Inflow Depth = 2.96" for 10y24h event
Inflow = 1.91 cfs @ 12.01 hrs, Volume= 0.160 af
Primary = 1.91 cfs @ 12.01 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland C/D

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-C/D: Wetland C/D

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

Inflow Area = 2.153 ac, 75.98% Impervious, Inflow Depth = 3.89" for 10y24h event
Inflow = 8.14 cfs @ 12.09 hrs, Volume= 0.699 af
Primary = 8.14 cfs @ 12.09 hrs, Volume= 0.699 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 1.505 ac, 86.16% Impervious, Inflow Depth = 4.30" for 10y24h event
Inflow = 6.82 cfs @ 12.10 hrs, Volume= 0.539 af
Primary = 6.82 cfs @ 12.10 hrs, Volume= 0.539 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland C/D

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 2.110 ac, 85.59% Impervious, Inflow Depth = 4.18" for 10y24h event
Inflow = 9.17 cfs @ 12.11 hrs, Volume= 0.734 af
Primary = 9.17 cfs @ 12.11 hrs, Volume= 0.734 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 0.556 ac, 28.04% Impervious, Inflow Depth = 2.02" for 10y24h event
Inflow = 1.27 cfs @ 12.10 hrs, Volume= 0.094 af
Primary = 1.27 cfs @ 12.10 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-H:

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

Inflow Area = 6.316 ac, 39.35% Impervious, Inflow Depth = 2.62" for 10y24h event
Inflow = 10.82 cfs @ 12.12 hrs, Volume= 1.381 af
Primary = 10.82 cfs @ 12.12 hrs, Volume= 1.381 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-I: Wetland I

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

Inflow Area = 0.500 ac, 91.70% Impervious, Inflow Depth = 4.73" for 10y24h event
Inflow = 2.45 cfs @ 12.09 hrs, Volume= 0.197 af
Primary = 2.45 cfs @ 12.09 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: PDA Runoff Area=27,674 sf 96.83% Impervious Runoff Depth=6.03"
Tc=6.0 min CN=97 Runoff=3.87 cfs 0.319 af

Subcatchment 2: PDA Runoff Area=11,386 sf 94.57% Impervious Runoff Depth=5.80"
Tc=6.0 min CN=95 Runoff=1.57 cfs 0.126 af

Subcatchment 4: PDA Runoff Area=211,460 sf 86.63% Impervious Runoff Depth=5.45"
Tc=13.6 min CN=92 Runoff=22.70 cfs 2.206 af

Subcatchment 5: PDA Runoff Area=14,264 sf 44.18% Impervious Runoff Depth=3.02"
Tc=8.8 min CN=69 Runoff=1.03 cfs 0.082 af

Subcatchment 6: PDA Runoff Area=422 sf 100.00% Impervious Runoff Depth=6.15"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment 7A: PDA Runoff Area=49,587 sf 89.44% Impervious Runoff Depth=5.68"
Tc=7.0 min CN=94 Runoff=6.62 cfs 0.539 af

Subcatchment 7B: PDA Runoff Area=15,958 sf 75.99% Impervious Runoff Depth=4.78"
Tc=6.0 min CN=86 Runoff=1.95 cfs 0.146 af

Subcatchment 8A: PDA Runoff Area=15,255 sf 17.73% Impervious Runoff Depth=2.45"
Tc=9.0 min CN=63 Runoff=0.87 cfs 0.072 af

Subcatchment 8B: PDA Runoff Area=12,986 sf 93.02% Impervious Runoff Depth=5.68"
Tc=0.0 min CN=94 Runoff=2.08 cfs 0.141 af

Subcatchment 9: PDA Runoff Area=91,916 sf 85.59% Impervious Runoff Depth=5.34"
Tc=7.8 min CN=91 Runoff=11.56 cfs 0.939 af

Subcatchment 10A: PDA Runoff Area=16,304 sf 37.19% Impervious Runoff Depth=2.83"
Tc=6.0 min CN=67 Runoff=1.21 cfs 0.088 af

Subcatchment 10B: PDA Runoff Area=7,913 sf 9.19% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=70 Runoff=0.65 cfs 0.047 af

Subcatchment 11: PDA Runoff Area=21,783 sf 91.70% Impervious Runoff Depth=5.92"
Tc=6.0 min CN=96 Runoff=3.03 cfs 0.247 af

Subcatchment 13: PDA Runoff Area=10,374 sf 18.59% Impervious Runoff Depth=2.18"
Tc=6.0 min CN=60 Runoff=0.57 cfs 0.043 af

Subcatchment 14A: PDA Runoff Area=31,146 sf 74.91% Impervious Runoff Depth=4.67"
Tc=6.0 min CN=85 Runoff=3.74 cfs 0.278 af

Subcatchment 14B: PDA Runoff Area=68,323 sf 83.25% Impervious Runoff Depth=5.23"
Tc=12.0 min CN=90 Runoff=7.48 cfs 0.683 af

Subcatchment 15: PDA Runoff Area=8,441 sf 93.70% Impervious Runoff Depth=5.80"
Tc=6.0 min CN=95 Runoff=1.16 cfs 0.094 af

Subcatchment 16: PDA Runoff Area=10,846 sf 57.10% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=77 Runoff=1.09 cfs 0.079 af

Subcatchment 17: PDA Runoff Area=4,936 sf 27.21% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=62 Runoff=0.30 cfs 0.022 af

Subcatchment 18A: PDA Runoff Area=16,246 sf 29.48% Impervious Runoff Depth=2.45"
Tc=7.0 min CN=63 Runoff=1.00 cfs 0.076 af

Subcatchment 18B: PDA Runoff Area=95,678 sf 74.30% Impervious Runoff Depth=4.67"
Tc=7.8 min CN=85 Runoff=10.93 cfs 0.855 af

Subcatchment 18C: PDA Runoff Area=83,629 sf 26.75% Impervious Runoff Depth=3.32"
Tc=31.7 min CN=72 Runoff=4.10 cfs 0.530 af

Subcatchment 18D1: PDA Runoff Area=78,460 sf 11.48% Impervious Runoff Depth=3.02"
Flow Length=1,330' Slope=0.0410 '/' Tc=21.6 min CN=69 Runoff=4.12 cfs 0.453 af

Subcatchment 18D2: PDA Runoff Area=1,103 sf 91.12% Impervious Runoff Depth=5.68"
Tc=6.0 min CN=94 Runoff=0.15 cfs 0.012 af

Subcatchment 19: PDA Runoff Area=4,847 sf 78.54% Impervious Runoff Depth=4.89"
Tc=0.0 min CN=87 Runoff=0.71 cfs 0.045 af

Subcatchment 20A: PDA Runoff Area=83,763 sf 14.91% Impervious Runoff Depth=5.11"
Tc=6.0 min CN=89 Runoff=10.77 cfs 0.819 af

Subcatchment 20B: PDA Runoff Area=134,369 sf 54.88% Impervious Runoff Depth=4.89"
Flow Length=455' Slope=0.0900 '/' Tc=16.1 min CN=87 Runoff=12.64 cfs 1.257 af

Subcatchment 21: PDA Runoff Area=4,080 sf 37.13% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=84 Runoff=0.48 cfs 0.036 af

Reach DP1: Inflow=3.87 cfs 0.319 af
Outflow=3.87 cfs 0.319 af

Reach DP10: Inflow=1.86 cfs 0.135 af
Outflow=1.86 cfs 0.135 af

Reach DP11: Inflow=3.03 cfs 0.247 af
Outflow=3.03 cfs 0.247 af

Reach DP12:

Reach DP13: Inflow=0.57 cfs 0.043 af
Outflow=0.57 cfs 0.043 af

Reach DP14: Inflow=7.92 cfs 0.881 af
Outflow=7.92 cfs 0.881 af

Reach DP15: Inflow=1.16 cfs 0.094 af
Outflow=1.16 cfs 0.094 af

Reach DP16: Inflow=1.09 cfs 0.079 af
Outflow=1.09 cfs 0.079 af

Reach DP17: Inflow=0.30 cfs 0.022 af
Outflow=0.30 cfs 0.022 af

Reach DP18: Inflow=15.13 cfs 1.905 af
Outflow=15.13 cfs 1.905 af

Reach DP19: Inflow=0.71 cfs 0.045 af
Outflow=0.71 cfs 0.045 af

Reach DP2: Inflow=1.57 cfs 0.126 af
Outflow=1.57 cfs 0.126 af

Reach DP20: Inflow=20.09 cfs 2.020 af
Outflow=20.09 cfs 2.020 af

Reach DP21: Inflow=0.48 cfs 0.036 af
Outflow=0.48 cfs 0.036 af

Reach DP3:

Reach DP4: Inflow=22.70 cfs 2.206 af
Outflow=22.70 cfs 2.206 af

Reach DP5: Inflow=1.03 cfs 0.082 af
Outflow=1.03 cfs 0.082 af

Reach DP6: Inflow=0.06 cfs 0.005 af
Outflow=0.06 cfs 0.005 af

Reach DP7: Inflow=8.56 cfs 0.685 af
Outflow=8.56 cfs 0.685 af

Reach DP8: Inflow=2.49 cfs 0.213 af
Outflow=2.49 cfs 0.213 af

Reach DP9: Inflow=11.56 cfs 0.939 af
Outflow=11.56 cfs 0.939 af

Pond 1P: DEP WETLAND W/ VERNAL POOLS Inflow=1.03 cfs 0.082 af
Primary=1.03 cfs 0.082 af

Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=0.06 cfs 0.005 af
Primary=0.06 cfs 0.005 af

Pond 2P: Bypass DMH (7-25) Peak Elev=86.94' Inflow=10.77 cfs 0.819 af
Primary=5.02 cfs 0.742 af Secondary=5.75 cfs 0.078 af Outflow=10.77 cfs 0.819 af

Pond SCM1: Subsurface Infiltration System Peak Elev=89.18' Storage=6,475 cf Inflow=3.74 cfs 0.278 af
Outflow=0.65 cfs 0.198 af

Pond SCM2: Old Main St Infiltration Basin Peak Elev=88.43' Storage=3,376 cf Inflow=4.12 cfs 0.453 af
Outflow=3.64 cfs 0.431 af

Pond SCM3: Subsurface Infiltration System Peak Elev=86.83' Storage=7,800 cf Inflow=5.02 cfs 0.742 af
Outflow=4.99 cfs 0.685 af

Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=22.70 cfs 2.206 af
Primary=22.70 cfs 2.206 af

Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49 Inflow=2.49 cfs 0.213 af
Primary=2.49 cfs 0.213 af

Pond W-C/D: Wetland C/D Inflow=10.38 cfs 0.898 af
Primary=10.38 cfs 0.898 af

Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49 Inflow=8.56 cfs 0.685 af
Primary=8.56 cfs 0.685 af

Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK Inflow=11.56 cfs 0.939 af
Primary=11.56 cfs 0.939 af

Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=1.86 cfs 0.135 af
Primary=1.86 cfs 0.135 af

Pond W-H: Inflow=15.13 cfs 1.905 af
Primary=15.13 cfs 1.905 af

Pond W-I: Wetland I Inflow=3.03 cfs 0.247 af
Primary=3.03 cfs 0.247 af

Total Runoff Area = 26.014 ac Runoff Volume = 10.243 af Average Runoff Depth = 4.72"
38.09% Pervious = 9.908 ac 61.91% Impervious = 16.106 ac

Summary for Subcatchment 1: PDA

Runoff = 3.87 cfs @ 12.09 hrs, Volume= 0.319 af, Depth= 6.03"
Routed to Reach DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
26,797	98	Paved roads w/curbs & sewers, HSG A
877	68	<50% Grass cover, Poor, HSG A
27,674	97	Weighted Average
877		3.17% Pervious Area
26,797		96.83% Impervious Area

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

Summary for Subcatchment 2: PDA

Runoff = 1.57 cfs @ 12.09 hrs, Volume= 0.126 af, Depth= 5.80"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
10,768	98	Paved roads w/curbs & sewers, HSG A
618	49	50-75% Grass cover, Fair, HSG A
11,386	95	Weighted Average
618		5.43% Pervious Area
10,768		94.57% Impervious Area

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

Summary for Subcatchment 4: PDA

Runoff = 22.70 cfs @ 12.18 hrs, Volume= 2.206 af, Depth= 5.45"
Routed to Reach DP4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
183,183	98	Paved roads w/curbs & sewers, HSG A
23,753	49	50-75% Grass cover, Fair, HSG A
2,716	69	50-75% Grass cover, Fair, HSG B
1,808	36	Woods, Fair, HSG A
211,460	92	Weighted Average
28,277		13.37% Pervious Area
183,183		86.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 5: PDA

Runoff = 1.03 cfs @ 12.13 hrs, Volume= 0.082 af, Depth= 3.02"
Routed to Reach DP5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
6,302	98	Paved roads w/curbs & sewers, HSG A
3,465	49	50-75% Grass cover, Fair, HSG A
4,497	45	Woods, Poor, HSG A
14,264	69	Weighted Average
7,962		55.82% Pervious Area
6,302		44.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 6: PDA

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth= 6.15"
Routed to Reach DP6 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
422	98	Paved roads w/curbs & sewers, HSG B
422		100.00% Impervious Area

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

Summary for Subcatchment 7A: PDA

Runoff = 6.62 cfs @ 12.10 hrs, Volume= 0.539 af, Depth= 5.68"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
44,349	98	Paved roads w/curbs & sewers, HSG A
2,465	49	50-75% Grass cover, Fair, HSG A
388	36	Woods, Fair, HSG A
2,385	76	Gravel roads, HSG A
49,587	94	Weighted Average
5,238		10.56% Pervious Area
44,349		89.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 7B: PDA

Runoff = 1.95 cfs @ 12.09 hrs, Volume= 0.146 af, Depth= 4.78"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
12,126	98	Paved roads w/curbs & sewers, HSG A
3,832	49	50-75% Grass cover, Fair, HSG A
15,958	86	Weighted Average
3,832		24.01% Pervious Area
12,126		75.99% Impervious Area

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

Summary for Subcatchment 8A: PDA

Runoff = 0.87 cfs @ 12.14 hrs, Volume= 0.072 af, Depth= 2.45"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
2,704	98	Paved roads w/curbs & sewers, HSG B
8,860	49	50-75% Grass cover, Fair, HSG A
3,647	69	50-75% Grass cover, Fair, HSG B
44	85	Gravel roads, HSG B
0	60	Woods, Fair, HSG B
15,255	63	Weighted Average
12,551		82.27% Pervious Area
2,704		17.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 8B: PDA

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.08 cfs @ 12.00 hrs, Volume= 0.141 af, Depth= 5.68"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
735	36	Woods, Fair, HSG A
172	49	50-75% Grass cover, Fair, HSG A
12,079	98	Paved roads w/curbs & sewers, HSG A
12,986	94	Weighted Average
907		6.98% Pervious Area
12,079		93.02% Impervious Area

Summary for Subcatchment 9: PDA

Runoff = 11.56 cfs @ 12.11 hrs, Volume= 0.939 af, Depth= 5.34"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
78,674	98	Paved roads w/curbs & sewers, HSG A
1,850	76	Gravel roads, HSG A
11,392	49	50-75% Grass cover, Fair, HSG A
91,916	91	Weighted Average
13,242		14.41% Pervious Area
78,674		85.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 10A: PDA

Runoff = 1.21 cfs @ 12.10 hrs, Volume= 0.088 af, Depth= 2.83"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
6,063	98	Paved roads w/curbs & sewers, HSG A
10,241	49	50-75% Grass cover, Fair, HSG A
16,304	67	Weighted Average
10,241		62.81% Pervious Area
6,063		37.19% Impervious Area

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

Summary for Subcatchment 10B: PDA

Runoff = 0.65 cfs @ 12.09 hrs, Volume= 0.047 af, Depth= 3.12"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
727	98	Paved roads w/curbs & sewers, HSG A
2,461	49	50-75% Grass cover, Fair, HSG A
4,725	76	Gravel roads, HSG A
7,913	70	Weighted Average
7,186		90.81% Pervious Area
727		9.19% Impervious Area

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

Summary for Subcatchment 11: PDA

Runoff = 3.03 cfs @ 12.09 hrs, Volume= 0.247 af, Depth= 5.92"
Routed to Reach DP11 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
19,976	98	Paved roads w/curbs & sewers, HSG B
1,807	69	50-75% Grass cover, Fair, HSG B
21,783	96	Weighted Average
1,807		8.30% Pervious Area
19,976		91.70% Impervious Area

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

Summary for Subcatchment 13: PDA

Runoff = 0.57 cfs @ 12.10 hrs, Volume= 0.043 af, Depth= 2.18"
Routed to Reach DP13 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
1,929	98	Paved roads w/curbs & sewers, HSG A
7,698	49	50-75% Grass cover, Fair, HSG A
747	76	Gravel roads, HSG A
10,374	60	Weighted Average
8,445		81.41% Pervious Area
1,929		18.59% Impervious Area

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

Summary for Subcatchment 14A: PDA

Runoff = 3.74 cfs @ 12.09 hrs, Volume= 0.278 af, Depth= 4.67"
Routed to Pond SCM1 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
23,330	98	Paved roads w/curbs & sewers, HSG A
6,350	39	>75% Grass cover, Good, HSG A
1,466	76	Gravel roads, HSG A
31,146	85	Weighted Average
7,816		25.09% Pervious Area
23,330		74.91% Impervious Area

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

Summary for Subcatchment 14B: PDA

Runoff = 7.48 cfs @ 12.16 hrs, Volume= 0.683 af, Depth= 5.23"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
56,877	98	Paved roads w/curbs & sewers, HSG A
11,446	49	50-75% Grass cover, Fair, HSG A
68,323	90	Weighted Average
11,446		16.75% Pervious Area
56,877		83.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 15: PDA

Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.094 af, Depth= 5.80"
Routed to Reach DP15 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
7,909	98	Paved roads w/curbs & sewers, HSG A
532	49	50-75% Grass cover, Fair, HSG A
8,441	95	Weighted Average
532		6.30% Pervious Area
7,909		93.70% Impervious Area

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

Summary for Subcatchment 16: PDA

Runoff = 1.09 cfs @ 12.09 hrs, Volume= 0.079 af, Depth= 3.82"
Routed to Reach DP16 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
6,193	98	Paved roads w/curbs & sewers, HSG A
4,653	49	50-75% Grass cover, Fair, HSG A
10,846	77	Weighted Average
4,653		42.90% Pervious Area
6,193		57.10% Impervious Area

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

Summary for Subcatchment 17: PDA

Runoff = 0.30 cfs @ 12.10 hrs, Volume= 0.022 af, Depth= 2.36"
Routed to Reach DP17 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
1,343	98	Paved roads w/curbs & sewers, HSG A
3,593	49	50-75% Grass cover, Fair, HSG A
0	76	Gravel roads, HSG A
4,936	62	Weighted Average
3,593		72.79% Pervious Area
1,343		27.21% Impervious Area

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

Summary for Subcatchment 18A: PDA

Runoff = 1.00 cfs @ 12.11 hrs, Volume= 0.076 af, Depth= 2.45"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
4,790	98	Paved roads w/curbs & sewers, HSG A
11,456	49	50-75% Grass cover, Fair, HSG A
16,246	63	Weighted Average
11,456		70.52% Pervious Area
4,790		29.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18B: PDA

Runoff = 10.93 cfs @ 12.11 hrs, Volume= 0.855 af, Depth= 4.67"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

	Area (sf)	CN	Description
*	71,087	98	Impervious
	20,290	49	50-75% Grass cover, Fair, HSG A
	4,301	36	Woods, Fair, HSG A
	95,678	85	Weighted Average
	24,591		25.70% Pervious Area
	71,087		74.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18C: PDA

Runoff = 4.10 cfs @ 12.45 hrs, Volume= 0.530 af, Depth= 3.32"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

	Area (sf)	CN	Description
*	22,372	98	Impervious
	850	49	50-75% Grass cover, Fair, HSG A
	22,494	36	Woods, Fair, HSG A
	37,913	79	Woods, Fair, HSG D
	83,629	72	Weighted Average
	61,257		73.25% Pervious Area
	22,372		26.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18D1: PDA

Runoff = 4.12 cfs @ 12.31 hrs, Volume= 0.453 af, Depth= 3.02"
Routed to Pond SCM2 : Old Main St Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

	Area (sf)	CN	Description
*	9,006	98	Impervious
	6,850	39	>75% Grass cover, Good, HSG A
	18,155	36	Woods, Fair, HSG A
	7,463	79	Woods, Fair, HSG D
	20,912	76	Gravel roads, HSG A
	16,074	91	Gravel roads, HSG D
	78,460	69	Weighted Average
	69,454		88.52% Pervious Area
	9,006		11.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0410	1.62		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
21.1	1,280	0.0410	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.6	1,330	Total			

Summary for Subcatchment 18D2: PDA

AREA GOING TO THE EXISTING BMP

Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 5.68"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
1,005	98	Paved roads w/curbs & sewers, HSG A
98	49	50-75% Grass cover, Fair, HSG A
1,103	94	Weighted Average
98		8.88% Pervious Area
1,005		91.12% Impervious Area

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

Summary for Subcatchment 19: PDA

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.71 cfs @ 12.00 hrs, Volume= 0.045 af, Depth= 4.89"
Routed to Reach DP19 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
3,807	98	Unconnected pavement, HSG A
1,040	49	50-75% Grass cover, Fair, HSG A
4,847	87	Weighted Average
1,040		21.46% Pervious Area
3,807		78.54% Impervious Area
3,807		100.00% Unconnected

Summary for Subcatchment 20A: PDA

Runoff = 10.77 cfs @ 12.09 hrs, Volume= 0.819 af, Depth= 5.11"
Routed to Pond 2P : Bypass DMH (7-25)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

	Area (sf)	CN	Description
*	12,491	98	Impervious
	2,679	80	>75% Grass cover, Good, HSG D
	18,187	77	Woods, Good, HSG D
	50,406	91	Gravel roads, HSG D
	83,763	89	Weighted Average
	71,272		85.09% Pervious Area
	12,491		14.91% Impervious Area

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

Summary for Subcatchment 20B: PDA

Runoff = 12.64 cfs @ 12.22 hrs, Volume= 1.257 af, Depth= 4.89"
Routed to Reach DP20 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

	Area (sf)	CN	Description
*	73,748	98	Impervious
	8,414	74	>75% Grass cover, Good, HSG C
	5,511	80	>75% Grass cover, Good, HSG D
	23,542	70	Woods, Good, HSG C
	23,154	77	Woods, Good, HSG D
	0	91	Gravel roads, HSG D
	134,369	87	Weighted Average
	60,621		45.12% Pervious Area
	73,748		54.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0900	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
4.5	405	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	455	Total			

Summary for Subcatchment 21: PDA

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 4.56"
Routed to Reach DP21 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25y24h Rainfall=6.39"

Area (sf)	CN	Description
1,515	98	Paved roads w/curbs & sewers, HSG C
917	79	50-75% Grass cover, Fair, HSG C
1,648	73	Woods, Fair, HSG C
4,080	84	Weighted Average
2,565		62.87% Pervious Area
1,515		37.13% Impervious Area

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

Summary for Reach DP1:

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

Inflow Area = 0.635 ac, 96.83% Impervious, Inflow Depth = 6.03" for 25y24h event
Inflow = 3.87 cfs @ 12.09 hrs, Volume= 0.319 af
Outflow = 3.87 cfs @ 12.09 hrs, Volume= 0.319 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP10:

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

Inflow Area = 0.556 ac, 28.04% Impervious, Inflow Depth = 2.92" for 25y24h event
Inflow = 1.86 cfs @ 12.10 hrs, Volume= 0.135 af
Outflow = 1.86 cfs @ 12.10 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-G : UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP11:

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

Inflow Area = 0.500 ac, 91.70% Impervious, Inflow Depth = 5.92" for 25y24h event
Inflow = 3.03 cfs @ 12.09 hrs, Volume= 0.247 af
Outflow = 3.03 cfs @ 12.09 hrs, Volume= 0.247 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-I : Wetland I

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP12:

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

Summary for Reach DP13:

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

Inflow Area = 0.238 ac, 18.59% Impervious, Inflow Depth = 2.18" for 25y24h event
Inflow = 0.57 cfs @ 12.10 hrs, Volume= 0.043 af
Outflow = 0.57 cfs @ 12.10 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP14:

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

Inflow Area = 2.283 ac, 80.64% Impervious, Inflow Depth = 4.63" for 25y24h event
Inflow = 7.92 cfs @ 12.16 hrs, Volume= 0.881 af
Outflow = 7.92 cfs @ 12.16 hrs, Volume= 0.881 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP15:

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

Inflow Area = 0.194 ac, 93.70% Impervious, Inflow Depth = 5.80" for 25y24h event
Inflow = 1.16 cfs @ 12.09 hrs, Volume= 0.094 af
Outflow = 1.16 cfs @ 12.09 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP16:

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

Inflow Area = 0.249 ac, 57.10% Impervious, Inflow Depth = 3.82" for 25y24h event
Inflow = 1.09 cfs @ 12.09 hrs, Volume= 0.079 af
Outflow = 1.09 cfs @ 12.09 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP17:

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

Inflow Area = 0.113 ac, 27.21% Impervious, Inflow Depth = 2.36" for 25y24h event
Inflow = 0.30 cfs @ 12.10 hrs, Volume= 0.022 af
Outflow = 0.30 cfs @ 12.10 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP18:

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

Inflow Area = 6.316 ac, 39.35% Impervious, Inflow Depth = 3.62" for 25y24h event
Inflow = 15.13 cfs @ 12.12 hrs, Volume= 1.905 af
Outflow = 15.13 cfs @ 12.12 hrs, Volume= 1.905 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-H :

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP19:

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

Inflow Area = 0.111 ac, 78.54% Impervious, Inflow Depth = 4.89" for 25y24h event
Inflow = 0.71 cfs @ 12.00 hrs, Volume= 0.045 af
Outflow = 0.71 cfs @ 12.00 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2:

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

Inflow Area = 0.261 ac, 94.57% Impervious, Inflow Depth = 5.80" for 25y24h event
Inflow = 1.57 cfs @ 12.09 hrs, Volume= 0.126 af
Outflow = 1.57 cfs @ 12.09 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP20:

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

Inflow Area = 5.008 ac, 39.54% Impervious, Inflow Depth = 4.84" for 25y24h event
Inflow = 20.09 cfs @ 12.13 hrs, Volume= 2.020 af
Outflow = 20.09 cfs @ 12.13 hrs, Volume= 2.020 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP21:

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

Inflow Area = 0.094 ac, 37.13% Impervious, Inflow Depth = 4.56" for 25y24h event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 0.036 af
Outflow = 0.48 cfs @ 12.09 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3:

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

Summary for Reach DP4:

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

Inflow Area = 4.854 ac, 86.63% Impervious, Inflow Depth = 5.45" for 25y24h event
Inflow = 22.70 cfs @ 12.18 hrs, Volume= 2.206 af
Outflow = 22.70 cfs @ 12.18 hrs, Volume= 2.206 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5:

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

Inflow Area = 0.327 ac, 44.18% Impervious, Inflow Depth = 3.02" for 25y24h event
Inflow = 1.03 cfs @ 12.13 hrs, Volume= 0.082 af
Outflow = 1.03 cfs @ 12.13 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : DEP WETLAND W/ VERNAL POOLS

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6:

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

Inflow Area = 0.010 ac,100.00% Impervious, Inflow Depth = 6.15" for 25y24h event
Inflow = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af
Outflow = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1W : DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP7:

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

Inflow Area = 1.505 ac, 86.16% Impervious, Inflow Depth = 5.46" for 25y24h event
Inflow = 8.56 cfs @ 12.10 hrs, Volume= 0.685 af
Outflow = 8.56 cfs @ 12.10 hrs, Volume= 0.685 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-D : DOWNSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP8:

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

Inflow Area = 0.648 ac, 52.35% Impervious, Inflow Depth = 3.94" for 25y24h event
Inflow = 2.49 cfs @ 12.01 hrs, Volume= 0.213 af
Outflow = 2.49 cfs @ 12.01 hrs, Volume= 0.213 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C : UPSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP9:

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

Inflow Area = 2.110 ac, 85.59% Impervious, Inflow Depth = 5.34" for 25y24h event
Inflow = 11.56 cfs @ 12.11 hrs, Volume= 0.939 af
Outflow = 11.56 cfs @ 12.11 hrs, Volume= 0.939 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-E : DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: DEP WETLAND W/ VERNAL POOLS

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

Inflow Area = 0.327 ac, 44.18% Impervious, Inflow Depth = 3.02" for 25y24h event
Inflow = 1.03 cfs @ 12.13 hrs, Volume= 0.082 af
Primary = 1.03 cfs @ 12.13 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 0.010 ac,100.00% Impervious, Inflow Depth = 6.15" for 25y24h event
Inflow = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af
Primary = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Bypass DMH (7-25)

Inflow Area = 1.923 ac, 14.91% Impervious, Inflow Depth = 5.11" for 25y24h event
Inflow = 10.77 cfs @ 12.09 hrs, Volume= 0.819 af
Outflow = 10.77 cfs @ 12.09 hrs, Volume= 0.819 af, Atten= 0%, Lag= 0.0 min
Primary = 5.02 cfs @ 12.09 hrs, Volume= 0.742 af
Routed to Pond SCM3 : Subsurface Infiltration System
Secondary = 5.75 cfs @ 12.09 hrs, Volume= 0.078 af
Routed to Reach DP20 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 86.94' @ 12.09 hrs
Flood Elev= 89.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**12.0" Round Culvert** L= 104.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 84.00' / 83.42' S= 0.0056 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Secondary	85.00'	**18.0" Round Culvert** L= 114.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 85.00' / 84.45' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#3	Device 2	86.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=5.00 cfs @ 12.09 hrs HW=86.93' (Free Discharge)
└**1=Culvert** (Barrel Controls 5.00 cfs @ 6.37 fps)

Secondary OutFlow Max=5.49 cfs @ 12.09 hrs HW=86.93' (Free Discharge)
└**2=Culvert** (Passes 5.49 cfs of 8.20 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 5.49 cfs @ 2.68 fps)

Summary for Pond SCM1: Subsurface Infiltration System

Inflow Area = 0.715 ac, 74.91% Impervious, Inflow Depth = 4.67" for 25y24h event
Inflow = 3.74 cfs @ 12.09 hrs, Volume= 0.278 af
Outflow = 0.65 cfs @ 12.56 hrs, Volume= 0.198 af, Atten= 83%, Lag= 28.3 min
Primary = 0.65 cfs @ 12.56 hrs, Volume= 0.198 af
Routed to Reach DP14 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 89.18' @ 12.56 hrs Surf.Area= 3,941 sf Storage= 6,475 cf

Plug-Flow detention time= 239.6 min calculated for 0.198 af (71% of inflow)
Center-of-Mass det. time= 148.4 min (946.7 - 798.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	86.55'	3,240 cf	**44.25'W x 89.06'L x 4.00'H Field A** 15,763 cf Overall - 4,962 cf Embedded = 10,802 cf x 30.0% Voids
#2A	87.05'	4,962 cf	**ADS_StormTech SC-740 +Cap** x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 108 Chambers in 9 Rows
		8,202 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.50'	**15.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 87.50' / 86.10' S= 0.0093 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	89.85'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#3	Device 1	88.00'	**5.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.65 cfs @ 12.56 hrs HW=89.18' (Free Discharge)
└**1=Culvert** (Passes 0.65 cfs of 5.96 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=Orifice** (Orifice Controls 0.65 cfs @ 4.75 fps)

Summary for Pond SCM2: Old Main St Infiltration Basin

Inflow Area = 1.801 ac, 11.48% Impervious, Inflow Depth = 3.02" for 25y24h event
Inflow = 4.12 cfs @ 12.31 hrs, Volume= 0.453 af
Outflow = 3.64 cfs @ 12.43 hrs, Volume= 0.431 af, Atten= 12%, Lag= 7.4 min
Primary = 3.64 cfs @ 12.43 hrs, Volume= 0.431 af
Routed to Reach DP18 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 88.43' @ 12.43 hrs Surf.Area= 1,875 sf Storage= 3,376 cf

Plug-Flow detention time= 52.8 min calculated for 0.431 af (95% of inflow)
Center-of-Mass det. time= 25.7 min (877.7 - 851.9)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	4,546 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)
85.00	235	113.0	0	0	235
86.00	620	160.0	412	412	1,265
87.00	1,100	201.0	849	1,261	2,457
88.00	1,651	240.0	1,366	2,627	3,843
89.00	2,200	259.0	1,919	4,546	4,638

Device	Routing	Invert	Outlet Devices
#1	Primary	84.75'	**12.0" Round RCP_Round 12"** L= 24.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.75' / 84.50' S= 0.0104 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	88.30'	**2.0" x 2.0" Horiz. Inlet Grate X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#3	Device 1	86.70'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.59 cfs @ 12.43 hrs HW=88.42' (Free Discharge)
└**1=RCP_Round 12"** (Passes 3.59 cfs of 6.74 cfs potential flow)
  ├**2=Inlet Grate** (Weir Controls 1.12 cfs @ 1.15 fps)
  └**3=Orifice** (Orifice Controls 2.47 cfs @ 5.59 fps)

Summary for Pond SCM3: Subsurface Infiltration System

[81] Warning: Exceeded Pond 2P by 1.80' @ 12.65 hrs

Inflow Area = 1.923 ac, 14.91% Impervious, Inflow Depth = 4.63" for 25y24h event
Inflow = 5.02 cfs @ 12.09 hrs, Volume= 0.742 af
Outflow = 4.99 cfs @ 12.12 hrs, Volume= 0.685 af, Atten= 1%, Lag= 2.0 min
Primary = 4.99 cfs @ 12.12 hrs, Volume= 0.685 af
Routed to Reach DP20 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 86.83' @ 12.12 hrs Surf.Area= 3,740 sf Storage= 7,800 cf

Plug-Flow detention time= 114.5 min calculated for 0.685 af (92% of inflow)
Center-of-Mass det. time= 75.5 min (867.9 - 792.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	82.80'	3,175 cf	**30.00'W x 124.66'L x 4.08'H Field A** 15,270 cf Overall - 4,686 cf Embedded = 10,585 cf x 30.0% Voids
#2A	83.38'	4,686 cf	**ADS_StormTech SC-740 +Cap** x 102 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 102 Chambers in 6 Rows
		7,861 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	83.94'	**12.0" Round Culvert** L= 31.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 83.94' / 83.77' S= 0.0055 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	86.40'	**3.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#3	Device 1	84.00'	**6.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.94 cfs @ 12.12 hrs HW=86.83' (Free Discharge)
└**1=Culvert** (Passes 4.94 cfs of 5.84 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 3.43 cfs @ 2.36 fps)
  └**3=Orifice** (Orifice Controls 1.52 cfs @ 7.73 fps)

Summary for Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 4.854 ac, 86.63% Impervious, Inflow Depth = 5.45" for 25y24h event
Inflow = 22.70 cfs @ 12.18 hrs, Volume= 2.206 af
Primary = 22.70 cfs @ 12.18 hrs, Volume= 2.206 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 0.648 ac, 52.35% Impervious, Inflow Depth = 3.94" for 25y24h event
Inflow = 2.49 cfs @ 12.01 hrs, Volume= 0.213 af
Primary = 2.49 cfs @ 12.01 hrs, Volume= 0.213 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland C/D

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-C/D: Wetland C/D

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

Inflow Area = 2.153 ac, 75.98% Impervious, Inflow Depth = 5.00" for 25y24h event
Inflow = 10.38 cfs @ 12.09 hrs, Volume= 0.898 af
Primary = 10.38 cfs @ 12.09 hrs, Volume= 0.898 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 1.505 ac, 86.16% Impervious, Inflow Depth = 5.46" for 25y24h event
Inflow = 8.56 cfs @ 12.10 hrs, Volume= 0.685 af
Primary = 8.56 cfs @ 12.10 hrs, Volume= 0.685 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland C/D

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 2.110 ac, 85.59% Impervious, Inflow Depth = 5.34" for 25y24h event
Inflow = 11.56 cfs @ 12.11 hrs, Volume= 0.939 af
Primary = 11.56 cfs @ 12.11 hrs, Volume= 0.939 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 0.556 ac, 28.04% Impervious, Inflow Depth = 2.92" for 25y24h event
Inflow = 1.86 cfs @ 12.10 hrs, Volume= 0.135 af
Primary = 1.86 cfs @ 12.10 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-H:

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

Inflow Area = 6.316 ac, 39.35% Impervious, Inflow Depth = 3.62" for 25y24h event
Inflow = 15.13 cfs @ 12.12 hrs, Volume= 1.905 af
Primary = 15.13 cfs @ 12.12 hrs, Volume= 1.905 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-I: Wetland I

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

Inflow Area = 0.500 ac, 91.70% Impervious, Inflow Depth = 5.92" for 25y24h event
Inflow = 3.03 cfs @ 12.09 hrs, Volume= 0.247 af
Primary = 3.03 cfs @ 12.09 hrs, Volume= 0.247 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: PDA Runoff Area=27,674 sf 96.83% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=97 Runoff=5.00 cfs 0.417 af

Subcatchment 2: PDA Runoff Area=11,386 sf 94.57% Impervious Runoff Depth=7.63"
Tc=6.0 min CN=95 Runoff=2.04 cfs 0.166 af

Subcatchment 4: PDA Runoff Area=211,460 sf 86.63% Impervious Runoff Depth=7.27"
Tc=13.6 min CN=92 Runoff=29.79 cfs 2.941 af

Subcatchment 5: PDA Runoff Area=14,264 sf 44.18% Impervious Runoff Depth=4.55"
Tc=8.8 min CN=69 Runoff=1.55 cfs 0.124 af

Subcatchment 6: PDA Runoff Area=422 sf 100.00% Impervious Runoff Depth=7.99"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment 7A: PDA Runoff Area=49,587 sf 89.44% Impervious Runoff Depth=7.51"
Tc=7.0 min CN=94 Runoff=8.62 cfs 0.712 af

Subcatchment 7B: PDA Runoff Area=15,958 sf 75.99% Impervious Runoff Depth=6.55"
Tc=6.0 min CN=86 Runoff=2.63 cfs 0.200 af

Subcatchment 8A: PDA Runoff Area=15,255 sf 17.73% Impervious Runoff Depth=3.85"
Tc=9.0 min CN=63 Runoff=1.39 cfs 0.112 af

Subcatchment 8B: PDA Runoff Area=12,986 sf 93.02% Impervious Runoff Depth=7.51"
Tc=0.0 min CN=94 Runoff=2.71 cfs 0.187 af

Subcatchment 9: PDA Runoff Area=91,916 sf 85.59% Impervious Runoff Depth=7.15"
Tc=7.8 min CN=91 Runoff=15.24 cfs 1.258 af

Subcatchment 10A: PDA Runoff Area=16,304 sf 37.19% Impervious Runoff Depth=4.31"
Tc=6.0 min CN=67 Runoff=1.86 cfs 0.135 af

Subcatchment 10B: PDA Runoff Area=7,913 sf 9.19% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=70 Runoff=0.97 cfs 0.071 af

Subcatchment 11: PDA Runoff Area=21,783 sf 91.70% Impervious Runoff Depth=7.75"
Tc=6.0 min CN=96 Runoff=3.92 cfs 0.323 af

Subcatchment 13: PDA Runoff Area=10,374 sf 18.59% Impervious Runoff Depth=3.51"
Tc=6.0 min CN=60 Runoff=0.95 cfs 0.070 af

Subcatchment 14A: PDA Runoff Area=31,146 sf 74.91% Impervious Runoff Depth=6.44"
Tc=6.0 min CN=85 Runoff=5.08 cfs 0.383 af

Subcatchment 14B: PDA Runoff Area=68,323 sf 83.25% Impervious Runoff Depth=7.03"
Tc=12.0 min CN=90 Runoff=9.91 cfs 0.919 af

Subcatchment 15: PDA Runoff Area=8,441 sf 93.70% Impervious Runoff Depth=7.63"
Tc=6.0 min CN=95 Runoff=1.51 cfs 0.123 af

Subcatchment 16: PDA Runoff Area=10,846 sf 57.10% Impervious Runoff Depth=5.49"
Tc=6.0 min CN=77 Runoff=1.55 cfs 0.114 af

Subcatchment 17: PDA Runoff Area=4,936 sf 27.21% Impervious Runoff Depth=3.74"
Tc=6.0 min CN=62 Runoff=0.48 cfs 0.035 af

Subcatchment 18A: PDA Runoff Area=16,246 sf 29.48% Impervious Runoff Depth=3.85"
Tc=7.0 min CN=63 Runoff=1.60 cfs 0.120 af

Subcatchment 18B: PDA Runoff Area=95,678 sf 74.30% Impervious Runoff Depth=6.44"
Tc=7.8 min CN=85 Runoff=14.82 cfs 1.178 af

Subcatchment 18C: PDA Runoff Area=83,629 sf 26.75% Impervious Runoff Depth=4.90"
Tc=31.7 min CN=72 Runoff=6.07 cfs 0.783 af

Subcatchment 18D1: PDA Runoff Area=78,460 sf 11.48% Impervious Runoff Depth=4.55"
Flow Length=1,330' Slope=0.0410 '/' Tc=21.6 min CN=69 Runoff=6.25 cfs 0.682 af

Subcatchment 18D2: PDA Runoff Area=1,103 sf 91.12% Impervious Runoff Depth=7.51"
Tc=6.0 min CN=94 Runoff=0.20 cfs 0.016 af

Subcatchment 19: PDA Runoff Area=4,847 sf 78.54% Impervious Runoff Depth=6.67"
Tc=0.0 min CN=87 Runoff=0.95 cfs 0.062 af

Subcatchment 20A: PDA Runoff Area=83,763 sf 14.91% Impervious Runoff Depth=6.91"
Tc=6.0 min CN=89 Runoff=14.31 cfs 1.108 af

Subcatchment 20B: PDA Runoff Area=134,369 sf 54.88% Impervious Runoff Depth=6.67"
Flow Length=455' Slope=0.0900 '/' Tc=16.1 min CN=87 Runoff=16.98 cfs 1.716 af

Subcatchment 21: PDA Runoff Area=4,080 sf 37.13% Impervious Runoff Depth=6.32"
Tc=6.0 min CN=84 Runoff=0.66 cfs 0.049 af

Reach DP1: Inflow=5.00 cfs 0.417 af
Outflow=5.00 cfs 0.417 af

Reach DP10: Inflow=2.83 cfs 0.205 af
Outflow=2.83 cfs 0.205 af

Reach DP11: Inflow=3.92 cfs 0.323 af
Outflow=3.92 cfs 0.323 af

Reach DP12:

Reach DP13: Inflow=0.95 cfs 0.070 af
Outflow=0.95 cfs 0.070 af

Reach DP14: Inflow=11.03 cfs 1.222 af
Outflow=11.03 cfs 1.222 af

Reach DP15: Inflow=1.51 cfs 0.123 af
Outflow=1.51 cfs 0.123 af

Reach DP16: Inflow=1.55 cfs 0.114 af
Outflow=1.55 cfs 0.114 af

Reach DP17: Inflow=0.48 cfs 0.035 af
Outflow=0.48 cfs 0.035 af

Reach DP18: Inflow=21.18 cfs 2.757 af
Outflow=21.18 cfs 2.757 af

Reach DP19: Inflow=0.95 cfs 0.062 af
Outflow=0.95 cfs 0.062 af

Reach DP2: Inflow=2.04 cfs 0.166 af
Outflow=2.04 cfs 0.166 af

Reach DP20: Inflow=26.94 cfs 2.766 af
Outflow=26.94 cfs 2.766 af

Reach DP21: Inflow=0.66 cfs 0.049 af
Outflow=0.66 cfs 0.049 af

Reach DP3:

Reach DP4: Inflow=29.79 cfs 2.941 af
Outflow=29.79 cfs 2.941 af

Reach DP5: Inflow=1.55 cfs 0.124 af
Outflow=1.55 cfs 0.124 af

Reach DP6: Inflow=0.08 cfs 0.006 af
Outflow=0.08 cfs 0.006 af

Reach DP7: Inflow=11.24 cfs 0.913 af
Outflow=11.24 cfs 0.913 af

Reach DP8: Inflow=3.41 cfs 0.299 af
Outflow=3.41 cfs 0.299 af

Reach DP9: Inflow=15.24 cfs 1.258 af
Outflow=15.24 cfs 1.258 af

Pond 1P: DEP WETLAND W/ VERNAL POOLS Inflow=1.55 cfs 0.124 af
Primary=1.55 cfs 0.124 af

Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=0.08 cfs 0.006 af
Primary=0.08 cfs 0.006 af

Pond 2P: Bypass DMH (7-25) Peak Elev=87.24' Inflow=14.31 cfs 1.108 af
Primary=5.30 cfs 0.951 af Secondary=9.01 cfs 0.156 af Outflow=14.31 cfs 1.108 af

Pond SCM1: Subsurface Infiltration System Peak Elev=90.14' Storage=7,713 cf Inflow=5.08 cfs 0.383 af
Outflow=2.48 cfs 0.303 af

Pond SCM2: Old Main St Infiltration Basin Peak Elev=88.69' Storage=3,898 cf Inflow=6.25 cfs 0.682 af
Outflow=5.72 cfs 0.660 af

Pond SCM3: Subsurface Infiltration System Peak Elev=86.85' Storage=7,821 cf Inflow=5.30 cfs 0.951 af
Outflow=5.23 cfs 0.894 af

Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90 Inflow=29.79 cfs 2.941 af
Primary=29.79 cfs 2.941 af

Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49 Inflow=3.41 cfs 0.299 af
Primary=3.41 cfs 0.299 af

Pond W-C/D: Wetland C/D Inflow=13.87 cfs 1.212 af
Primary=13.87 cfs 1.212 af

Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49 Inflow=11.24 cfs 0.913 af
Primary=11.24 cfs 0.913 af

Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK Inflow=15.24 cfs 1.258 af
Primary=15.24 cfs 1.258 af

Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Inflow=2.83 cfs 0.205 af
Primary=2.83 cfs 0.205 af

Pond W-H: Inflow=21.18 cfs 2.757 af
Primary=21.18 cfs 2.757 af

Pond W-I: Wetland I Inflow=3.92 cfs 0.323 af
Primary=3.92 cfs 0.323 af

Total Runoff Area = 26.014 ac Runoff Volume = 14.010 af Average Runoff Depth = 6.46"
38.09% Pervious = 9.908 ac 61.91% Impervious = 16.106 ac

Summary for Subcatchment 1: PDA

Runoff = 5.00 cfs @ 12.09 hrs, Volume= 0.417 af, Depth= 7.87"
Routed to Reach DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
26,797	98	Paved roads w/curbs & sewers, HSG A
877	68	<50% Grass cover, Poor, HSG A
27,674	97	Weighted Average
877		3.17% Pervious Area
26,797		96.83% Impervious Area

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

Summary for Subcatchment 2: PDA

Runoff = 2.04 cfs @ 12.09 hrs, Volume= 0.166 af, Depth= 7.63"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
10,768	98	Paved roads w/curbs & sewers, HSG A
618	49	50-75% Grass cover, Fair, HSG A
11,386	95	Weighted Average
618		5.43% Pervious Area
10,768		94.57% Impervious Area

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

Summary for Subcatchment 4: PDA

Runoff = 29.79 cfs @ 12.18 hrs, Volume= 2.941 af, Depth= 7.27"
Routed to Reach DP4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
183,183	98	Paved roads w/curbs & sewers, HSG A
23,753	49	50-75% Grass cover, Fair, HSG A
2,716	69	50-75% Grass cover, Fair, HSG B
1,808	36	Woods, Fair, HSG A
211,460	92	Weighted Average
28,277		13.37% Pervious Area
183,183		86.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 5: PDA

Runoff = 1.55 cfs @ 12.13 hrs, Volume= 0.124 af, Depth= 4.55"
Routed to Reach DP5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
6,302	98	Paved roads w/curbs & sewers, HSG A
3,465	49	50-75% Grass cover, Fair, HSG A
4,497	45	Woods, Poor, HSG A
14,264	69	Weighted Average
7,962		55.82% Pervious Area
6,302		44.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 6: PDA

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 7.99"
Routed to Reach DP6 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
422	98	Paved roads w/curbs & sewers, HSG B
422		100.00% Impervious Area

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

Summary for Subcatchment 7A: PDA

Runoff = 8.62 cfs @ 12.10 hrs, Volume= 0.712 af, Depth= 7.51"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
44,349	98	Paved roads w/curbs & sewers, HSG A
2,465	49	50-75% Grass cover, Fair, HSG A
388	36	Woods, Fair, HSG A
2,385	76	Gravel roads, HSG A
49,587	94	Weighted Average
5,238		10.56% Pervious Area
44,349		89.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 7B: PDA

Runoff = 2.63 cfs @ 12.09 hrs, Volume= 0.200 af, Depth= 6.55"
Routed to Reach DP7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
12,126	98	Paved roads w/curbs & sewers, HSG A
3,832	49	50-75% Grass cover, Fair, HSG A
15,958	86	Weighted Average
3,832		24.01% Pervious Area
12,126		75.99% Impervious Area

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

Summary for Subcatchment 8A: PDA

Runoff = 1.39 cfs @ 12.13 hrs, Volume= 0.112 af, Depth= 3.85"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
2,704	98	Paved roads w/curbs & sewers, HSG B
8,860	49	50-75% Grass cover, Fair, HSG A
3,647	69	50-75% Grass cover, Fair, HSG B
44	85	Gravel roads, HSG B
0	60	Woods, Fair, HSG B
15,255	63	Weighted Average
12,551		82.27% Pervious Area
2,704		17.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 8B: PDA

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.71 cfs @ 12.00 hrs, Volume= 0.187 af, Depth= 7.51"
Routed to Reach DP8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
735	36	Woods, Fair, HSG A
172	49	50-75% Grass cover, Fair, HSG A
12,079	98	Paved roads w/curbs & sewers, HSG A
12,986	94	Weighted Average
907		6.98% Pervious Area
12,079		93.02% Impervious Area

Summary for Subcatchment 9: PDA

Runoff = 15.24 cfs @ 12.11 hrs, Volume= 1.258 af, Depth= 7.15"
Routed to Reach DP9 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
78,674	98	Paved roads w/curbs & sewers, HSG A
1,850	76	Gravel roads, HSG A
11,392	49	50-75% Grass cover, Fair, HSG A
91,916	91	Weighted Average
13,242		14.41% Pervious Area
78,674		85.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 10A: PDA

Runoff = 1.86 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 4.31"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
6,063	98	Paved roads w/curbs & sewers, HSG A
10,241	49	50-75% Grass cover, Fair, HSG A
16,304	67	Weighted Average
10,241		62.81% Pervious Area
6,063		37.19% Impervious Area

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

Summary for Subcatchment 10B: PDA

Runoff = 0.97 cfs @ 12.09 hrs, Volume= 0.071 af, Depth= 4.66"
Routed to Reach DP10 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
727	98	Paved roads w/curbs & sewers, HSG A
2,461	49	50-75% Grass cover, Fair, HSG A
4,725	76	Gravel roads, HSG A
7,913	70	Weighted Average
7,186		90.81% Pervious Area
727		9.19% Impervious Area

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

Summary for Subcatchment 11: PDA

Runoff = 3.92 cfs @ 12.09 hrs, Volume= 0.323 af, Depth= 7.75"
Routed to Reach DP11 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
19,976	98	Paved roads w/curbs & sewers, HSG B
1,807	69	50-75% Grass cover, Fair, HSG B
21,783	96	Weighted Average
1,807		8.30% Pervious Area
19,976		91.70% Impervious Area

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

Summary for Subcatchment 13: PDA

Runoff = 0.95 cfs @ 12.10 hrs, Volume= 0.070 af, Depth= 3.51"
Routed to Reach DP13 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
1,929	98	Paved roads w/curbs & sewers, HSG A
7,698	49	50-75% Grass cover, Fair, HSG A
747	76	Gravel roads, HSG A
10,374	60	Weighted Average
8,445		81.41% Pervious Area
1,929		18.59% Impervious Area

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

Summary for Subcatchment 14A: PDA

Runoff = 5.08 cfs @ 12.09 hrs, Volume= 0.383 af, Depth= 6.44"
Routed to Pond SCM1 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
23,330	98	Paved roads w/curbs & sewers, HSG A
6,350	39	>75% Grass cover, Good, HSG A
1,466	76	Gravel roads, HSG A
31,146	85	Weighted Average
7,816		25.09% Pervious Area
23,330		74.91% Impervious Area

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

Summary for Subcatchment 14B: PDA

Runoff = 9.91 cfs @ 12.16 hrs, Volume= 0.919 af, Depth= 7.03"
Routed to Reach DP14 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
56,877	98	Paved roads w/curbs & sewers, HSG A
11,446	49	50-75% Grass cover, Fair, HSG A
68,323	90	Weighted Average
11,446		16.75% Pervious Area
56,877		83.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 15: PDA

Runoff = 1.51 cfs @ 12.09 hrs, Volume= 0.123 af, Depth= 7.63"
Routed to Reach DP15 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
7,909	98	Paved roads w/curbs & sewers, HSG A
532	49	50-75% Grass cover, Fair, HSG A
8,441	95	Weighted Average
532		6.30% Pervious Area
7,909		93.70% Impervious Area

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

Summary for Subcatchment 16: PDA

Runoff = 1.55 cfs @ 12.09 hrs, Volume= 0.114 af, Depth= 5.49"
Routed to Reach DP16 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
6,193	98	Paved roads w/curbs & sewers, HSG A
4,653	49	50-75% Grass cover, Fair, HSG A
10,846	77	Weighted Average
4,653		42.90% Pervious Area
6,193		57.10% Impervious Area

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

Summary for Subcatchment 17: PDA

Runoff = 0.48 cfs @ 12.10 hrs, Volume= 0.035 af, Depth= 3.74"
Routed to Reach DP17 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
1,343	98	Paved roads w/curbs & sewers, HSG A
3,593	49	50-75% Grass cover, Fair, HSG A
0	76	Gravel roads, HSG A
4,936	62	Weighted Average
3,593		72.79% Pervious Area
1,343		27.21% Impervious Area

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

Summary for Subcatchment 18A: PDA

Runoff = 1.60 cfs @ 12.11 hrs, Volume= 0.120 af, Depth= 3.85"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
4,790	98	Paved roads w/curbs & sewers, HSG A
11,456	49	50-75% Grass cover, Fair, HSG A
16,246	63	Weighted Average
11,456		70.52% Pervious Area
4,790		29.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18B: PDA

Runoff = 14.82 cfs @ 12.11 hrs, Volume= 1.178 af, Depth= 6.44"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

	Area (sf)	CN	Description
*	71,087	98	Impervious
	20,290	49	50-75% Grass cover, Fair, HSG A
	4,301	36	Woods, Fair, HSG A
	95,678	85	Weighted Average
	24,591		25.70% Pervious Area
	71,087		74.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18C: PDA

Runoff = 6.07 cfs @ 12.44 hrs, Volume= 0.783 af, Depth= 4.90"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

	Area (sf)	CN	Description
*	22,372	98	Impervious
	850	49	50-75% Grass cover, Fair, HSG A
	22,494	36	Woods, Fair, HSG A
	37,913	79	Woods, Fair, HSG D
	83,629	72	Weighted Average
	61,257		73.25% Pervious Area
	22,372		26.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.7					**Direct Entry, calcs in spreadsheet**

Summary for Subcatchment 18D1: PDA

Runoff = 6.25 cfs @ 12.30 hrs, Volume= 0.682 af, Depth= 4.55"
Routed to Pond SCM2 : Old Main St Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

	Area (sf)	CN	Description
*	9,006	98	Impervious
	6,850	39	>75% Grass cover, Good, HSG A
	18,155	36	Woods, Fair, HSG A
	7,463	79	Woods, Fair, HSG D
	20,912	76	Gravel roads, HSG A
	16,074	91	Gravel roads, HSG D
	78,460	69	Weighted Average
	69,454		88.52% Pervious Area
	9,006		11.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0410	1.62		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
21.1	1,280	0.0410	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.6	1,330	Total			

Summary for Subcatchment 18D2: PDA

AREA GOING TO THE EXISTING BMP

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 7.51"
Routed to Reach DP18 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
1,005	98	Paved roads w/curbs & sewers, HSG A
98	49	50-75% Grass cover, Fair, HSG A
1,103	94	Weighted Average
98		8.88% Pervious Area
1,005		91.12% Impervious Area

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

Summary for Subcatchment 19: PDA

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.95 cfs @ 12.00 hrs, Volume= 0.062 af, Depth= 6.67"
Routed to Reach DP19 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
3,807	98	Unconnected pavement, HSG A
1,040	49	50-75% Grass cover, Fair, HSG A
4,847	87	Weighted Average
1,040		21.46% Pervious Area
3,807		78.54% Impervious Area
3,807		100.00% Unconnected

Summary for Subcatchment 20A: PDA

Runoff = 14.31 cfs @ 12.09 hrs, Volume= 1.108 af, Depth= 6.91"
Routed to Pond 2P : Bypass DMH (7-25)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

	Area (sf)	CN	Description
*	12,491	98	Impervious
	2,679	80	>75% Grass cover, Good, HSG D
	18,187	77	Woods, Good, HSG D
	50,406	91	Gravel roads, HSG D
	83,763	89	Weighted Average
	71,272		85.09% Pervious Area
	12,491		14.91% Impervious Area

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

Summary for Subcatchment 20B: PDA

Runoff = 16.98 cfs @ 12.21 hrs, Volume= 1.716 af, Depth= 6.67"
Routed to Reach DP20 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

	Area (sf)	CN	Description
*	73,748	98	Impervious
	8,414	74	>75% Grass cover, Good, HSG C
	5,511	80	>75% Grass cover, Good, HSG D
	23,542	70	Woods, Good, HSG C
	23,154	77	Woods, Good, HSG D
	0	91	Gravel roads, HSG D
	134,369	87	Weighted Average
	60,621		45.12% Pervious Area
	73,748		54.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0900	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.30"
4.5	405	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	455	Total			

Summary for Subcatchment 21: PDA

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.049 af, Depth= 6.32"
Routed to Reach DP21 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100y24h Rainfall=8.23"

Area (sf)	CN	Description
1,515	98	Paved roads w/curbs & sewers, HSG C
917	79	50-75% Grass cover, Fair, HSG C
1,648	73	Woods, Fair, HSG C
4,080	84	Weighted Average
2,565		62.87% Pervious Area
1,515		37.13% Impervious Area

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

Summary for Reach DP1:

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

Inflow Area = 0.635 ac, 96.83% Impervious, Inflow Depth = 7.87" for 100y24h event
Inflow = 5.00 cfs @ 12.09 hrs, Volume= 0.417 af
Outflow = 5.00 cfs @ 12.09 hrs, Volume= 0.417 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP10:

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

Inflow Area = 0.556 ac, 28.04% Impervious, Inflow Depth = 4.43" for 100y24h event
Inflow = 2.83 cfs @ 12.09 hrs, Volume= 0.205 af
Outflow = 2.83 cfs @ 12.09 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-G : UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP11:

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

Inflow Area = 0.500 ac, 91.70% Impervious, Inflow Depth = 7.75" for 100y24h event
Inflow = 3.92 cfs @ 12.09 hrs, Volume= 0.323 af
Outflow = 3.92 cfs @ 12.09 hrs, Volume= 0.323 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-I : Wetland I

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP12:

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

Summary for Reach DP13:

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

Inflow Area = 0.238 ac, 18.59% Impervious, Inflow Depth = 3.51" for 100y24h event
Inflow = 0.95 cfs @ 12.10 hrs, Volume= 0.070 af
Outflow = 0.95 cfs @ 12.10 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP14:

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

Inflow Area = 2.283 ac, 80.64% Impervious, Inflow Depth = 6.42" for 100y24h event
Inflow = 11.03 cfs @ 12.19 hrs, Volume= 1.222 af
Outflow = 11.03 cfs @ 12.19 hrs, Volume= 1.222 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP15:

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

Inflow Area = 0.194 ac, 93.70% Impervious, Inflow Depth = 7.63" for 100y24h event
Inflow = 1.51 cfs @ 12.09 hrs, Volume= 0.123 af
Outflow = 1.51 cfs @ 12.09 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP16:

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

Inflow Area = 0.249 ac, 57.10% Impervious, Inflow Depth = 5.49" for 100y24h event
Inflow = 1.55 cfs @ 12.09 hrs, Volume= 0.114 af
Outflow = 1.55 cfs @ 12.09 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP17:

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

Inflow Area = 0.113 ac, 27.21% Impervious, Inflow Depth = 3.74" for 100y24h event
Inflow = 0.48 cfs @ 12.10 hrs, Volume= 0.035 af
Outflow = 0.48 cfs @ 12.10 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP18:

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

Inflow Area = 6.316 ac, 39.35% Impervious, Inflow Depth = 5.24" for 100y24h event
Inflow = 21.18 cfs @ 12.12 hrs, Volume= 2.757 af
Outflow = 21.18 cfs @ 12.12 hrs, Volume= 2.757 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-H :

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP19:

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

Inflow Area = 0.111 ac, 78.54% Impervious, Inflow Depth = 6.67" for 100y24h event
Inflow = 0.95 cfs @ 12.00 hrs, Volume= 0.062 af
Outflow = 0.95 cfs @ 12.00 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2:

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

Inflow Area = 0.261 ac, 94.57% Impervious, Inflow Depth = 7.63" for 100y24h event
Inflow = 2.04 cfs @ 12.09 hrs, Volume= 0.166 af
Outflow = 2.04 cfs @ 12.09 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP20:

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

Inflow Area = 5.008 ac, 39.54% Impervious, Inflow Depth = 6.63" for 100y24h event
Inflow = 26.94 cfs @ 12.13 hrs, Volume= 2.766 af
Outflow = 26.94 cfs @ 12.13 hrs, Volume= 2.766 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP21:

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

Inflow Area = 0.094 ac, 37.13% Impervious, Inflow Depth = 6.32" for 100y24h event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 0.049 af
Outflow = 0.66 cfs @ 12.09 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3:

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

Summary for Reach DP4:

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

Inflow Area = 4.854 ac, 86.63% Impervious, Inflow Depth = 7.27" for 100y24h event
Inflow = 29.79 cfs @ 12.18 hrs, Volume= 2.941 af
Outflow = 29.79 cfs @ 12.18 hrs, Volume= 2.941 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-A : DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5:

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

Inflow Area = 0.327 ac, 44.18% Impervious, Inflow Depth = 4.55" for 100y24h event
Inflow = 1.55 cfs @ 12.13 hrs, Volume= 0.124 af
Outflow = 1.55 cfs @ 12.13 hrs, Volume= 0.124 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1P : DEP WETLAND W/ VERNAL POOLS

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6:

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

Inflow Area = 0.010 ac,100.00% Impervious, Inflow Depth = 7.99" for 100y24h event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1W : DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP7:

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

Inflow Area = 1.505 ac, 86.16% Impervious, Inflow Depth = 7.28" for 100y24h event
Inflow = 11.24 cfs @ 12.10 hrs, Volume= 0.913 af
Outflow = 11.24 cfs @ 12.10 hrs, Volume= 0.913 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-D : DOWNSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP8:

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

Inflow Area = 0.648 ac, 52.35% Impervious, Inflow Depth = 5.53" for 100y24h event
Inflow = 3.41 cfs @ 12.01 hrs, Volume= 0.299 af
Outflow = 3.41 cfs @ 12.01 hrs, Volume= 0.299 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C : UPSTREAM OF 36"CULVERT @ 238+49

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP9:

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

Inflow Area = 2.110 ac, 85.59% Impervious, Inflow Depth = 7.15" for 100y24h event
Inflow = 15.24 cfs @ 12.11 hrs, Volume= 1.258 af
Outflow = 15.24 cfs @ 12.11 hrs, Volume= 1.258 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-E : DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: DEP WETLAND W/ VERNAL POOLS

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

Inflow Area = 0.327 ac, 44.18% Impervious, Inflow Depth = 4.55" for 100y24h event
Inflow = 1.55 cfs @ 12.13 hrs, Volume= 0.124 af
Primary = 1.55 cfs @ 12.13 hrs, Volume= 0.124 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1W: DEP WETLAND AT UPSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 0.010 ac,100.00% Impervious, Inflow Depth = 7.99" for 100y24h event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af
Primary = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Bypass DMH (7-25)

Inflow Area = 1.923 ac, 14.91% Impervious, Inflow Depth = 6.91" for 100y24h event
Inflow = 14.31 cfs @ 12.09 hrs, Volume= 1.108 af
Outflow = 14.31 cfs @ 12.09 hrs, Volume= 1.108 af, Atten= 0%, Lag= 0.0 min
Primary = 5.30 cfs @ 12.09 hrs, Volume= 0.951 af
Routed to Pond SCM3 : Subsurface Infiltration System
Secondary = 9.01 cfs @ 12.09 hrs, Volume= 0.156 af
Routed to Reach DP20 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 87.24' @ 12.09 hrs
Flood Elev= 89.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	84.00'	**12.0" Round Culvert** L= 104.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 84.00' / 83.42' S= 0.0056 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Secondary	85.00'	**18.0" Round Culvert** L= 114.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 85.00' / 84.45' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#3	Device 2	86.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=5.28 cfs @ 12.09 hrs HW=87.22' (Free Discharge)
└**1=Culvert** (Barrel Controls 5.28 cfs @ 6.72 fps)

Secondary OutFlow Max=8.73 cfs @ 12.09 hrs HW=87.19' (Free Discharge)
└**2=Culvert** (Barrel Controls 8.73 cfs @ 4.94 fps)
└**3=Sharp-Crested Rectangular Weir** (Passes 8.73 cfs of 10.57 cfs potential flow)

Summary for Pond SCM1: Subsurface Infiltration System

Inflow Area = 0.715 ac, 74.91% Impervious, Inflow Depth = 6.44" for 100y24h event
Inflow = 5.08 cfs @ 12.09 hrs, Volume= 0.383 af
Outflow = 2.48 cfs @ 12.27 hrs, Volume= 0.303 af, Atten= 51%, Lag= 10.8 min
Primary = 2.48 cfs @ 12.27 hrs, Volume= 0.303 af
Routed to Reach DP14 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 90.14' @ 12.27 hrs Surf.Area= 3,941 sf Storage= 7,713 cf

Plug-Flow detention time= 201.8 min calculated for 0.303 af (79% of inflow)
Center-of-Mass det. time= 124.2 min (913.8 - 789.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	86.55'	3,240 cf	**44.25'W x 89.06'L x 4.00'H Field A** 15,763 cf Overall - 4,962 cf Embedded = 10,802 cf x 30.0% Voids
#2A	87.05'	4,962 cf	**ADS_StormTech SC-740 +Cap** x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 108 Chambers in 9 Rows
		8,202 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.50'	**15.0" Round Culvert** L= 150.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 87.50' / 86.10' S= 0.0093 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	89.85'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#3	Device 1	88.00'	**5.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.37 cfs @ 12.27 hrs HW=90.12' (Free Discharge)
└**1=Culvert** (Passes 2.37 cfs of 7.34 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.46 cfs @ 1.82 fps)
  └**3=Orifice** (Orifice Controls 0.91 cfs @ 6.66 fps)

Summary for Pond SCM2: Old Main St Infiltration Basin

Inflow Area = 1.801 ac, 11.48% Impervious, Inflow Depth = 4.55" for 100y24h event
Inflow = 6.25 cfs @ 12.30 hrs, Volume= 0.682 af
Outflow = 5.72 cfs @ 12.40 hrs, Volume= 0.660 af, Atten= 8%, Lag= 5.6 min
Primary = 5.72 cfs @ 12.40 hrs, Volume= 0.660 af
Routed to Reach DP18 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 88.69' @ 12.40 hrs Surf.Area= 2,023 sf Storage= 3,898 cf

Plug-Flow detention time= 40.6 min calculated for 0.660 af (97% of inflow)
Center-of-Mass det. time= 21.5 min (861.6 - 840.1)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	4,546 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)
85.00	235	113.0	0	0	235
86.00	620	160.0	412	412	1,265
87.00	1,100	201.0	849	1,261	2,457
88.00	1,651	240.0	1,366	2,627	3,843
89.00	2,200	259.0	1,919	4,546	4,638

Device	Routing	Invert	Outlet Devices
#1	Primary	84.75'	**12.0" Round RCP_Round 12"** L= 24.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.75' / 84.50' S= 0.0104 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	88.30'	**2.0" x 2.0" Horiz. Inlet Grate X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#3	Device 1	86.70'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.72 cfs @ 12.40 hrs HW=88.69' (Free Discharge)
└**1=RCP_Round 12"** (Passes 5.72 cfs of 7.02 cfs potential flow)
  └**2=Inlet Grate** (Orifice Controls 3.01 cfs @ 3.01 fps)
  └**3=Orifice** (Orifice Controls 2.70 cfs @ 6.12 fps)

Summary for Pond SCM3: Subsurface Infiltration System

[81] Warning: Exceeded Pond 2P by 1.77' @ 13.00 hrs

Inflow Area = 1.923 ac, 14.91% Impervious, Inflow Depth = 5.94" for 100y24h event
Inflow = 5.30 cfs @ 12.09 hrs, Volume= 0.951 af
Outflow = 5.23 cfs @ 12.11 hrs, Volume= 0.894 af, Atten= 1%, Lag= 1.0 min
Primary = 5.23 cfs @ 12.11 hrs, Volume= 0.894 af
Routed to Reach DP20 :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 86.85' @ 12.11 hrs Surf.Area= 3,740 sf Storage= 7,821 cf

Plug-Flow detention time= 103.9 min calculated for 0.894 af (94% of inflow)
Center-of-Mass det. time= 70.1 min (857.0 - 786.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	82.80'	3,175 cf	**30.00'W x 124.66'L x 4.08'H Field A** 15,270 cf Overall - 4,686 cf Embedded = 10,585 cf x 30.0% Voids
#2A	83.38'	4,686 cf	**ADS_StormTech SC-740 +Cap** x 102 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 102 Chambers in 6 Rows
		7,861 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	83.94'	**12.0" Round Culvert** L= 31.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 83.94' / 83.77' S= 0.0055 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	86.40'	**3.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#3	Device 1	84.00'	**6.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.20 cfs @ 12.11 hrs HW=86.85' (Free Discharge)
└**1=Culvert** (Passes 5.20 cfs of 5.87 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 3.68 cfs @ 2.42 fps)
  └**3=Orifice** (Orifice Controls 1.52 cfs @ 7.76 fps)

Summary for Pond W-A: DOWNSTREAM OF 3.5X1.5 CULVERT @ STA219+90

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

Inflow Area = 4.854 ac, 86.63% Impervious, Inflow Depth = 7.27" for 100y24h event
Inflow = 29.79 cfs @ 12.18 hrs, Volume= 2.941 af
Primary = 29.79 cfs @ 12.18 hrs, Volume= 2.941 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-C: UPSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 0.648 ac, 52.35% Impervious, Inflow Depth = 5.53" for 100y24h event
Inflow = 3.41 cfs @ 12.01 hrs, Volume= 0.299 af
Primary = 3.41 cfs @ 12.01 hrs, Volume= 0.299 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland C/D

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-C/D: Wetland C/D

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

Inflow Area = 2.153 ac, 75.98% Impervious, Inflow Depth = 6.75" for 100y24h event
Inflow = 13.87 cfs @ 12.09 hrs, Volume= 1.212 af
Primary = 13.87 cfs @ 12.09 hrs, Volume= 1.212 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-D: DOWNSTREAM OF 36"CULVERT @ 238+49

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

Inflow Area = 1.505 ac, 86.16% Impervious, Inflow Depth = 7.28" for 100y24h event
Inflow = 11.24 cfs @ 12.10 hrs, Volume= 0.913 af
Primary = 11.24 cfs @ 12.10 hrs, Volume= 0.913 af, Atten= 0%, Lag= 0.0 min
Routed to Pond W-C/D : Wetland C/D

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-E: DOWNSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 2.110 ac, 85.59% Impervious, Inflow Depth = 7.15" for 100y24h event
Inflow = 15.24 cfs @ 12.11 hrs, Volume= 1.258 af
Primary = 15.24 cfs @ 12.11 hrs, Volume= 1.258 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-G: UPSTREAM OF 144" CULVERT & MAPLE MEADOW BROOK @ Sta253+74

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

Inflow Area = 0.556 ac, 28.04% Impervious, Inflow Depth = 4.43" for 100y24h event
Inflow = 2.83 cfs @ 12.09 hrs, Volume= 0.205 af
Primary = 2.83 cfs @ 12.09 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-H:

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

Inflow Area = 6.316 ac, 39.35% Impervious, Inflow Depth = 5.24" for 100y24h event
Inflow = 21.18 cfs @ 12.12 hrs, Volume= 2.757 af
Primary = 21.18 cfs @ 12.12 hrs, Volume= 2.757 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond W-I: Wetland I

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

Inflow Area = 0.500 ac, 91.70% Impervious, Inflow Depth = 7.75" for 100y24h event
Inflow = 3.92 cfs @ 12.09 hrs, Volume= 0.323 af
Primary = 3.92 cfs @ 12.09 hrs, Volume= 0.323 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

WILMINGTON
ROUTE 38 (MAIN STREET)

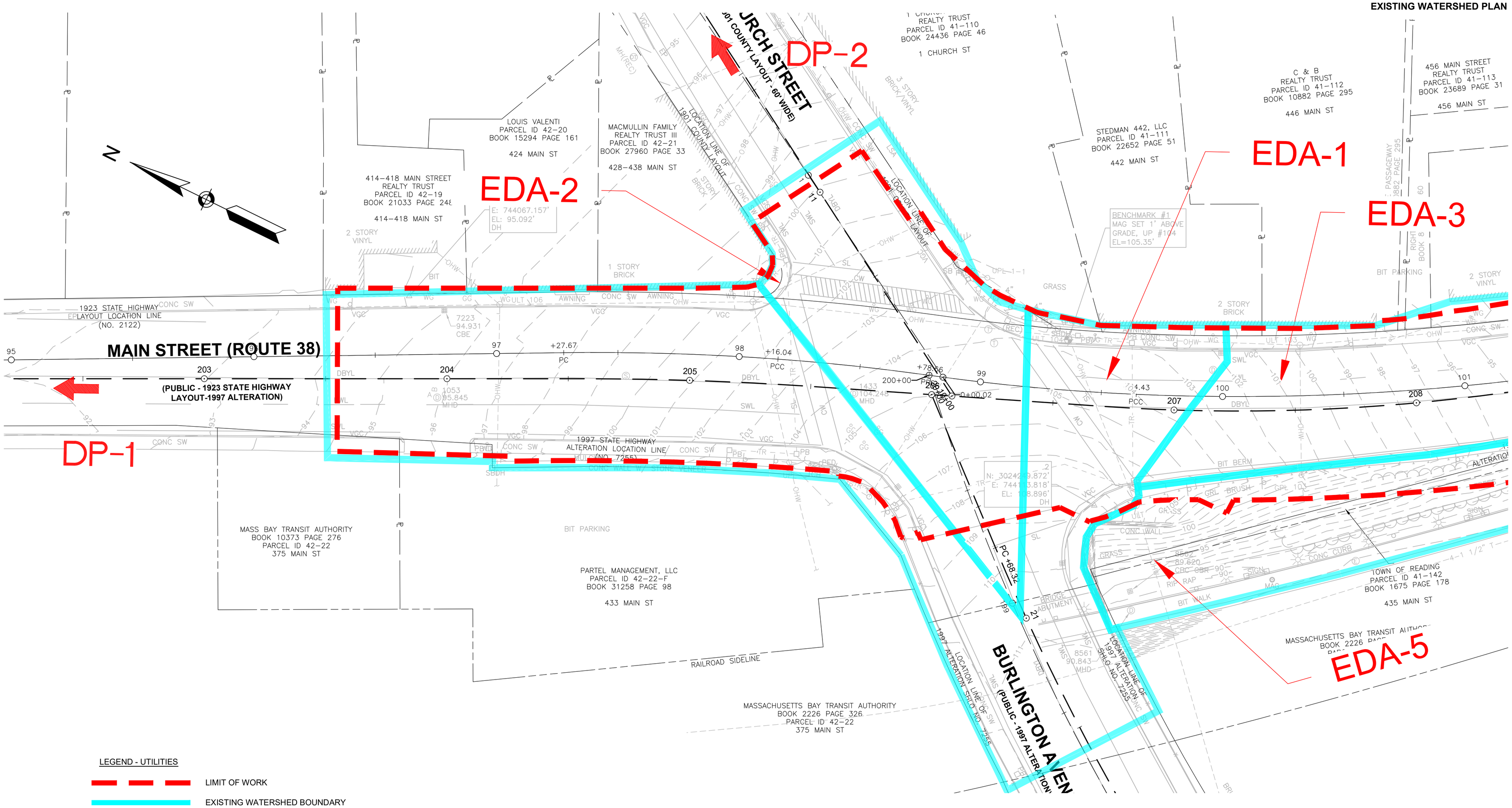
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 12:58 PM

Proposal No. 608051 - 132406

A00840 - 127



LEGEND - UTILITIES

- LIMIT OF WORK
- EXISTING WATERSHED BOUNDARY
- EDA-1 EXISTING WATERSHED NUMBER
- DP-1 DESIGN POINT

0 20 50 100

SCALE: 1" = 20'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

STEDMAN 442, LLC
PARCEL ID 41-111
BOOK 22652 PAGE 51
442 MAIN ST

C & B
REALTY TRUST
PARCEL ID 41-112
BOOK 10882 PAGE 295
446 MAIN ST

456 MAIN STREET
REALTY TRUST
PARCEL ID 41-113
BOOK 23689 PAGE 31
456 MAIN ST

CORREIA VENTURES, LLC
PARCEL ID 41-114
BOOK 31739 PAGE 40
458 MAIN ST

ROSKI TRUST
PARCEL ID 41-120
BOOK 26613 PAGE 99
470 MAIN ST

SUPALI PROPERTIES, LLC
PARCEL ID 41-121
BOOK 30730 PAGE 247
474 MAIN ST

TOWN OF READING
PARCEL ID 41-142
BOOK 1675 PAGE 178
435 MAIN ST

MASSACHUSETTS BAY TRANSIT AUTHOR...

KIRK STREET (PUBLIC)

MAIN STREET (ROUTE 38)

(PUBLIC - 1923 STATE HIGHWAY LAYOUT-1997 ALTERATION)

BENCHMARK #1
MAG SET 1' ABOVE GRADE, UP #104
EL=105.35'

BENCHMARK #2
MAG SET 1' ABOVE GRADE, UP #12-100
EL=89.72'

4
N: 3024051.072'
E: 744310.983'
EL: 90.100'
DH

5
N: 3023819.93
E: 744521.42
EL: 87.639'
MAG

1910 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1315)

1910 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1315)

1951 TOWN LAYOUT

1997 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 7255)

1951 TOWN LAYOUT

APPROXIMATE RAILROAD SIDELINE

APPROXIMATE RAILROAD SIDELINE

RR TRACK TIE LINE

EDA-1

EDA-3

EDA-5

DP-5

CONTINUED ON SHEET NO. 87

CONTINUED ON SHEET NO. 89

0 20 50 100

SCALE: 1" = 20'

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 12:58 PM

Proposal No. 608051 - 132406

A00840 - 728

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

DP-3

DP-4

DP-6

EDA-3

EDA-4

EDA-6

SUPALI PROPERTIES, LLC
PARCEL ID 41-121
BOOK 30730 PAGE 247

474 MAIN ST

S AND S REALTY TRUST
MOHAMADSHAFI MALEK, TRUSTEE
L.C.C. 6462 B
L.C.C. 6462 E
CERT. NO. 29030
DOC. NO. 128871
PACEL 41-122

496 MAIN ST

EMILY A. LAZURE AND
JEANNE E. FICOCIELLO, TRUSTEES OF
500 MAIN STREET REALTY TRUST
L.C.C. 6462 E
CERT. NO. 37865
DOC. NO. 230907
PARCEL ID 41-123

500 MAIN ST

DANA KIKLIS
L.C.C. 6462 B
CERT. NO. 36223
DOC. NO. 206007
PARCEL ID 41-128-A

508 MAIN ST

MASSACHUSETTS BAY
TRANSIT AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 41-141

MAIN STREET (ROUTE 38)
(PUBLIC - 1910 STATE HIGHWAY LAYOUT)

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

DUBLIN AVENUE
(PUBLIC)

APPROXIMATE RAILROAD SIDELINE

RR TRACK TIE LINE

BENCHMARK #3
MAG SET 1' ABOVE
GRADE, UP #96
EL=89.45'

5
N: 3023819.930'
E: 744521.429'
EL: 87.639'
MAG

CONTINUED ON SHEET NO.88

CONTINUED ON SHEET NO. 90

0 20 50 100

SCALE: 1" = 20'

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 12:58 PM

Proposal No. 608051 - 132406

A00840 - 729

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 12:59 PM

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	21
PROJECT FILE NO. 608051			

EXISTING WATERSHED PLAN

EDA-4

CONTINUED ON SHEET NO. 91

MAIN STREET (ROUTE 38)
(PUBLIC - 1910 STATE HIGHWAY LAYOUT)

RANCH ROAD
(PRIVATE)
(PAPER STREET)

MONTROSE AVENUE
(PRIVATE)
(PAPER STREET)

1910 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1315)

APPROXIMATE RAILROAD SIDELINE

PRIVATE LAYOUT LINE

BENCHMARK #4
MAG SET 1' ABOVE GRADE, UP #92
EL=89.23'

PR356, LLC
PARCEL ID 41-131
L.C.C. 6462 C
CERT. NO. 40114
DOC. NO. 257307
580 MAIN ST

THE 520 MAIN STREET CONDOMINIUM
L.C.C. 6462 C-35
CERT. NO. C-35
DOC. NO. 233854
PARCEL ID 41-130-CM
520 MAIN ST

SUBJECT TO VERIZON EASEMENT
DOC. NO. 227331
(NOT PLOTTABLE)

TOWN OF WILMINGTON
UTILITY EASEMENT
BOOK 5145 PAGE 34

FRED F. CAIN, INC.
PARCEL ID 41-138
BOOK 2469 PAGE 363
579 MAIN ST

STEDMAN 555, LLC
PARCEL ID 41-139
BOOK 24082 PAGE 158
563 MAIN ST

STEDMAN 555, LLC
PARCEL ID 41-140
BOOK 22652 PAGE 49
555 MAIN ST

MASSACHUSETTS BAY
TRANSIT AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 41-141

DEREK LEIDER PROPERTY, LLC
L.C.C. 6462 B
CERT. NO. 45467
DOC. NO. 312075
PARCEL ID 41-129
510 MAIN ST

DANA KIKLIS
L.C.C. 6462 B
CERT. NO. 36223
DOC. NO. 206007
PARCEL ID 41-128-A
508 MAIN ST

1 STORY BRICK

6'VINYL FENCE

BIT PARKING
BIT BERM
BIT CURB
BIT DRIVE
CONC SW
CONC BLOCK WALL
STONE RET WALL
LSA
GRASS
MULCH
VGC
GRATE
CURB
WG
OHW
ULP 12-90
ULP 92
ULP 91
ULP 94
ULT 89
CONC
PVC FNC
BKL BOARD
RR TRACK TIE LINE

DP-4
DP-6

CONTINUED ON SHEET NO. 89

SCALE: 1" = 20'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	21
PROJECT FILE NO.		608051	

EXISTING WATERSHED PLAN

EDA-4

PR356, LLC
PARCEL ID 41–131
L.C.C. 6462 C
CERT. NO. 40114
DOC. NO. 257307
580 MAIN ST

PATRICIA A. SULLIVAN, TRUSTEE
OF THE
PATRICIA A. SULLIVAN
REVOCABLE TRUST
L.C.C. 6462 B
CERT. NO. 45142
DOC. NO. 308372
PARCEL ID 41–132
600 MAIN ST

TOWN OF WILMINGTON
PARCEL ID 41–136
LAND COURT CASE NO. 6462

600 MAIN ST

ONE LOWELL STREET
REALTY, LLC
BOOK 33724 PAGE 207
PARCEL ID 41–137–A

2 LOWELL ST

KIERNAN AVENUE
(PUBLIC)

1955 TOWN LAYOUT

1958 TOWN LAYOUT

LOWELL STREET (ROUTE 129)
(1950 COUNTY LAYOUT - VARIABLE WIDTH)

LOCATION LINE OF
1951 COUNTY LAYOUT

1950 STATE HIGHWAY ALTERATION
LOCATION LINE (NO. 3755)

31 PRC +02.59

32

MAIN STREET (ROUTE 38)

+61.30 PT

+22.76 PC

(PUBLIC - 1910 STATE HIGHWAY LAYOUT-1950 ALTERATION)

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

BENCHMARK #5
PK FND, 1' ABOVE
GRADE, UP #12–87
EL=91.39'

8
N: 3022951.928'
E: 745610.211'
EL: 91.148'
MAG

BENCHMARK #6
MAG FND 0.1' ABOVE
GRADE, UP #12–85
EL=94.21'

TOWN OF WILMINGTON
ROUNDING EASEMENT
(BOOK 17004, PAGE 65)

TARANTO REALTY TRUST
PARCEL ID 41–138–C
BOOK 21859 PAGE 293

585 MAIN ST

10' WIDE RIGHT OF WAY
PLAN BK 113 PG 92

EVONA, LLC
PARCEL ID 41–138–A
BOOK 24618 PAGE 150

603 MAIN ST

609 MAIN STREET
NOMINEE TRUST
PARCEL ID 40–4
BOOK 24253 PAGE 297

609 MAIN ST

611 MAIN STREET
NOMINEE TRUST
PARCEL ID 40–3
BOOK 24254 PAGE 8

611 MAIN ST

FRED F. CAIN, INC.
PARCEL ID 41–138
BOOK 2469 PAGE 363

579 MAIN ST

TOWN OF WILMINGTON
UTILITY EASEMENT
BOOK 5145 PAGE 34

TARANTO REALTY TRUST
PARCEL ID 41–138–B
BOOK 18317 PAGE 280
581 MAIN ST

APPROXIMATE
BIT LOCATION OF
RIGHT OF WAY

CONTINUED ON SHEET NO. 90

CONTINUED ON SHEET NO. 92

0 20 50 100

SCALE: 1" = 20'

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:02 PM
Proposal No. 608051 - 132406
A008840 - 731

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:04 PM

Proposal No. 608051 - 132406

A00840 - 732

EDA-7A

EDA-8A

N

COLONIAL PARK
MALL CONDOMINIUM
PARCEL ID 40-6-A
L.C.C. 29466 B
CERT. NO. C-20
DOC. NO. 120308

25 LOWELL ST

GLOBE REALTY TRUST
PARCEL ID 40-6
L.C.C. 29466 B
CERT. NO. 34101
DOC. NO. 181185

35 LOWELL ST

GTY MA/NH LEASING, INC.
PARCEL ID 40-5
BOOK 24895 PAGE 204

586 MAIN ST

SUBJECT TO VERIZON EASEMENT
BOOK 11541 PAGE 327
(NOT PLOTTABLE)

REGISTERED L
RECORDED LA

REGISTERED LAND
RECORDED LAND

CONTINUED ON SHEET NO. 91

CONTINUED ON SHEET NO.93

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

MAIN STREET (ROUTE 38)

(PUBLIC - 1910 STATE HIGHWAY LAYOUT)

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

BENCHMARK #6
0.1' ABOVE
UP #12-85
EL=94.21'

BENCHMARK #7
MAG SET 1' ABOVE
GRADE, UP #12-82X
EL=92.95'

N: 3022475.270'
E: 746026.564'
EL: 91.479'
MAG

N: 3022614.920'

615 MAIN STREET NOMINEE TRUST
AKA THE 615 MAIN STREET NOMINEE TRUST
PARCEL ID 40-2-C
BOOK 24254 PAGE 17

615 MAIN ST

WILMINGTON PROPERTY
MANAGEMENT LLC
PARCEL ID 40-2-B
BOOK 37684 PAGE 48
619 MAIN ST

MMJMJ LLC
BOOK 36016 PAGE 250
PARCEL ID 40-2-A

625 MAIN ST

635 MAIN STREET OWNER LLC
AKA 635 MAIN STREET OWNER, LLC
BOOK 34786 PAGE 182
PARCEL ID 40-1

635 MAIN ST

ACCESS EASEMENT
BOOK 2517 PAGE 128

DRIVEWAY EASEMENT
BOOK 34278 PAGE 198

SIGN EASEMENT
BOOK 34278 PAGE 198

0 20 50 100

SCALE: 1" = 20'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EDA-7A

DP-7

DP-8

EDA-8A

MAIN STREET (ROUTE 38)

(PUBLIC - 1910 STATE HIGHWAY LAYOUT)

MAIN STREET

(PUBLIC - 1 HIGHWAY

REGISTERED LAND RECORDED LAND

GLOBE REALTY TRUST
PARCEL ID 40-6
BOOK 29264 PAGE 30

35 LOWELL ST

ONE CROSS LLC
BOOK 35186 PAGE 80
PARCEL ID 40-11

CROSS ST

NEW ENGLAND TELEPHONE H COMPANY 40-12 PAGE 352

MAIN ST

1910 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1315)

2023 TOWN ALTERATION SECTION 3 (PLAN BK 37867 PG 1)

PT +54.62 (2023 TOWN ALTERA

LOCATION LINE OF 1910 STATE HIGHWAY LAYOUT (SHLO NO. 1315)

SUBJECT TO VERIZON EASEMENT BOOK 36483 PAGE 73 (NOT PLOTTABLE)

635 MAIN STREET OWNER LLC
AKA 635 MAIN STREET OWNER, LLC
BOOK 34786 PAGE 182
PARCEL ID 40-1

635 MAIN ST

CONTINUED ON SHEET NO. 92

CONTINUED ON SHEET NO. 94

0 20 50 100

SCALE: 1" = 20'

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:04 PM

A00840 - 733

Proposal No. 608051 - 132406

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EDA-7B

EDA-7A

EDA-9A

EDA-8B

EDA-8A

N

MIDDLESEX COUNTY EASEMENT FOR HIGHWAY PURPOSES (BOOK 1178 PAGE 237)

ONE CROSS LLC
BOOK 35186 PAGE 80
PARCEL ID 40-11

CROSS ST

CB
RIM=94.29
INV.=N.P.V.
SUMP=87.64

TOWN OF WILMINGTON
PARCEL ID 40-13-A
BOOK 35162 PAGE 138

CROSS ST

DIAMOND PROPERTIES TRUST
BOOK 33133 PAGE 123
PARCEL ID 39-6

668 MAIN ST

TOWN OF WILMINGTON
PARCEL ID 39-5
BOOK 26062 PAGE 215
9 CROSS ST

YENTILE FARM
RECREATIONAL FACILITY

PT +54.62
(2023 TOWN ALTERATION - VARIABLE WIDTH)

CROSS STREET

1894 TOWN LAYOUT

2023 TOWN ALTERATION
SECTION 3
(DEED BK 37867 PG 1)
(PLAN BK 251 PG 51)

11
N: 3021816.421'
E: 746732.398'
EL: 96.276'
MAG

BENCHMARK #9
MAG SET 1' ABOVE
GRADE, UP #72
EL=96.26'

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

NON TANGENT
C

END OF
1910 LAYOUT

BEGINNING OF
1911 LAYOUT

MAIN STREET (ROUTE 38)

(PUBLIC - 19[illegible]) STATE
HIGHWAY LAYOUT)

PC +02+21.12

50+00

LOCATION LINE OF 1910 STATE
HIGHWAY LAYOUT
(SHLO NO. 1315)

N44°52'23"W (BACK)
S44°55'34"E (AHEAD)

PC

END OF
1910 LAYOUT

BEGINNING OF
1911 LAYOUT

NON TANGENT
AT PC

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

JOHN C. OLSON
PARCEL ID 39-14
BOOK 23310 PAGE 186

673 MAIN ST

2.5 STORY
VINYL

(2023 TOWN ALTERATION - VARIABLE WIDTH)

BUTTERS ROW

2023 TOWN ALTERATION, SECTION
(DEED BK 37867 PG 1)
(PLAN BK 251 PG 51)

PT +42.19

1894 TOWN LAYOUT

PC +03.96

1894 TOWN LAYOUT

AUGUST 31, 1951
COUNTY EASEMENT LINE
(NO. 3221)

JARID POLLEY AND
MARY POLLEY
BOOK 37173 PAGE 123
PARCEL ID 39-15

669 MAIN ST

ANDREA J. DELUCA
PARCEL ID 39-16
BOOK 18231 PAGE 111

665 MAIN ST

35 MAIN STREET OWNER LLC
635 MAIN STREET OWNER, LLC
BOOK 34786 PAGE 182
PARCEL ID 40-1

635 MAIN ST

PT +96.48

2023 STATE HIGHWAY
ALTERATION NO. 6078
(DEED BK 37867 PG 1)
(PLAN BK 251 PG 51)

WATER EASEMENT
(BOOK 98 PLAN 150)

CONTINUED ON SHEET NO. 93

CONTINUED ON SHEET NO. 95

CONTINUED RIGHT

CONTINUED LEFT

0 20 50 100

SCALE: 1" = 20'

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:05 PM

A00840 - 734

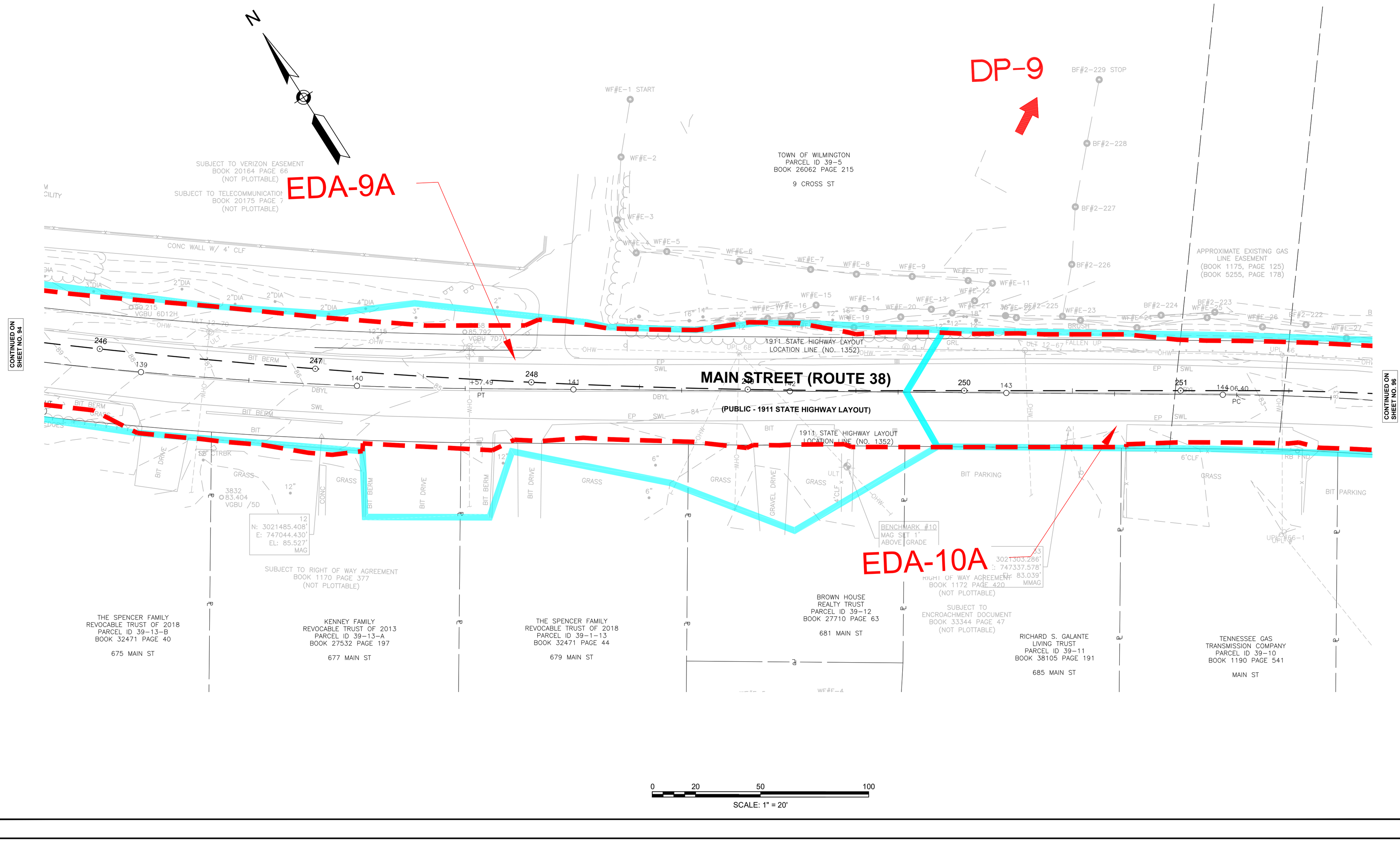
Proposal No. 608051 - 132406

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:05 PM
Proposal No. 608051 - 132406
A00840 - 735



WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	10	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:06 PM

Proposal No. 608051 - 132406

A00840 - 736

TOWN OF WILMINGTON
PARCEL ID 39-5
BOOK 26062 PAGE 215

9 CROSS ST

TEXTRON SYSTEMS
CORPORATION
PARCEL ID 48-73-A
BOOK 24103 PAGE 25
BOOK 35305 PAGE 130
BOOK 35305 PAGE 132

201 LOWELL ST

SUBJECT TO RECIPROCAL EASEMENTS
BOOK 37155 PAGE 258
(NOT PLOTTABLE)

N

EDA-9B

EDA-10A

DP-10

MAIN STREET (ROUTE 38)

(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

BENCHMARK #11
MAG SET 2' ABOVE
GRADE, UP #12-64
EL=85.19'

32
N: 3021190.077'
E: 747495.492'
EL: 82.076'
MMAG

13
N: 3021211.735'
E: 747...

EL: 83.788'
RB CAP

EL: 83.776'
RB CAP

100 YEAR FLOODPLAIN (81.5')

BRUSH

GRASS AREA
BOOK 12943 PAGE 96

SIGNAGE
BOOK 12943 PAGE 96

BIT DRIVE

BIT PARKING

TENNESSEE GAS
TRANSMISSION COMPANY
PARCEL ID 39-10
BOOK 1190 PAGE 541

MAIN ST

AMERCO REAL
ESTATE COMPANY
PARCEL ID 39-11-A
BOOK 5015 PAGE 103

687 MAIN ST

TOWN OF WILMINGTON
BOOK 2299 PAGE 288
PARCEL ID 39-9
MAIN ST

CONTINUED ON SHEET NO.9S

CONTINUED ON SHEET NO. S7

0 20 50 100

SCALE: 1" = 20'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:07 PM

Proposal No. 608051 - 132406

A00840 - 737

N

DSM NEORESINS INC.
PARCEL ID 39-8
L.C.C. 23888 C
CERT. NO. 35932
DOC NO. 202386

730 MAIN ST

ESSEX HOLDING, LLC
A/K/A ESSEX HOLDING LLC
PARCEL ID 39-8-A
L.C.C. 23888 D
CERT. NO. 41633
DOC NO. 276222

730 MAIN ST

EDA-11

EDA-9B

DP-11

EDA-10B

BENCHMARK: 12
MAG SET 1' ABOVE GRADE, UP #59
EL=85.72'

TEMPORARY EASEMENT
PARCEL 25-TE-6
SHLO 8859

PERMANENT EASEMENT
PARCEL 25-PUE-1
SHLO 8859

TEMPORARY EASEMENT
PARCEL 25-TE-1
SHLO 8859

PERMANENT EASEMENT
PARCEL 25-PUE-2
SHLO 8859

TEMPORARY EASEMENT
PARCEL 25-TE-2
SHLO 8859

TEMPORARY EASEMENT
PARCEL 25-TE-3
SHLO 8859

TOWN OF WILMINGTON
BOOK 2299 PAGE 288
PARCEL ID 39-9
MAIN ST

MAIN STREET (ROUTE 38)
(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

EDGE OF WETLAND
BIT BERM
BIT DRIVE
GRASS
TREES
SUB OWNED 2"T CONDUIT
100 YEAR FLOODPLAIN (W.S.EL 81.5')
STAKE AND NAIL
SURVEY TRAVERSE
BRUSH
PCC
SWL
DRYL
OHW
9'WIF
6'CLF
10'WIF

259
12°39'29"
R=2008.48'
L=443.65'
T=222.73'

258 151 260 153 261 154 262 155 263 156

15
N: 3020507.764'
E: 747872.400'
EL: 85.737'
MAG

CONTINUED ON SHEET NO. 96

CONTINUED ON SHEET NO. 98

0 20 50 100
SCALE: 1" = 20'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EDA-11

EDA-12

EDA-14A

EDA-10B

MBTA RAILROAD

MAIN STREET (ROUTE 38)

(PUBLIC - 1911 ST[illegible] LAYOUT)

TEMPORARY EASEMENT PARCEL 25-TE-1 SHLO 8859

TEMPORARY EASEMENT PARCEL 25-TE-2 SHLO 8859

PERMANENT EASEMENT PARCEL 25-PUE-1 SHLO 8859

PERMANENT EASEMENT PARCEL 25-PUE-2 SHLO 8859

20' SEWER EASEMENT BOOK 2244 PAGE 156

DSM NEORESINS INC.
PARCEL ID 39-8
L.C.C. 23888 C
CERT. NO. 35932
DOC NO. 202386

730 MAIN ST

BENCHMARK: 13
MAG SET 1' ABOVE GRADE, UP #53
EL= 104.88'

38
N: 3019903.837'
E: 748086.818'
EL: 98.974'
MHDL

MASSACHUSETTS BAY TRANSIT AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 41-141

JEG 760 MAIN, LLC
BOOK 37934 PAGE 238
PARCEL ID 38-1D
760 MAIN ST

PERMANENT PARCEL 25-SHLO 8859

2023 STATE HIGHWAY LAYOUT LOCATION LINE (8859)

1911 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1352)

APPROXIMATE RAILROAD SIDELINE

RAILROAD TRACKS

CATV FO

TREES

STONE WALL

6' CLF

8' CLF

SURVEY TRAVERSE

N: 3020025.776'
E: 747927.484'
EL: 104.145'
MAG

N: 3020047.455'
E: 747933.813'
EL: 103.624'
MMAG

39
N: 3020010.319'
E: 747913.098'
EL: 82.773'
MREB

2023 STATE HIGHWAY LAYOUT
LOCATION LINE (8859)
TOWN OF WILMINGTON
BOOK 2299 PAGE 288
PARCEL ID 39-9
MAIN ST

PERMANENT EASEMENT PARCEL 25-S-1 SHLO 8859

TEMPORARY EASEMENT PARCEL 25-TE-3 SHLO 8859

MASSACHUSETTS BAY TRANSIT AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 41-141

PERMANENT EASEMENT PARCEL 25-E-1 SHLO 8859

TOWN OF WILMINGTON
PARCEL ID 26-9
L.C.C. 23888 A
CERT. NO. 8851
DOC NO. 71875

823 MAIN ST

BIT PARKING

BOULDERS

TEMPORARY PARCEL 25 SHLO 885[illegible]

CONTINUED ON SHEET NO. 97

CONTINUED ON SHEET NO. 99

0 20 50 100

SCALE: 1" = 20'

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:07 PM

Proposal No. 608051 - 132406

A008840 - 738

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	13	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EDA-12

EDA-13

EDA-14A

EDA-14B

MAIN, LLC
34 PAGE 238
ID 38-1D
MAIN ST

PERMANENT EASEMENT
PARCEL 25-PUE-3
SHLO 8859

PERMANENT EASEMENT
PARCEL 25-PUE-3
SHLO 8859

BENCHMARK: 14
MAG SET 1' ABOVE
GRADE, UP #49
EL=96.41'

JEG 760 MAIN, LLC
BOOK 37934 PAGE 238
PARCEL ID 38-1D
760 MAIN ST

TEMPORARY EASEMENT
PARCEL 25-TE-5
SHLO 8859

KOVALUS SEPARATION SOLUTIONS, LLC
BOOK 2416 PAGE 70
BOOK 5931 PAGE 42
BOOK 11135 PAGE 159
PARCEL ID 38-1
850 MAIN ST

DRAIN EASEMENT
BOOK 2535 PAGE 127

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

MAIN STREET (ROUTE 38)

(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

TEMPORARY EASEMENT
PARCEL 25-TE-4
SHLO 8859

TEMPORARY EASEMENT
PARCEL 25-TE-4
SHLO 8859

17
N: 3019600.368'
E: 747989.757'
EL: 95.200'
RB CAP

TOWN OF WILMINGTON
PARCEL ID 26-9
L.C.C. 23888 A
CERT. NO. 8851
DOC NO. 71875

823 MAIN ST

CONTINUED ON SHEET NO. 98

CONTINUED ON SHEET NO. 100

0 20 50 100

SCALE: 1" = 20'

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:08 PM

Proposal No. 608051 - 132406

A00840 - 739

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	14	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:08 PM

Proposal No. 608051 - 123406

A00840 - 740

N

KOVALUS SEPARATION SOLUTIONS, LLC
BOOK 2416 PAGE 70
BOOK 5931 PAGE 42
BOOK 11135 PAGE 159
PARCEL ID 38-1
850 MAIN ST

EDA-13

DP-13

18
N: 3019039.887'
E: 748113.916'
EL: 90.412'
RB CAP

BENCHMARK #15
MAG SET 1' ABOVE
GRADE, UP #44
EL=92.36'

19
N: 3018556.635'
E: 748136.072'
EL: 97.038'
RB CAP

7916
90.120
VGST 12

CONTINUED ON SHEET NO. 99

CONTINUED ON SHEET NO. 101

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

MAIN STREET (ROUTE 38)

(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

275 168 276 169 277 +95.230 PC 278 171 279 172 280 +87.39 PT 173

DP-14

EDA-14B

TOWN OF WILMINGTON
PARCEL ID 26-9
L.C.C. 23888 A
CERT. NO. 8851
DOC NO. 71875

823 MAIN ST

TOWN OF WI
PARCEL ID
L.C.C. 238
CERT. NO.
DOC NO. 7

823 MAIN S

0 20 50 100
SCALE: 1" = 20'

WILMINGTON
ROUTE 38 (MAIN STREET)

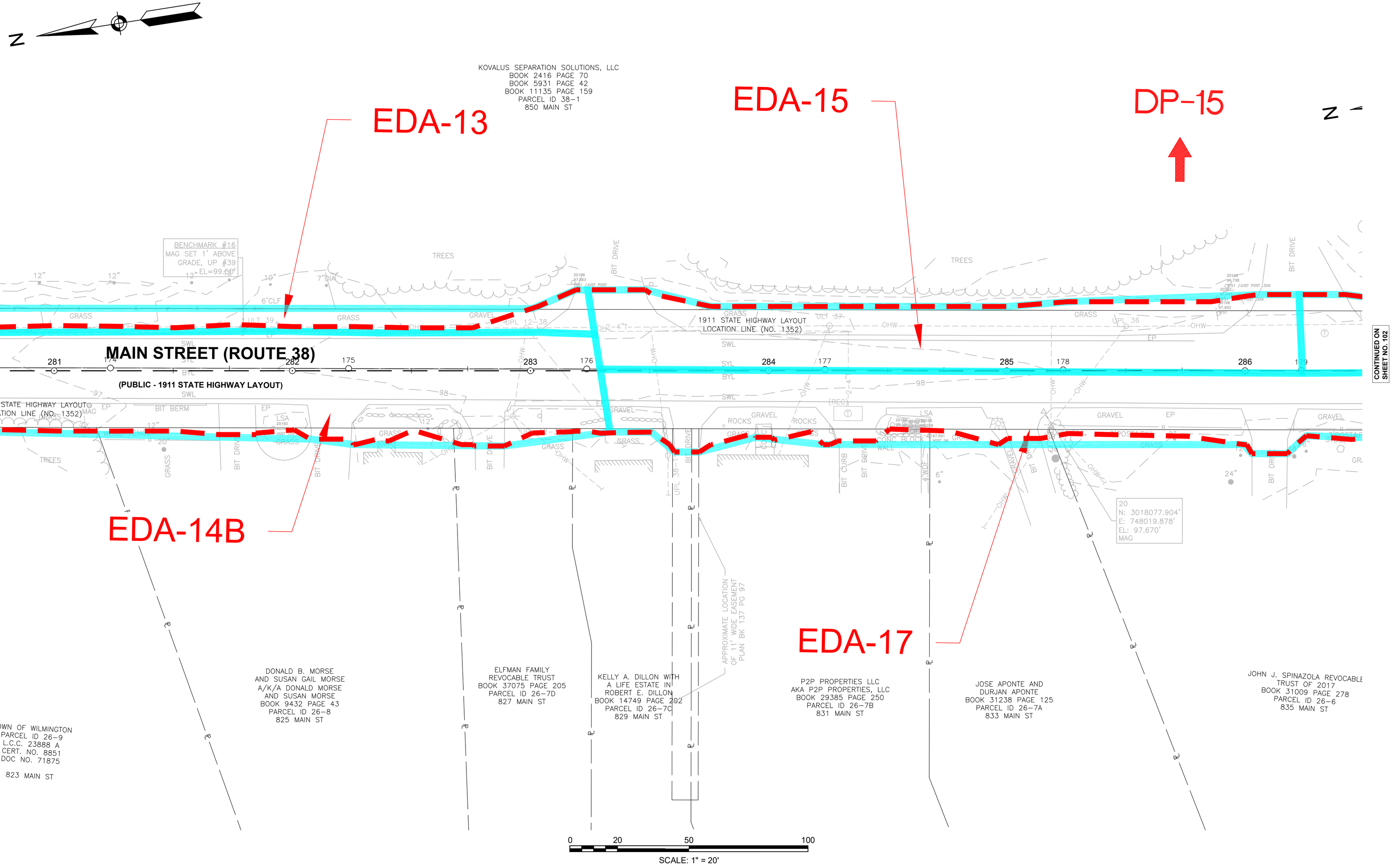
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	15	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:09 PM

Proposal No. 608051 - 132406

A008340 - 741



WILMINGTON
ROUTE 38 (MAIN STREET)

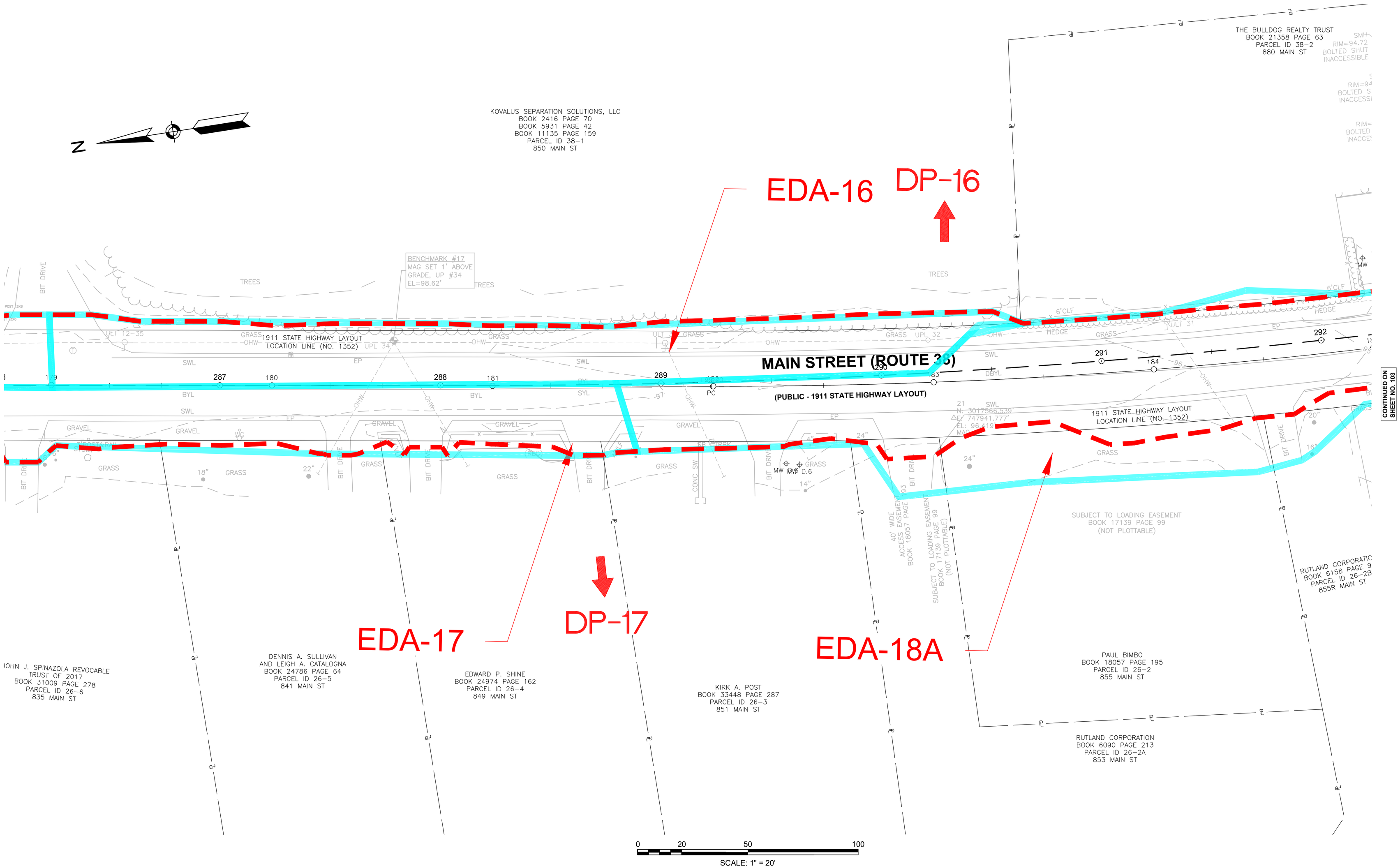
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:09 PM

Proposal No. 608051 - 13240S

A00840 - 742



WILMINGTON
ROUTE 38 (MAIN STREET)

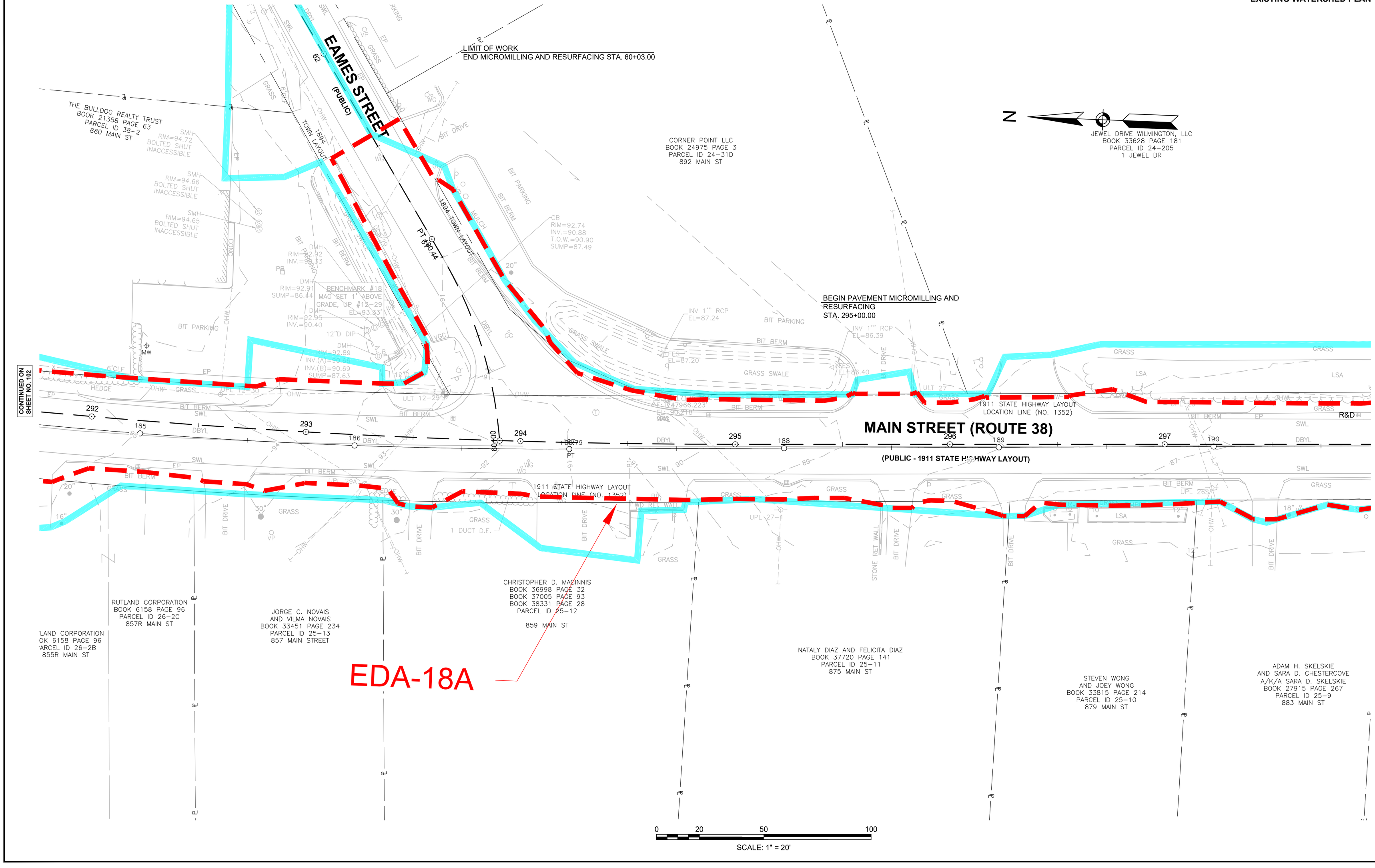
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	21
PROJECT FILE NO.		608051	

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:10 PM

Proposal No. 608051 - 132406

A00840 - 743



WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	18	21
PROJECT FILE NO.	608051		

EXISTING WATERSHED PLAN

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:10 PM

Proposal No. 608051 - 132406

A008440 - 7444

N

900 MAIN STREET REALTY, LLC
BOOK 32192 PAGE 5
PARCEL ID 24-33A
900 MAIN ST

BENCHMARK #19
MAG SET 1" ABOVE GRADE, UP #23
EL=89.18'

904 MAIN STREET REALTY COMPANY, LLC
BOOK 18278 PAGE 139
BOOK 27805 PAGE 207
PARCEL ID 24-33
904 MAIN ST

JEWEL DRIVE WILMINGTON, LLC
BOOK 33628 PAGE 181
PARCEL ID 24-205
1 JEWEL DR

1927 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 2441)

MAIN STREET (ROUTE 38)
(PUBLIC - 1927 STATE HIGHWAY ALTERATION)

1927 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 2441)

CONTINUED ON SHEET NO. 103

CONTINUED ON SHEET NO. 105

DP-18

EDA-18A

JOHNATHAN F. LAROCK
A/K/A JONATHAN F. LAROCK
A/K/A JONATHAN LAROCK
AND SONIA SERRAO
A/K/A SONIA LAROCK
BOOK 19052 PAGE 266
PARCEL ID 25-5
905 MAIN ST

ADAM H. SKELSKIE
AND SARA D. CHESTERCOVE
A/K/A SARA D. SKELSKIE
BOOK 27915 PAGE 267
PARCEL ID 25-9
883 MAIN ST

KATEY ELIZABETH DILLON
AND CHRISTOPHER DANIEL HAYES
BOOK 37265 PAGE 85
PARCEL ID 25-8
885 MAIN ST

SUSAN J. PHIPPS A/K/A
SUSAN PHIPPS-SPINAZOLA
BOOK 21298 PAGE 251
PARCEL ID 25-7
887 MAIN ST

JAMES PAPPAS
BOOK 36471 PAGE 23
PARCEL ID 25-6
889 MAIN ST

SUBJECT TO GROUNDWATER RESTRICTION
BOOK 9357 PAGE 91
(NOT PLOTTABLE)

MW D.6

23
N: 3016618.556'
E: 747946.297'
EL: 86.370'
MAG

0 20 50 100
SCALE: 1" = 20'

Proposal No. 608051 - 132406

EXISTING WATERSHED PLAN

WILLMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	19	21

PROJECT FILE NO. 608051

SCALE: 1" = 20'
0 20 50 100

EDA-18B
DP-19
EDA-19
DP-18
EDA-20
EDA-18A

OLD MAIN STREET
(PUBLIC - 50' WIDE)
71+61.13
1928 TOWN LAYOUT

MAIN STREET (ROUTE 38)
(PUBLIC - 1927 STATE HIGHWAY ALTERATION)

CENTRAL AVENUE
(PAPER STREET)

WOODWARD AVENUE
(PAPER STREET)
(PRIVATE)

COOK AVENUE
(PUBLIC)

PC +47.82
PT +16.47
1927 STATE HIGHWAY ALTERATION LINE OF 1928 DISCONTINUANCE
LOCATION LINE (NO. 2441)
1928 TOWN LAYOUT
1946 TOWN LAYOUT
PRIVATE LAYOUT LINE
SUBJECT TO VERIZON EASEMENT BOOK/2010D PAGE 248 (NOT PLOTTABLE)
DRAIN EASEMENT BOOK 21820 PAGE 159
GRADE UP #12-18 EL=92.68'
BENCHMARK #20 SPIKE FND 1' ABOVE GRADE, UP

ROBERT P. AUTENZIO, JR., TRUSTEE OF M.T. POKKETS REALTY TRUST
BOOK 21081 PAGE 87
PARCEL ID 25-4
919 MAIN ST

RAYMOND LEPORE
L.C.C. 38844 A
CERT. NO. 32201
DOC. NO. 1609045
PARCEL ID 25-3
919 MAIN ST

BOSTON EDISON COMPANY
BOOK 1474 PAGE 362
PARCEL ID 25-18
927 MAIN ST

TAM DEVELOPMENT CORPORATION
BOOK 11130 PAGE 74
PARCEL ID 25-1A
925 MAIN ST

TOWN OF WILLMINGTON
BOOK 1082 PAGE 59
PARCEL ID 24-79
WOODWARD AVE

TOWN OF WILLMINGTON
BOOK 1431 PAGE 460
PARCEL ID 24-80
MAIN ST

TOWN OF WILLMINGTON
BOOK 891 PAGE 294
MAIN ST

TOWN OF WILLMINGTON
BOOK 1178 PAGE 256
PARCEL ID 24-78
WOODWARD AVE

OWNER UNKNOWN
BOOK XX PAGE XX
PARCEL ID 24-81A
MAIN ST

BOSTON EDISON COMPANY
BOOK 1490 PAGE 211
PARCEL ID 24-81B
910 MAIN ST

KALENKA RAYMOND AND SEDAR RAYMOND
BOOK 32794 PAGE 241
PARCEL ID 24-72A
1A COOK AVE

904 MAIN STREET REALTY COMPANY, LLC
BOOK 13278 PAGE 139
BOOK 27805 PAGE 207
PARCEL ID 24-33
904 MAIN ST

CONTINUED ON SHEET NO. 106

CONTINUED ON SHEET NO. 104

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2026 1:11 PM

A00840 - 745

EXISTING WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:11 PM

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	21
	PROJECT FILE NO. 608051		

EXISTING WATERSHED PLAN

CONTINUED ON SHEET NO. 107

CONTINUED ON SHEET NO. 105

MAIN STREET (ROUTE 38)
(PUBLIC - 1927 STATE HIGHWAY ALTERATION)

OLD MAIN STREET
(PUBLIC - 50' WIDE)

BERWICK AVENUE
(PAPER STREET)

BERWICK AVENUE
(PRIVATE)

1927 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 2441)

1928 TOWN LAYOUT

LINE OF 1928 DISCONTINUANCE

PC +53.70

PT +82.02

208+08.24 PC

80+00

82+08.57

+32.28

BENCHMARK #22
MAG SET 1' ABOVE GRADE, UP #10-A
EL=89.82'

BENCHMARK #21
MAG SET 1' ABOVE GRADE, UP #13-A
EL=95.02'

N: 5015457.761'
E: 747956.910'
EL: 91.814'
MAG

OWNER UNKNOWN
BOOK XX PAGE XX
PARCEL ID 24-86
MAIN ST

OWNER UNKNOWN
BOOK XX PAGE XX
PARCEL ID 24-81
MAIN ST

945 MAIN STREET NOMINEE REALTY TRUST
BOOK 37409 PAGE 251
PARCEL ID 12-2
945 MAIN ST

TAM DEVELOPMENT CORPORATION
DOC NO. 257711
PARCEL ID 12-1
943 MAIN ST

TAM DEVELOPMENT CORPORATION
DOC NO. 257711
PARCEL ID 25-1
MAIN ST

TOWN OF WILMINGTON
BOOK 2025 PAGE 94
PARCEL ID 12-18
955 MAIN ST

BOSTON EDISON COMPANY
BOOK 1474 PAGE 362
PARCEL ID 25-1B
927 MAIN ST

BOSTON EDISON COMPANY
BOOK 1490 PAGE 211
PARCEL ID 24-81B
910 MAIN ST

R&D

EDA-20

SCALE: 1" = 20'

SCALE: 1" = 20'

0 20 50 100

EDA-20

DP-20

EDA-21

DP-21

CONTINUED ON SHEET NO. 106

MAIN STREET (ROUTE 38)
(PUBLIC - 1912 STATE HIGHWAY LAYOUT)

MAIN STREET (ROUTE 38)
(PUBLIC - 1927 STATE HIGHWAY ALTERATION)

1912 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1403)

1927 STATE HIGHWAY ALTERATION LINE NO. 2441

1928 TOWN LAYOUT

CITY LINE

TOWN LINE

BREED AVENUE (PRIVATE)

FLORENCE AVENUE (PRIVATE)

BORDER AVENUE (PRIVATE)

WOBURN

PRIVATE LAYOUT LINE

959 MAIN STREET REALTY, LLC
A/K/A MAIN STREET REALTY LLC
BOOK 33724 PAGE 209
PARCEL ID 12-4
959 MAIN ST

HENRY P. GARDNER
BOOK 37422 PAGE 274
PARCEL ID 12-3
967 MAIN ST

LORRAINE A. MACARIO
BOOK 66087 PAGE 128
PARCEL ID 03-03-02
1100 MAIN ST

HENRY P. GARDNER
BOOK 80792 PAGE 409
PARCEL ID 03-03-03
MAIN ST

DARWIN T. CIAVARDONE AND
KIMBERLY GRIFFITHS
BOOK 58169 PAGE 211
PARCEL ID 03-07-03
1091 MAIN ST

DARWIN T. CIAVARDONE AND
KIMBERLY GRIFFITHS
BOOK 58169 PAGE 211
PARCEL ID 03-07-02
1091 MAIN ST

PARCEL ID 24-120
960 MAIN ST

SKYE GRAMS AND VALERIE GRAMS
BOOK 29847 PAGE 270
PARCEL ID 24-117
1 BORDER AVE

ROBERT HOLMES AND
LAURA HOLMES
L.C.C. 22159 B
CERT. NO. 41929
DOC NO. 278979
PARCEL ID 24-87
9 BORDER AVE

OWNER UNKNOWN
BOOK XX PAGE XX
PARCEL ID 24-86
MAIN ST

PARCEL ID 03-03-01
3 BREED AVE

BENCHMARK #23
MAG SET 1' ABOVE
GRADE, UP #138-195
EL=92.51'

N: 3014918.913'
E: 748357.253'
EL: 91.352'
MAG

N: 3015158.146'
E: 748290.554'
EL: 90.073'
MAG

NON TANGENT

END OF 1927 ALTERATION

209 210 211 316 318

211+83.58

208+08.24

EXISTING WATERSHED PLAN

WILLMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	21	21

PROJECT FILE NO. 608051

EXISTING WATERSHED PLAN.DWG Plotted on: 20-Jan-2025 1:12 PM

A00840 - 747

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

BEGIN PROJECT
STA. 203+55.00
MEET EXISTING
N3024552.8585
E744023.6687

N

DP-1

DP-2

PDA-1

PDA-2

PDA-5

MAIN STREET (ROUTE 38)

(PUBLIC - 1923 STATE HIGHWAY LAYOUT-1997 ALTERATION)

ROUTE 38 (MAIN STREET)

(PUBLIC - 1923 STATE HIGHWAY LAYOUT-1997 ALTERATION)

BURLINGTON AVENUE

(PUBLIC - 1997 ALTERATION)

1923 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 2122)

1997 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 7755)

1901 COUNTY LAYOUT - 60' WIDE

LOCATION LINE OF 1901 COUNTY LAYOUT

LOCATION LINE OF 1997 ALTERATION SHLO NO. 7255

LOCATION LINE OF 1997 ALTERATION SHLO NO. 7755

4 LF - 12" DRAINAGE PIPE - OPTION @ 1.7%

PROP. GI (0-01)

LOUIS VALENTI
PARCEL ID 42-20
BOOK 15294 PAGE 161
424 MAIN ST

MACMULLIN FAMILY REALTY TRUST III
PARCEL ID 42-21
BOOK 27960 PAGE 33
428-438 MAIN ST

414-418 MAIN STREET REALTY TRUST
PARCEL ID 42-19
BOOK 21033 PAGE 248
414-418 MAIN ST

1 CHURCH REALTY TRUST
PARCEL ID 41-110
BOOK 24436 PAGE 46
1 CHURCH ST

STEDMAN 442, LLC
PARCEL ID 41-111
BOOK 22652 PAGE 51
442 MAIN ST

C & B REALTY TRUST
PARCEL ID 41-112
BOOK 10882 PAGE 295
446 MAIN ST

456 MAIN STREET REALTY TRUST
PARCEL ID 41-113
BOOK 23689 PAGE 31
456 MAIN ST

3" WIDE PASSAGEWAY BOOK 10882 PAGE 295

RIGHT OF WAY BOOK 865 PAGE 60

MASS BAY TRANSIT AUTHORITY
BOOK 10373 PAGE 276
PARCEL ID 42-22
375 MAIN ST

PARTEL MANAGEMENT, LLC
PARCEL ID 42-22-F
BOOK 31258 PAGE 98
433 MAIN ST

MASSACHUSETTS BAY TRANSIT AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 42-22
375 MAIN ST

TOWN OF READING
PARCEL ID 41-142
BOOK 1675 PAGE 178
435 MAIN ST

MASSACHUSETTS BAY TRANSIT AUTHORITY
BOOK 2226 PAGE

RAILROAD SIDELINE

BOSTON & NORTHERN STREET RAILWAY (BURIED)

PC +57.68
PT +49.62
PC +72.09
PC +66.34
+27.67 PC
16.04 PCC
+44.43

CONTINUED ON SHEET NO. ##

LEGEND - UTILITIES

PROPOSED WATERSHED BOUNDARY

PDA-1 PROPOSED WATERSHED NUMBER

DP-1 DESIGN POINT

0 20 50 100

SCALE: 1" = 20'

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:12 PM
Proposal No. 600851 - 132406
A000840 - 748

WILMINGTON
##########################

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PDA-1

PDA-5

DP-5

4 LF - 12" DRAINAGE PIPE - OPTION @ 1.7%

PROP. CI (0-01)

PROP. CBCI (1-07)

17 LF - 12" DIP @ 0.7%

PROP. DMH (1-08)

113 LF - 12" CLASS V RCP @ 1.5%

23 LF - 12" DIP @ 0.4%

PROP. CBCI (1-10)

27 LF - 12" DIP @ 0.5%

PROP. ECC. CBCI (1-14)

PROP. ECC. CB (1-03)

10 LF - 12" CLASS V RCP @ 1.0%

PROP. CBCI (1-11)

8 LF - 12" DIP @ 0.7%

PROP. DMH (1-12)

PROP. DMH (1-02)

11 LF - 15" DRAINAGE PIPE - OPTION @ 2.7%

PROP. DMH (1-04)

10 LF - 12" CLASS V RCP @ 0.5%

42 LF - 12" DRAINAGE PIPE - OPTION @ 0.2%

PROP. DMH (1-05)

18 LF - 12" DIP @ 2.8%

PROP. ECC. CBCI (1-06)

34 LF - 15" CLASS V RCP @ 2.9%

ROUTE 38 (MAIN STREET)

(PUBLIC - 1923 STATE HIGHWAY LAYOUT-1997 ALTERATION)

MAIN STREET (ROUTE 38)

(PUBLIC - 1923 STATE HIGHWAY LAYOUT-1997 ALTERATION)

KIRK STREET (PUBLIC)

1951 TOWN LAYOUT

1910 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1315)

1997 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 7258)

APPROXIMATE RAILROAD SIDELINE

APPROX LOCATION BOSTON & NORTHERN STREET RAILWAY (BURIED)

STEDMAN 442, LLC
PARCEL ID 41-111
BOOK 22652 PAGE 51
442 MAIN ST

C & B REALTY TRUST
PARCEL ID 41-112
BOOK 10882 PAGE 295
446 MAIN ST

456 MAIN STREET REALTY TRUST
PARCEL ID 41-113
BOOK 23689 PAGE 31
456 MAIN ST

CORREIA VENTURES, LLC
PARCEL ID 41-114
BOOK 31739 PAGE 40
458 MAIN ST

ROSKI TRUST
PARCEL ID 41-120
BOOK 26613 PAGE 99
470 MAIN ST

SUPALI PROPERTIES, LLC
PARCEL ID 41-121
BOOK 30730 PAGE 247
474 MAIN ST

TOWN OF READING
PARCEL ID 41-142
BOOK 1675 PAGE 178
435 MAIN ST

MASSACHUSETTS BAY TRANSIT AUTHORITY
BOOK 2226 PAGE

BENCHMARK #1
MAG SET 1" ABOVE GRADE, UP #104
EL=105.35'

BENCHMARK #2
MAG SET 1" ABOVE GRADE, UP #103

3' WIDE PASSAGEWAY
BOOK 10882 PAGE 295

RIGHT OF WAY
BOOK 865 PAGE 60

PC +72.09

PT +60.55

CONTINUED ON SHEET NO. ##

CONTINUED ON SHEET NO. ##

0 20 50 100

SCALE: 1" = 20'

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:13 PM

Proposal No. 606051 - 132406

A00840 - 749

WILMINGTON
##########################

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

DP-3

DP-4

DP-6

PDA-4

PDA-6

N

SUPALI PROPERTIES, LLC
PARCEL ID 41–121
BOOK 30730 PAGE 247

474 MAIN ST

S AND S REALTY TRUST
MOHAMADSHAFI MALEK, TRUSTEE
L.C.C. 6462 B
L.C.C. 6462 E
CERT. NO. 29030
DOC. NO. 128871
PACEL 41–122

496 MAIN ST

EMILY A. LAZURE AND
JEANNE E. FICOCIELLO, TRUSTEES OF
500 MAIN STREET REALTY TRUST
L.C.C. 6462 E
CERT. NO. 37865
DOC. NO. 230907
PARCEL ID 41–123

500 MAIN ST

DANA KIKLIS
L.C.C. 6462 B
CERT. NO. 36223
DOC. NO. 206007
PARCEL ID 41–128–A

508 MAIN ST

MASSACHUSETTS BAY
TRANSIT AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 41–141

BENCHMARK #3
MAG SET 1' ABOVE
GRADE, UP #96
EL=89.45'

MAIN STREET (ROUTE 38)
(PUBLIC - 1910 STATE HIGHWAY LAYOUT)

DUBLIN AVENUE
(PUBLIC)

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

APPROXIMATE RAILROAD SIDELINE

PROP. ECC. CB (1-03)
10 LF - 12" CLASS V RCP @ 1.0%
PROP. DMH (1-02)
11 LF - 15" CLASS V RCP @ 2.7%
76 LF - 15" CLASS V RCP @ 0.3%
PROP. DMH (1-04)
10 LF - 12" CLASS V RCP @ 0.5%
34 LF - 15" CLASS V RCP @ 2.9%

PROP. CB (1-15)
10 LF - 12" DIP @ 0.5%
PROP. DMH (1-16)
27 LF - 15" CLASS V RCP @ 0.3%
PROP. DMH (1-20)
PROP. ECC. CBCI (1-23)
11 LF - 12" DIP @ 0.9%
PROP. DMH (1-24)
241 LF - 18" DRAINAGE PIPE - OPTION @ 0.3%
PROP. DMH (1-19)
PROP. CB (1-19)
10 LF - 12" CLASS V RCP @ 0.7%
PROP. DMH (1-27)
20 LF - 15" DRAINAGE PIPE - OPTION @ 0.3%
28 LF - 12" DIP @ 0.4%
PROP. CBCI (1-22)
29 LF - 12" DIP @ 0.3%
PROP. CBCI (1-18)
28 LF - 12" DIP @ 0.5%
PROP. CBCI (1-26)

PROP. CBCI (2-11)
21 LF - 18" DRAINAGE PIPE - OPTION @ 0.3%
35 LF - 18" DRAINAGE PIPE - OPTION @ 0.5%
PROP. SPECIAL DRAINAGE
STRUCTURE NO. 1
PROP. HW (2-01)
PROP. STONE FOR PIPE ENDS
TO A DEPTH OF 1'
36'X22.5' AREA = 90 SY
27 LF - 18" DRAINAGE PIPE - OPTION @ 0.2%
PROP. DMH (2-02)
73 LF - 18" CLASS V RCP @ 0.3%
PROP. CB (2-05)
241 LF - 18" DRAINAGE PIPE - OPTION @ 0.3%
17 LF - 12" DIP @ 0.4%
PROP. DMH (2-03)
20 LF - 12" DIP @ 0.8%
PROP. CBCI (2-06)
PROP. HW (2-02)
PROP. HW (2-02)
PROP. STONE FOR PIPE ENDS
TO A DEPTH OF 1'
AREA = 10 SY
10 LF - 12" DIP @ 1.0%
PROP. DMH (2-09)
21 LF - 12" DIP @ 0.9%
PROP. CBCI (2-10)
7 LF - 12" DIP @ 1.3%
PROP. DMH (2-12)
21 LF - 12" CLASS V RCP @ 0.7%
PROP. ECC. CBCI (2-13)

CONTINUED ON SHEET NO.##

CONTINUED ON SHEET NO. ##

0 20 50 100
SCALE: 1" = 20'

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:14 PM

A00840 - 750

Proposal No. 606851 - 132406

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:14 PM
Proposal No. 608051 - 132406
A008440 - 751

DP-4

DP-6

PDA-4

PROP. CBCI (2-08)
10 LF - 12" DIP @ 1.0%
PROP. DMH (2-09)
21 LF - 12" DIP @ 0.9%
21 LF - 18" DRAINAGE PIPE - OPTION @ 0.3%
PROP. CBCI (2-11)
7 LF - 12" DRAINAGE PIPE - OPTION @ 1.3%

MONTROSE AVENUE
(PRIVATE) (PAPER STREET)

RANCH ROAD
(PAPER STREET)

DANA KIKLIS
L.C.C. 6462 B
CERT. NO. 36223
DOC. NO. 206007
PARCEL ID 41-128-A

508 MAIN ST

DEREK LEIDER PROPERTY, LLC
L.C.C. 6462 B
CERT. NO. 45467
DOC. NO. 312075
PARCEL ID 41-129

510 MAIN ST

THE 520 MAIN STREET CONDOMINIUM
L.C.C. 6462 C-35
CERT. NO. C-35
DOC. NO. 233854
PARCEL ID 41-130-CM

520 MAIN ST

SUBJECT TO VERIZON EASEMENT
DOC. NO. 227331
(NOT PLOTTABLE)

PR356, LLC
PARCEL ID 41-131
L.C.C. 6462 C
CERT. NO. 40114
DOC. NO. 257307

580 MAIN ST

PROP. CBCI (2-14) ABOVE GRADE, UP #92
11 LF - 12" DIP @ 0.9%
PROP. DMH (2-15)

18 LF - 12" DIP @ 1.1%

94 LF - 18" DRAINAGE PIPE - OPTION @ 0.4%
PROP. ECC. CBCI (2-13)
21 LF - 12" CLASS V RCP @ 0.7%
PROP. DMH (2-12)
PROP. CBCI (2-10)
35 LF - 18" DRAINAGE PIPE - OPTION @ 0.5%

107 LF - 18" DRAINAGE PIPE - OPTION @ 0.4%
19 LF - 42" DIP @ 1.0%
PROP. CBCI (2-16)

PROP. DMH (2-18)
12 LF - 12" DIP @ 0.8%
PROP. CBCI (2-19)

195 LF - 18" DRAINAGE PIPE - OPTION @ 0.4%
PROP. DMH (2-29)

15 LF - 12" DIP @ 0.7%

122 LF - 15" DRAINAGE PIPE - OPTION @ 0.4%

1910 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1315)

MAIN STREET (ROUTE 38)
(PUBLIC - 1910 STATE HIGHWAY LAYOUT)

STEDMAN 555, LLC
PARCEL ID 41-140
BOOK 22652 PAGE 49

555 MAIN ST

STEDMAN 555, LLC
PARCEL ID 41-139
BOOK 24082 PAGE 158

563 MAIN ST

TOWN OF WILMINGTON
PARCEL ID 41-138
BOOK 2469 PAGE 363

579 MAIN ST

TOWN OF WILMINGTON UTILITY EASEMENT BOOK 5145 PAGE 34

MASSACHUSETTS BAY TRANSIT AUTHORITY
BOOK 2226 PAGE 326
PARCEL D 41-147

APPROXIMATE RAILROAD SIDELINE

BENCHMARK #4
ELEV. = 87.00

1 STORY BRICK

SMH
RIM=88.09
CAR PARKED ON, INACCESSIBLE

SMH
RIM=88.52
PAVED OVER, INACCESSIBLE

CB
RIM=88.25
INV.=N.P.V.
T.O.W.=85.49
SUMP=83.64

CB
RIM=88.12
INV.(A)=N.P.V.
INV.(B)=83.74
INV.(C)=N.P.V.
T.O.W.=83.72
SUMP=81.93

DMH
RIM=88.88
INV.(A)=83.71
INV.(B)=84.35
INV.(C)=83.54
SUMP=83.16

CB
RIM=88.93
INV.=84.31
T.O.W.=84.31
SUMP=81.93

CB
RIM=89.27
INV.(A)=84.95
INV.(B)=86.47
T.O.W.=84.97
SUMP=82.27

DMH
RIM=89.43
INV.(A)=84.09
INV.(B)=84.35
INV.(C)=84.83
SUMP=83.83

CB
RIM=86.84
INV.=N.P.V.
T.O.W.=83.72
SUMP=80.92

CONTINUED ON SHEET NO. ##

CONTINUED ON SHEET NO. ##

0 20 50 100
SCALE: 1" = 20'

Proposal No. 608051 - 132406

PROPOSED WATERSHED PLAN.DWG Plotted on: 20-Jan-2025 1:15 PM

A00840 - 752

SCALE: 1" = 20'

0 20 50 100

PROPOSED WATERSHED PLAN

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	5	21
PROJECT FILE NO. ######			

##########
##########

PDA-4

N

MAIN STREET (ROUTE 38)

LOWELL STREET (ROUTE 129)

KIERNAN AVENUE (PUBLIC)

(1950 COUNTY LAYOUT - VARIABLE WIDTH)

(PUBLIC - 1910 STATE HIGHWAY LAYOUT-1950 ALTERATION)

1958 TOWN LAYOUT

1950 STATE HIGHWAY ALTERATION

LOCATION LINE (NO. 3755)

LOCATION LINE OF 1951 COUNTY LAYOUT

LOCATION LINE (NO. 3131)

CONTINUED ON SHEET NO. ##

CONTINUED ON SHEET NO. ##

611 MAIN STREET
NOMINEE TRUST
PARCEL ID 40-3
BOOK 24254 PAGE 8

609 MAIN STREET
NOMINEE TRUST
PARCEL ID 40-4
BOOK 24253 PAGE 297

609 MAIN ST

603 MAIN ST
EVONA, LLC
PARCEL ID 41-138-A
BOOK 24618 PAGE 150

585 MAIN ST
TARANTO REALTY TRUST
PARCEL ID 41-138-C
BOOK 21859 PAGE 293

579 MAIN ST
FRED F. CAIN, INC.
PARCEL ID 41-138
BOOK 2469 PAGE 363

581 MAIN ST
TARANTO REALTY TRUST
PARCEL ID 41-138-B
BOOK 18317 PAGE 280

ONE LOWELL STREET
REALTY, LLC
BOOK 33724 PAGE 207
PARCEL ID 41-137-A

2 LOWELL ST

600 MAIN ST

TOWN OF WILMINGTON
PARCEL ID 41-136
LAND COURT CASE NO. 6462

PATRICIA A. SULLIVAN, TRUSTEE
OF THE
PATRICIA A. SULLIVAN
REVOCABLE TRUST
CERT. NO. 451642
L.C.C. 6462 B
DOC. NO. 303372
PARCEL ID 41-132
600 MAIN ST

PR356, LLC
PARCEL ID 41-131
L.C.C. 6462 C
CERT. NO. 40114
DOC. NO. 257307
580 MAIN ST

TOWN OF WILMINGTON
UTILITY EASEMENT
BOOK 5145 PAGE 34

10' WIDE RIGHT OF WAY
PLAN BK 113 PG 92

30 LF - 12" DRAINAGE PIPE - OPTION @ 0.7%

PROP. ECC. CB (2-26)

9 LF - 12" DIP @ 0.9%

PROP. DMH (2-27)

40 LF - 12" DRAINAGE PIPE - OPTION @ 0.8%

101 LF - 12" DRAINAGE PIPE - OPTION @ 0.7%

12" DIP @ 0.7%

122 LF - 15" DRAINAGE PIPE - OPTION @ 0.4%

88 LF - 12" CLASS V RCP @ 0.8%

PROP. DMH (2-24)

17 LF - 12" DIP @ 0.6%

PROP. CBCI (2-25)

PROP. GI (2-23)

PROP. CIT (2-30)

17 LF - 12" CLASS V RCP @ 0.7%

15 LF - 12" DIP @ 0.7%

PROP. CB (2-21)

PROP. DMH (2-28)

PT +83.22'

3+02.59 PRO

PT

PC

PI

PRO

PT

PC

PI

##########
##########

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	6	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PDA-7A

PDA-8A

CONTINUED ON SHEET NO.##

CONTINUED ON SHEET NO.##

COLONIAL PARK MALL CONDOMINIUM
PARCEL ID 40-6-A
L.C.C. 29466 B
CERT. NO. C-20
DOC. NO. 120308

25 LOWELL ST

GLOBE REALTY TRUST
PARCEL ID 40-6
L.C.C. 29466 B
CERT. NO. 34101
DOC. NO. 181185

35 LOWELL ST

GTY MA/NH LEASING, INC.
PARCEL ID 40-5
BOOK 24895 PAGE 204

586 MAIN ST

SUBJECT TO VERIZON EASEMENT
BOOK 11541 PAGE 327
(NOT PLOTTABLE)

615 MAIN STREET NOMINEE TRUST
AKA THE '615 MAIN STREET NOMINEE TRUST
PARCEL ID 40-2-C
BOOK 24254 PAGE 17

615 MAIN ST

WILMINGTON PROPERTY MANAGEMENT LLC
PARCEL ID 40-2-B
BOOK 37684 PAGE 48
619 MAIN ST

MMJMJ LLC
BOOK 36016 PAGE 250
PARCEL ID 40-2-A

625 MAIN ST

635 MAIN STREET OWNER LLC
AKA 635 MAIN STREET OWNER, LLC
BOOK 34786 PAGE 182
PARCEL ID 40-1

635 MAIN ST

MAIN STREET (ROUTE 38)

(PUBLIC - 1910 STATE HIGHWAY LAYOUT)

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

PROP. GI (3-17)

19 LF - 12" DIP @ 1.6%

PROP. CB W/F&C (3-18)

10 LF - 12" DIP @ 3.1%

PROP. GI (3-19)

242 LF - 12" CLASS V RCP @ 0.7%

PROP. CBCI (3-12)

19 LF - 12" DIP @ 1.1%

219 LF - 12" CLASS V RCP @ 0.7%

PROP. DMH (3-14)

11 LF - 12" DIP @ 0.9%

PROP. CBCI (3-16)

BENCHMARK #7
MAG SET 1' ABOVE GRADE, UP #12-82X
EL=92.95'

BENCHMARK #6
MAG SET 0.1' ABOVE GRADE, UP #12-85
EL=94.21'

SMH
RIM=93.72
INV.(A)=80.42
INV.(B)=80.54
SUMP=80.50

SMH
RIM=92.05
INV.(A)=81.66
INV.(B)=81.84
SUMP=81.26

DMH
RIM=90.99
INV.(A)=88.17
INV.(B)=88.29
SUMP=88.17

CB
RIM=91.22
INV.=89.06
SUMP=83.14

DMH
RIM=91.45
INV.(A)=87.77
INV.(B)=87.66

REGISTERED LAND
RECORDED LAND

ACCESS EASEMENT
BOOK 34278 PAGE 198

DRIVEWAY EASEMENT
BOOK 34278 PAGE 198

SIGN EASEMENT
BOOK 34278 PAGE 198

0 20 50 100

SCALE: 1" = 20'

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	7	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PDA-7A

PDA-8C

DP-7

DP-8

PDA-8A

PDA-8A

PROP. FES (3-01)

45 LF - 15" CLASS V RCP @ 0.1%

PROP. CB (3-20)

PROP. STONE FOR PIPE ENDS

17 LF - 15" CLASS V RCP @ 0.3%

PROP. CB (3-06)

16 LF - 12" DIP @ 0.6%

PROP. DMH (3-04)

9 LF - 12" DIP @ 0.2%

PROP. CBCI (3-08)

20 LF - 12" DIP @ 0.5%

16 LF - 12" DIP @ 0.3%

PROP. DMH (3-22)

PROP. ECC. CB (3-33)

19 LF - 12" DIP @ 1.4%

PROP. 5' DIA. DMH (3-35)

PROP. ECC. CB (3-23)

25 LF - 12" CLASS V RCP @ 0.4%

PROP. DMH (3-24)

57 LF - 12" CLASS V RCP @ 0.4%

134 LF - 12" CLASS V RCP @ 1.8%

PROP. DMH (3-09)

11 LF - 12" DIP @ 1.0%

PROP. CB (3-11)

219 LF - 12" CLASS V RCP @ 0.7%

222 LF - 12" CLASS V RCP @ 0.7%

PROP. ECC. CB (3-07)

PROP. 5' DIA. DMH (3-02)

7 LF - 12" DIP @ 0.7%

6 LF - 15" CLASS V RCP @ 0.8%

PROP. CBCI (3-03)

8 LF - 36" RCP @ 0.2%

PROP. HW-01

PROP. STONE FOR PIPE ENDS

8 LF - 12" DIP @ 0.9%

PROP. ECC. CB (3-36)

PROP. DMH (3-39)

17 LF - 12" CLASS V RCP @ 2.4%

PROP. HW (3-01)

PROP. STONE FOR PIPE ENDS

5 LF - 12" CLASS V RCP @ 1.7%

STA 240+06.86
N 3021978.5094
E 746545.4280

PROP. ECC. CB (3-25)

PROP. FES (2-8)

4 LF - 12" CLASS V

PROP. DMH (2-5)

LIMIT OF WORK

MAIN STREET (ROUTE 38)

(PUBLIC - 1910 STATE HIGHWAY LAYOUT)

MAIN STREET

(PUBLIC - 1
HIGHWAY

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

LOCATION LINE OF 1910 STATE
HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

APPROX. LOCATION BOSTON & NORTHERN STREET RAILWAY (ABANDONED)

2023 TOWN ALTERATION
SECTION - 3
RECORDED BK 37867 PG 1
(PLAN BK 2023 PG 1)

REGISTERED LAND
RECORDED LAND

REGISTERED LAND
RECORDED LAND

REGISTERED LAND
RECORDED LAND

GLOBE REALTY TRUST
PARCEL ID 40-6
BOOK 29264 PAGE 30

35 LOWELL ST

ONE CROSS LLC
BOOK 35186 PAGE 80
PARCEL ID 40-11

CROSS ST

ONE CROSS LLC
BOOK 35186 PAGE 80
PARCEL ID 40-11

CROSS ST

NEW ENGLAND TELEPHONE
H COMPANY
40-12
PAGE 352

MAIN ST

635 MAIN STREET OWNER LLC
AKA 635 MAIN STREET OWNER, LLC
BOOK 34786 PAGE 182
PARCEL ID 40-1

635 MAIN ST

635 MAIN STREET OWNER LLC
AKA 635 MAIN STREET OWNER, LLC
BOOK 34786 PAGE 182
PARCEL ID 40-1

OWNER LLC
T OWNER, LLC
AGE 182
40-1

ST

SUBJECT TO VERIZON EASEMENT
BOOK 36483 PAGE 73
(NOT PLOTTABLE)

SUBJECT TO VERIZON EASEMENT
BOOK 36483 PAGE 73
(NOT PLOTTABLE)

BENCHMARK #8
MAG SET 1' ABOVE
GRADE, UP #77
EL=88

1 STORY
BRICK

SMH
RIM=90.67
INV.(A)=82.89
INV.(B)=82.97
SUMP=82.95

RIM=87.50
INV.=84.93
T.O.W.=84.93
SUMP=84.86

12"D RCP

7'x12' BOX
STRUCTURE

CONTINUED ON SHEET NO. ##

CONTINUED ON SHEET NO. ##

0 20 50 100

SCALE: 1" = 20'

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:16 PM

Proposal No. 608051 - 132406

A00840 - 754

PROPOSED WATERSHED PLAN

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	8	21
	PROJECT FILE NO.	######	

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PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:17 PM

Proposal No. 608051 - 132406

A00840 - 755

SCALE: 1" = 20'
0 20 50 100

CONTINUED ON SHEET NO. ##

CONTINUED ON SHEET NO. ##

CONTINUED RIGHT

CONTINUED LEFT

PDA-10A

PDA-9

PDA-8C

PDA-7B

PDA-8A

PROPOSED BUTTERS ROW WORK PERMITTED UNDER DEP WOC FILE NO. 23-WW11-0002-APP

BUTTERS ROW

93.5' BMP

MAIN STREET (ROUTE 62)

CROSS STREET

N

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##########

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	9	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:17 PM

Proposal No. 608051 - 132406

A008340 - 756

PDA-9

DP-9

PDA-10A

N

MAIN STREET (ROUTE 38)

(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NOT 1352)

PROP. CBCI (4-14)
22 LF - 12" DIP @ 0.9%
189 LF - 12" CLASS V RCP @ 2.5%
PROP. DMH (4-15)
13 LF - 12" DIP @ 0.7%
PROP. CBCI (4-16)
89 LF - 12" DRAINAGE PIPE - OPTION @ 0.3%
PROP. DMH (4-13)
24 LF - 12" DIP @ 1.2%
PROP. GI (4-12)
5 LF - 12" DIP @ 19.3%
PROP. CIT (4-34)
8 LF - 12" DRAINAGE PIPE - OPTION @ 0.6%
PROP. DMH (4-11)
6 LF - 12" CLASS V RCP @ 1.7%
PROP. CB W/F&C (4-33)
86 LF - 12" DRAINAGE PIPE - OPTION @ 0.5%
PROP. DMH (4-09)
15 LF - 12" DRAINAGE PIPE - OPTION @ 0.4%
10 LF - 12" DIP @ 24.3%
PROP. CBCI (4-10)
125 LF - 12" DRAINAGE PIPE - OPTION @ 0.5%
PROP. CBCI (4-08)
PROP. DMH (4-07)
150 LF - 15" CLASS V RCP @ 9.4%
34 LF - 15" C
10 LF - 12" DIP @
PROP. CBCI (

SUBJECT TO VERIZON EASEMENT
BOOK 20164 PAGE 66
(NOT PLOTTABLE)

SUBJECT TO TELECOMMUNICATIO
BOOK 20175 PAGE 7
(NOT PLOTTABLE)

TOWN OF WILMINGTON
PARCEL ID 39-5
BOOK 26062 PAGE 215

9 CROSS ST

APPROXIMATE EXISTING GAS
LINE EASEMENT
(BOOK 1175, PAGE 125)
(BOOK 5255, PAGE 178)

SUBJECT TO RIGHT OF WAY AGREEMENT
BOOK 1170 PAGE 377
(NOT PLOTTABLE)

SUBJECT TO RIGHT OF WAY AGREEMENT
BOOK 1172 PAGE 420
(NOT PLOTTABLE)

SUBJECT TO
ENCROACHMENT DOCUMENT
BOOK 33344 PAGE 47
(NOT PLOTTABLE)

THE SPENCER FAMILY
REVOCABLE TRUST OF 2018
PARCEL ID 39-13-B
BOOK 32471 PAGE 40

675 MAIN ST

KENNEY FAMILY
REVOCABLE TRUST OF 2013
PARCEL ID 39-13-A
BOOK 27532 PAGE 197

677 MAIN ST

THE SPENCER FAMILY
REVOCABLE TRUST OF 2018
PARCEL ID 39-1-13
BOOK 32471 PAGE 44

679 MAIN ST

BROWN HOUSE
REALTY TRUST
PARCEL ID 39-12
BOOK 27710 PAGE 63

681 MAIN ST

RICHARD S. GALANTE
LIVING TRUST
PARCEL ID 39-11
BOOK 38105 PAGE 191

685 MAIN ST

TENNESSEE GAS
TRANSMISSION COMPANY
PARCEL ID 39-10
BOOK 1190 PAGE 541

MAIN ST

CONTINUED ON SHEET NO. ##

CONTINUED ON SHEET NO. ##

0 20 50 100

SCALE: 1" = 20'

PROPOSED WATERSHED PLAN

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:18 PM

Proposal No. 606051 - 132406

A008340 - 757

PDA-9

PDA-10A

DP-10

MAIN STREET (ROUTE 38)

(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1352)

TOWN OF WILMINGTON
PARCEL ID 39-5
BOOK 26062 PAGE 215

9 CROSS ST

TEXTRON SYSTEMS CORPORATION
PARCEL ID 48-73-A
BOOK 24103 PAGE 25
BOOK 35305 PAGE 130
BOOK 35305 PAGE 132

201 LOWELL ST

SUBJECT TO RECIPROCAL EASEMENTS
BOOK 37155 PAGE 258
(NOT PLOTTABLE)

BENCHMARK #11
MAG SET 2' ABOVE GRADE, UP #12-64
EL=85.19'

PROP. STONE FOR PIPE ENDS

PROP. HW (4-02)
34 LF - 15" CLASS V RCP @ 0.6%

PROP. DMH (4-37)
5 LF - 18" CLASS V RCP @ 2.1%
PROP. DMH (4-35)
8 LF - 12" HDPE @ 16.2%
28 LF - 18" CLASS V RCP @ 0.4%
PROP. CB (4-03)
PROP. HW (4-01)

15 LF - 18" DRAINAGE PIPE - OPTION @ 0.7%
7 LF - 12" DIP @ 18.6%
PROP. CB (4-17)
112 LF - 15" CLASS V RCP @ 0.2%
PROP. DMH (4-20)

PROP. DMH (4-21)

115 LF - 15" CLASS V RCP @ 0.2%

PCC +18.67

PROP. CBCI (4-19)
6 LF - 12" DIP @ 0.8%
PROP. DMH (4-36)
5 LF - 18" CLASS V RCP @ 1.0%
PROP. DMH (4-18)
5 LF - 12" DIP @ 0.9%
PROP. CBCI (4-05)

7 LF - 12" DIP @ 0.7%
PROP. CBCI (4-22)
179 LF - 15" CLASS V RCP @ 0.8%

PROP. DMH (4-06)
10 LF - 12" DIP @ 1.0%
PROP. CBCI (4-33)

PROP. RIPRAP TO A DEPTH OF 3'
TOTAL VOLUME = 700 TONS
(EXTEND RIPRAP THROUGH CULVERT, NOT SHOWN FOR CLARITY)

PC +35.53
150 LF - 15" CLASS V RCP @ 0.4%

TENNESSEE GAS TRANSMISSION COMPANY
PARCEL ID 39-10
BOOK 1190 PAGE 541
MAIN ST

AMERCO REAL ESTATE COMPANY
PARCEL ID 39-11-A
BOOK 5015 PAGE 103

687 MAIN ST

TOWN OF WILMINGTON
BOOK 2299 PAGE 288
PARCEL ID 39-9
MAIN ST

CONTINUED ON SHEET NO.##

CONTINUED ON SHEET NO. ##

0 20 50 100
SCALE: 1" = 20'

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STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	11	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

N

PDA-11

DP-11

PDA-9

PDA-10B

MATCH PROJECT
PROJECT NO. 607327
STA 261+38.00

DSM NEORESINS INC.
PARCEL ID 39-8
L.C.C. 23888 C
CERT. NO. 35932
DOC NO. 202386

730 MAIN ST

ESSEX HOLDING, LLC
A/K/A ESSEX HOLDING LLC
PARCEL ID 39-8-A
L.C.C. 23888 D
CERT. NO. 41633
DOC NO. 276222

730 MAIN ST

MAIN STREET (ROUTE 38)
(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

179 LF - 15" CLASS V RCP @ 0.8%
PROP. DMH (4-24)
6 LF - 12" CLASS V RCP @ 0.8%
PROP. CBOI (4-25)
PROP. DMH (4-26)
116 LF - 12" CLASS V RCP @ 1.4%
143 LF - 12" CLASS V RCP @ 0.7%

R&S FRAME AND COVER
PROP. FRAME AND GRATE

TEMPORARY EASEMENT
PARCEL 25-TE-6
SHLO 8859

TEMPORARY EASEMENT
PARCEL 25-TE-1
SHLO 8859

TEMPORARY EASEMENT
PARCEL 25-TE-2
SHLO 8859

TEMPORARY EASEMENT
PARCEL 25-TE-3
SHLO 8859

PERMANENT EASEMENT
PARCEL 25-PUE-2
SHLO 8859

TOWN OF WILMINGTON
BOOK: 2299 PAGE 285
PARCEL ID 39-9
MAIN ST

BENCHMARK: 12
MAG SET 1' ABOVE
GRADE, UP #39
EL=85.72'

PT #09.65

0 20 50 100
SCALE: 1" = 20'

CONTINUED ON SHEET NO. ##

CONTINUED ON SHEET NO. ##

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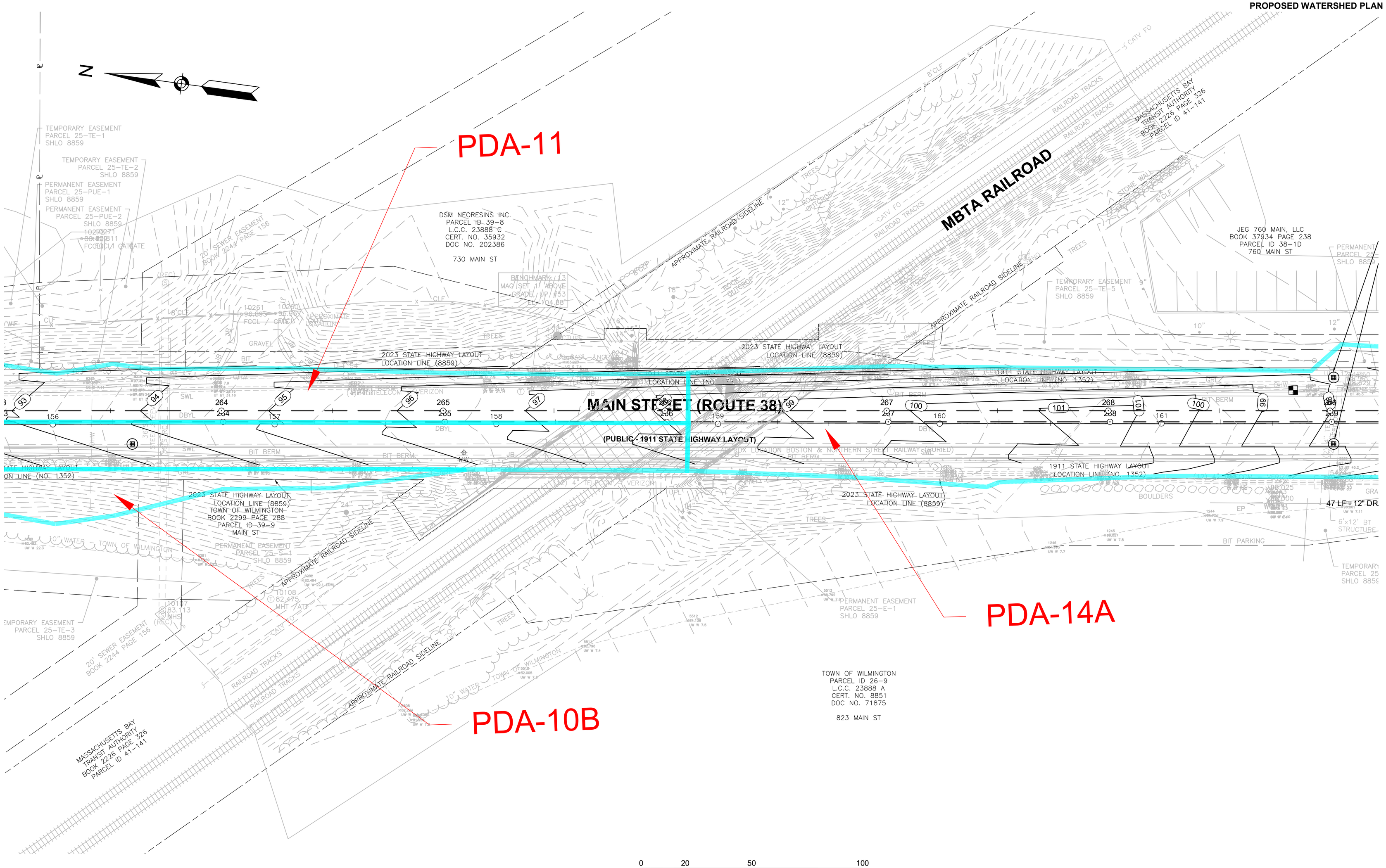
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	12	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

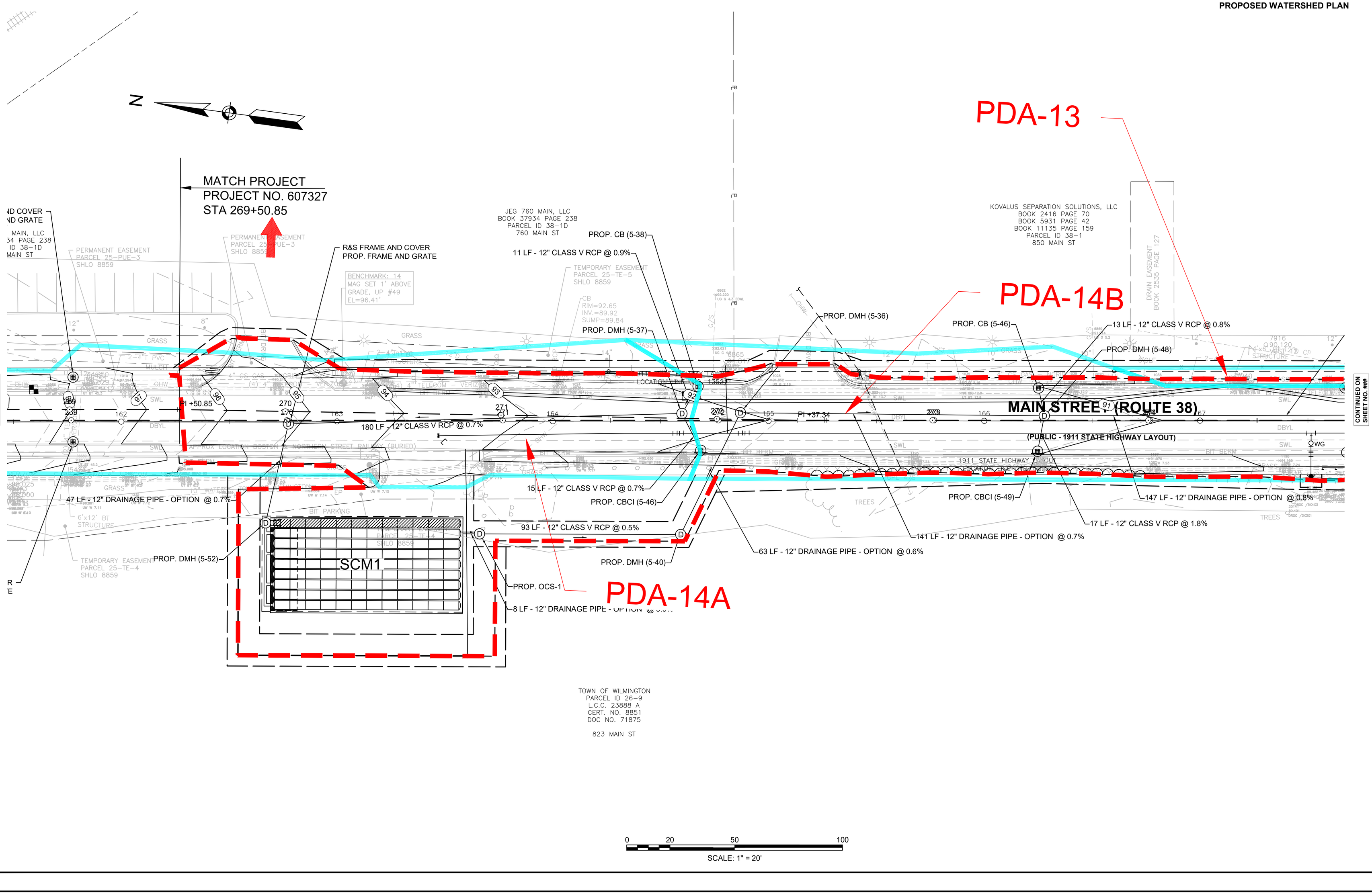


PROPOSED WATERSHED PLAN

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:21 PM

Proposal No. 608951 - 132406

A0080-40 - 760



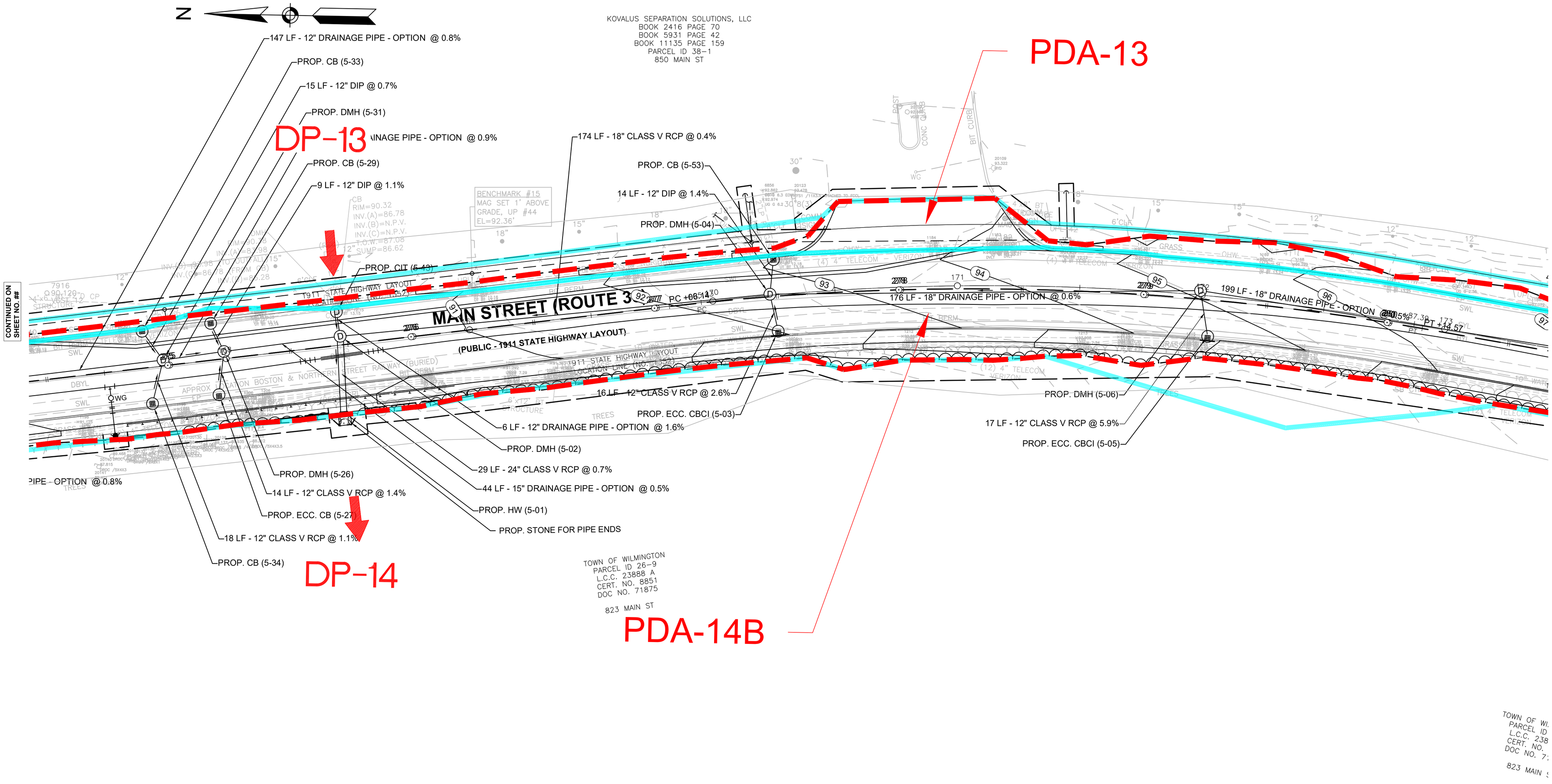
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	14	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:22 PM

Proposal No. 608051 - 132406

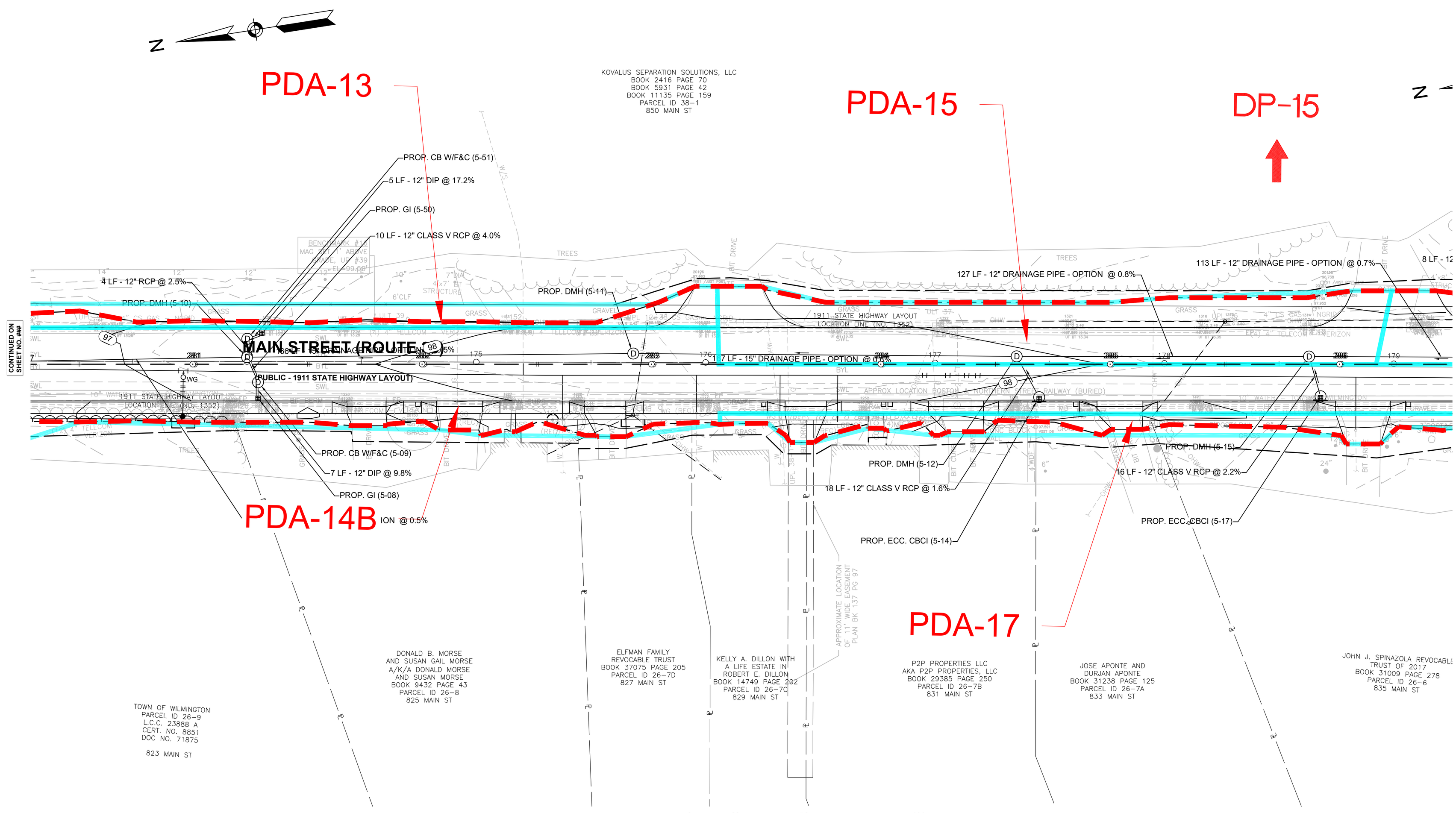
A008340 - 761



STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	15	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:23 PM
Proposal No. 608051 - 132406
AV0808-762



SCALE: 1" = 20'

0 20 50 100

PDA-17

DP-17

PDA-18A

PDA-16

DP-16

PDA-18B

MAIN STREET (ROUTE 35)

(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

CONTINUED ON SHEET NO. ###

CONTINUED ON SHEET NO. ###

N

PROP. CB (5-25)

12 LF - 12" CLASS V RCP @ 2.6%

PROP. DMH (5-24)

16 LF - 12" CLASS V RCP @ 1.9%

PROP. CB (5-18)

8 LF - 12" CLASS V RCP @ 1.2%

PROP. DMH (5-19)

@ 0.7%

27 LF - 12" CLASS V RCP @ 1.1%

PROP. ECC. CBCI (5-22)

14 LF - 12" CLASS V RCP @ 0.4%

PROP. ECC. CBCI (5-20)

113 LF - 12" DRAINAGE PIPE - OPTION @ 0.7%

PROP. CB (6-02)

31 LF - 12" DIP @ 0.7%

PROP. DMH (6-04)

PROP. CB (6-03)

16 LF - 12" DRAINAGE PIPE - OPTION @ 0.6%

104 LF - 12" CLASS V RCP @ 0.7%

PROP. C

16 LF - 12"

JOHN J. SPINAZOLA REVOCABLE TRUST OF 2017
BOOK 31009 PAGE 278
PARCEL ID 26-6
835 MAIN ST

DENNIS A. SULLIVAN AND LEIGH A. CATALOGNA
BOOK 24786 PAGE 64
PARCEL ID 26-5
841 MAIN ST

EDWARD P. SHINE
BOOK 24974 PAGE 162
PARCEL ID 26-4
849 MAIN ST

KIRK A. POST
BOOK 33448 PAGE 287
PARCEL ID 26-3
851 MAIN ST

RUTLAND CORPORATION
BOOK 6090 PAGE 213
PARCEL ID 26-2A
853 MAIN ST

PAUL BIMBO
BOOK 18057 PAGE 195
PARCEL ID 26-2
855 MAIN ST

RUTLAND CORPORATIO
BOOK 6158 PAGE 9
PARCEL ID 26-28
855R MAIN ST

SUBJECT TO LOADING EASEMENT
BOOK 17139 PAGE 99
(NOT PLOTTABLE)

40' WIDE ACCESS EASEMENT
BOOK 18057 PAGE 93
(NOT PLOTTABLE)

KOVALUS SEPARATION SOLUTIONS, LLC
BOOK 5931 PAGE 42
BOOK 2416 PAGE 70
BOOK 11135 PAGE 159
PARCEL ID 38-1
850 MAIN ST

THE BULLDOG REALTY TRUST
BOOK 21358 PAGE 63
PARCEL ID 38-2
880 MAIN ST

PROPOSED WATERSHED PLAN

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	16	21
PROJECT FILE NO. ######			

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STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	17	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:24 PM
Proposal No. 608051 - 132406
A008340 - 764

LIMIT OF WORK
END MICROMILLING AND RESURFACING STA. 60+03.00

EAMES STREET
(PUBLIC)

THE BULLDOG REALTY TRUST
BOOK 21358 PAGE 63
PARCEL ID 38-2
880 MAIN ST

CORNER POINT LLC
BOOK 24975 PAGE 3
PARCEL ID 24-31D
892 MAIN ST

JEWEL DRIVE WILMINGTON, LLC
BOOK 33628 PAGE 181
PARCEL ID 24-205
1 JEWEL DR

PDA-18B

PROP. CB (6-03)
16 LF - 12" DRAINAGE PIPE - OPTION @ 0.6%
PROP. CB (6-06)
18 LF - 12" DIP @ 1.1%
104 LF - 12" CLASS V RCP @ 0.7%
PROP. DMH (6-07)
PROP. DMH (6-04)
12 LF - 12" CLASS V RCP @ 0.8%
PROP. CBCI (6-05)

19 LF - 12" DIP @ 0.8%
PROP. DMH (6-32)
13 LF - 12" DIP @ 0.6%
PROP. ECC. CB (6-31)
61 LF - 12" DRAINAGE PIPE - OPTION @ 0.8%
PROP. 5' DIA. DMH (6-33)
76 LF - 12" CLASS V RCP @ 0.7%
PROP. CB (6-34)
PROP. CB (6-30)
122 LF - 12" DIP @ 1.0%
PROP. DMH (6-11)
12 LF - 12" DIP @ 0.8%
PROP. CBCI (6-08)

21 LF - 12" DIP @ 4.5%
PROP. CB (6-09)
8 LF - 12" DIP @ 8.0%
BEGIN PAVEMENT MICROMILLING AND RESURFACING
PROP. CB W/ FSC (6-10)
STA. 295+00.00
10 LF - 12" CLASS V RCP @ 1.1%

PROP. CBCI (6-36)
14 LF - 12" CLASS V RCP @ 0.7%
PROP. CB (6-13)
14 LF - 12" DIP @ 0.5%
PROP. DMH (6-15)
8 LF - 12" DIP @ 0.9%
PROP. CBCI (6-12)
115 LF - 15" CLASS V RCP @ 0.4%
PROP. DMH (6-37)

MAIN STREET (ROUTE 38)
(PUBLIC 1911 STATE HIGHWAY LAYOUT)
165 LF - 15" CLASS V RCP @ 0.4%

PDA-18A

RUTLAND CORPORATION
BOOK 6158 PAGE 96
PARCEL ID 26-2C
857R MAIN ST

LAND CORPORATION
OK 6158 PAGE 96
ARCEL ID 26-2B
857R MAIN ST

JORGE C. NOVAIS
AND VILMA NOVAIS
BOOK 33451 PAGE 234
PARCEL ID 25-13
857 MAIN STREET

CHRISTOPHER D. MACINNIS
BOOK 36998 PAGE 32
BOOK 37005 PAGE 93
BOOK 38331 PAGE 28
PARCEL ID 25-12
859 MAIN ST

NATALY DIAZ AND FELICITA DIAZ
BOOK 37720 PAGE 141
PARCEL ID 25-11
875 MAIN ST

STEVEN WONG
AND JOEY WONG
BOOK 33815 PAGE 214
PARCEL ID 25-10
879 MAIN ST

ADAM H. SKELSKIE
AND SARA D. CHESTERCOVE
A/K/A SARA D. SKELSKIE
BOOK 27915 PAGE 267
PARCEL ID 25-9
883 MAIN ST

CONTINUED ON SHEET NO. ###

CONTINUED ON SHEET NO. ###

N

0 20 50 100
SCALE: 1" = 20'

##########
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STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	18	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PDA-18B

PDA-18A

DP-18

N

BENCHMARK #19
MAG SET 1' ABOVE GRADE, UP #23
EL=89.18'

900 MAIN STREET REALTY, LLC
BOOK 32192 PAGE 5
PARCEL ID 24-33A
900 MAIN ST

904 MAIN STREET REALTY COMPANY, LLC
BOOK 15278 PAGE 139
BOOK 27805 PAGE 207
PARCEL ID 24-33
904 MAIN ST

JEWEL DRIVE WILMINGTON, LLC
BOOK 33628 PAGE 181
PARCEL ID 24-205
1 JEWEL DR

PROP. CBCI (6-36)
14 LF - 12" CLASS V RCP @ 0.7%
PROP. CB (6-17)
14 LF - 12" DIP @ 3.6%
PROP. CB (6-20)
13 LF - 12" CLASS V RCP @ 0.7%
PROP. CB (6-25)
11 LF - 12" DIP @ 2.7%
PROP. DMH (6-26)
PROP. CBCI (6-28)
13 LF - 12" DIP @ 0.7%
PROP. DMH (6-29)
PROP. DMH (6-21)
8 LF - 12" CLASS V RCP @ 1.2%
PROP. CBCI (6-19)
32 LF - 15" CLASS V RCP @ 0.4%
PROP. DMH (6-18)
8 LF - 12" CLASS V RCP @ 1.2%
PROP. CBCI (6-16)
24 LF - 15" CLASS V RCP @ 0.4%
PROP. DMH (6-37)
115 LF - 15" CLASS V RCP @ 0.4%
PROP. CB (6-23)
10 LF - 12" DIP @ 1.0%
PROP. CB (6-49)
11 LF - 12" DIP @ 0.9%

T83 LF - 18" DRAINAGE PIPE - OPTION @ 0.3%
124 LF - 15" CLASS V RCP @ 0.4%
226 LF - 18" CLASS V RCP @ 0.3%

MAIN STREET (ROUTE 38)
(PUBLIC - 1927 STATE HIGHWAY ALTERATION)
PC +21.90
PT +74.15
1927 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 2441)

CONTINUED ON SHEET NO. ###

CONTINUED ON SHEET NO. ###

ADAM H. SKELSKIE
AND SARA D. CHESTERCOVE
A/K/A SARA D. SKELSKIE
BOOK 27915 PAGE 267
PARCEL ID 25-9
883 MAIN ST

KATEY ELIZABETH DILLON
AND CHRISTOPHER DANIEL HAYES
BOOK 37265 PAGE 85
PARCEL ID 25-8
885 MAIN ST

SUSAN J. PHIPPS A/K/A
SUSAN PHIPPS-SPINAZOLA
BOOK 21298 PAGE 251
PARCEL ID 25-7
887 MAIN ST

JAMES PAPPAS
BOOK 36471 PAGE 23
PARCEL ID 25-6
889 MAIN ST

JOHNATHAN F. LAROCK
A/K/A JONATHAN F. LAROCK
A/K/A JONATHAN LAROCK
AND SONIA SERRAO
A/K/A SONIA LAROCK
BOOK 19052 PAGE 266
PARCEL ID 25-5
905 MAIN ST

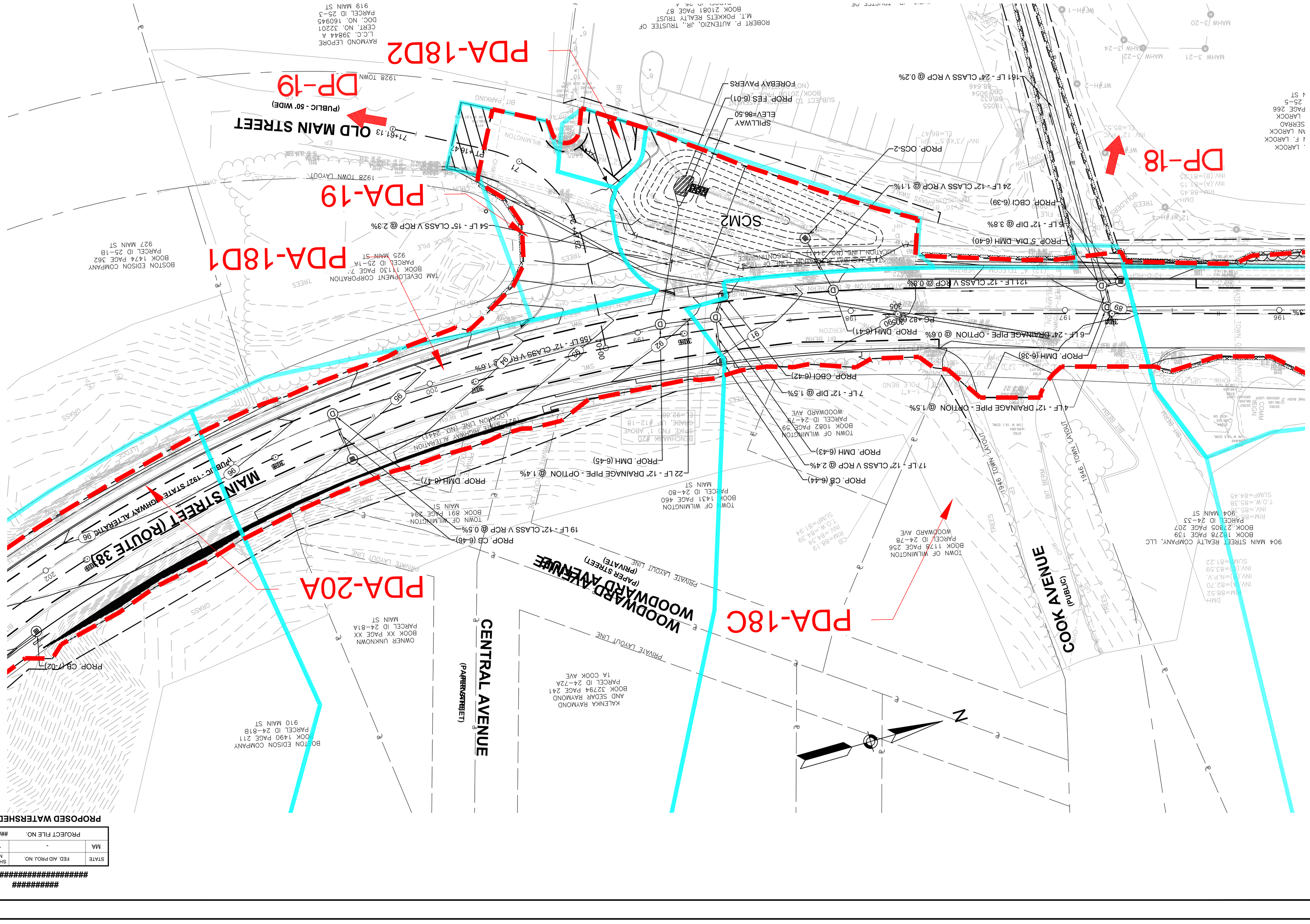
SUBJECT TO GROUNDWATER RESTRICTION BOOK 9357 PAGE 48 (NOT PLOTTABLE)

MW D.6

MAHW 3-1
MAHW 3-2
MAHW 3-3
MAHW 3-4
MAHW 3-5
MAHW 3-6
MAHW 3-7
MAHW 3-8
MAHW 3-9
MAHW 3-10
MAHW 3-11
MAHW 3-12
MAHW 3-13
MAHW 3-14
MAHW 3-15
MAHW 3-16
MAHW 3-17
MAHW 3-18
MAHW 3-19
MAHW 3-20
MAHW 3-21

WF#H-6
WF#H-7
WF#H-8
WF#H-9
WF#H-10
WF#H-11
WF#H-12
WF#H-14

0 20 50 100
SCALE: 1" = 20'


SCALE: 1" = 20'
0
20
50
100
PROPOSED WATERSHED PLAN
PROJECT FILE NO. ######
STATE | FED. AID PROJ. NO. | SHEET NO. | TOTAL SHEETS
MA | - | 19 | 21
##########
##########
PDA-18D2
PDA-19
PDA-18D1
PDA-20A
PDA-18C
SCM2
DP-19
DP-18
OLD MAIN STREET
(PUBLIC - 50' WIDE)
MAIN STREET (ROUTE 38)
(PUBLIC - 1927 STATE ALTERATION)
CENTRAL AVENUE
(PAPER STREET)
WOODWARD AVENUE
(PAPER STREET)
COOK AVENUE
(PUBLIC)
N
CONTINUED ON SHEET NO. ###
CONTINUED ON SHEET NO. ###
PROP. CB (7-02)
19 LF - 12" CLASS V RCP @ 0.5%
PROP. CB (6-45)
PROP. DMH (6-47)
22 LF - 12" DRAINAGE PIPE - OPTION @ 1.4%
PROP. DMH (6-45)
PROP. DMH (6-43)
17 LF - 12" CLASS V RCP @ 2.4%
PROP. CB (6-44)
PROP. CBCI (6-42)
7 LF - 12" DIP @ 1.5%
4 LF - 12" DRAINAGE PIPE - OPTION @ 1.5%
PROP. DMH (6-38)
6 LF - 24" DRAINAGE PIPE - OPTION @ 0.6%
PROP. DMH (6-41)
PROP. 5' DIA. DMH (6-40)
5 LF - 12" DIP @ 3.8%
PROP. CBCI (6-39)
24 LF - 12" CLASS V RCP @ 1.1%
PROP. OCS-2
161 LF - 24" CLASS V RCP @ 0.2%
121 LF - 12" CLASS V RCP @ 0.8%
165 LF - 12" CLASS V RCP @ 1.6%
64 LF - 15" CLASS V RCP @ 2.3%
PROP. FES (6-01)
SPILLWAY
ELEV=86.50
FOREBAY PAVERS
PROP. CB (6-46)
PROP. DMH (6-47)
PROP. DMH (6-45)
PROP. CB (6-44)
PROP. DMH (6-43)
PROP. CBCI (6-42)
PROP. DMH (6-41)
PROP. DMH (6-38)
PROP. CBCI (6-39)
PROP. 5' DIA. DMH (6-40)
PROP. FES (6-01)
PROP. OCS-2
PROP. CB (6-46)
PROP. DMH (6-47)
PROP. DMH (6-45)
PROP. CB (6-44)
PROP. DMH (6-43)
PROP. CBCI (6-42)
PROP. DMH (6-41)
PROP. DMH (6-38)
PROP. CBCI (6-39)
PROP. 5' DIA. DMH (6-40)
PROP. FES (6-01)
PROP. OCS-2
PRIVATE LAYOUT LINE
PRIVATE LAYOUT LINE
PRIVATE LAYOUT LINE

SCALE: 1" = 20'

0 20 50 100

PROPOSED WATERSHED PLAN

PROJECT FILE NO. ######		
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	20	21

##########
##########

PDA-20A

PDA-20B

SCM3

MAIN STREET (ROUTE 38)
(PUBLIC - 1927 STATE HIGHWAY ALTERATION)

OLD MAIN STREET
(PUBLIC - 60' WIDE)

BERWICK AVENUE
(PAPER STREET)

BERWICK AVENUE
(PRIVATE)

1928 TOWN LAYOUT

1927 STATE HIGHWAY ALTERATION
LOCATION LINE (NO. 2441)

LINE OF 1928 DISCONTINUANCE

PC +283.70

PT +68.23

+32.28

80

102 LF - 12" CLASS V RCP @ 0.6%

11 LF - 12" DIP @ 12.3%

17 LF - 12" DIP @ 1.2%

90 LF - 12" CLASS V RCP @ 1.3%

98 LF - 12" CLASS V RCP @ 0.8%

68 LF - 12" DIP @ 2.7%

109 LF - 18" DRAINAGE PIPE - OPTION @ 0.5%

169 LF - 12" DIP @ 1.2%

6 LF - 12" DIP @ 1.6%

4 LF - 12" DIP @ 2.5%

23 LF - 12" DRAINAGE PIPE - OPTION @ 0.4%

1 LF - 12" DRAINAGE PIPE - OPTION @ 0.6%

31 LF - 24" DRAINAGE PIPE - OPTION @ 0.6%

45 LF - 18" DRAINAGE PIPE - OPTION @ 1.2%

21 LF - 18" DRAINAGE PIPE - OPTION @ 0.7%

6 LF - 12" DIP @ 1.7%

15 LF - 12" CLASS V RCP @ 1.3%

31 LF - 12" CLASS V RCP @ 0.9%

15 LF - 12" DIP @ 1.4%

6 LF - 12" DIP @ 6.3%

85 LF - 12

PROP. DGCB (7-14)

PROP. DMH (7-16)

PROP. DMH (7-31)

PROP. DMH (7-30)

PROP. GI (7-24)

PROP. OCS-3

PROP. CB (7-26)

PROP. CBCI (7-04)

PROP. DGCB (7-06)

PROP. DMH (7-07)

PROP. CB (7-03)

PROP. DMH (7-05)

PROP. CB (7-02)

PROP. 5' DIA. BYPASS DMH W/ WEIR (7-25)

PROP. CB W/F&C (7-25)

PROP. DGCB (7-12)

PROP. 5' DIA DMH (7-10)

PROP. DGCB (7-11)

PROP. CBCI (7-13)

PROP. DMH (7-15)

PROP. DMH (7-19)

PROP. DGCB (7-20)

PROP. DGCB (7-21)

PROP. DMH (7-22)

PROP. DMH (7-23)

PROP. DMH (7-27)

PROP. DMH (7-28)

PROP. DMH (7-29)

PROP. DMH (7-32)

PROP. DMH (7-33)

PROP. DMH (7-34)

PROP. DMH (7-35)

PROP. DMH (7-36)

PROP. DMH (7-37)

PROP. DMH (7-38)

PROP. DMH (7-39)

PROP. DMH (7-40)

PROP. DMH (7-41)

PROP. DMH (7-42)

PROP. DMH (7-43)

PROP. DMH (7-44)

PROP. DMH

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	21	21
PROJECT FILE NO.	######		

PROPOSED WATERSHED PLAN

PROPOSED WATERSHED PLAN.DWG Plotted on 20-Jan-2025 1:26 PM

Proposal No. 606051 - 123406

AV808-40 - 78

DP-21

PDA-21

DP-20

PDA-20B

SCM3

BORDER AVENUE (PRIVATE)

FLORENCE AVENUE (PRIVATE)

BREED AVENUE (PRIVATE)

MAIN STREET (ROUTE 38)

(PUBLIC - 1927 STATE HIGHWAY ALTERATION)

(PUBLIC - 1912 STATE HIGHWAY LAYOUT)

1927 STATE HIGHWAY ALTERATION LOCATION LINE (NO. 2441)

1912 STATE HIGHWAY LAYOUT LOCATION LINE (NO. 1403)

1912 BASELINE

PRIVATE LAYOUT LINE

CITY LINE TOWN LINE

CONTINUED ON SHEET NO. ###

SKYE GRAMS AND VALERIE GRAMS
BOOK 29847 PAGE 270
PARCEL ID 24-117
1 BORDER AVE

ROBERT HOLMES AND
LAURA HOLMES
L.C.C. 22159 B
CERT. NO. 41929
DOC NO. 278979
PARCEL ID 24-87
9 BORDER AVE

OWNER UNKNOWN
BOOK XX PAGE XX
PARCEL ID 24-86
MAIN ST

959 MAIN STREET REALTY, LLC
A/K/A MAIN STREET REALTY LLC
BOOK 33724 PAGE 209
PARCEL ID 12-4
959 MAIN ST

PARCEL ID 24-120
960 MAIN ST

P.J.W. REALTY CORP.
BOOK 52021 PAGE 87
PARCEL ID 03-06-01
3 BREED AVE

DARWIN T. CIAVARDONE AND
KIMBERLY GRIFFITHS
BOOK 58169 PAGE 211
PARCEL ID 03-07-02
1091 MAIN ST

DARWIN T. CIAVARDONE AND
KIMBERLY GRIFFITHS
BOOK 58169 PAGE 211
PARCEL ID 03-07-03
1091 MAIN ST

HENRY P. GARDNER
BOOK 37422 PAGE 274
PARCEL ID 12-3
967 MAIN ST

HENRY P. GARDNER
BOOK 80792 PAGE 409
PARCEL ID 03-03-03
MAIN ST

LORRAINE A. MACARIO
BOOK 66087 PAGE 128
PARCEL ID 03-03-02
1100 MAIN ST

PROP. CBCI (7-13)
6 LF - 12" DIP @ 6.3%
PROP. DMH (7-15)
15 LF - 12" DIP @ 1.4%
PROP. DGCB (7-14)
85 LF - 24" DRAINAGE PIPE - OPTION @ 0.6%
PROP. DMH (7-22)
11 LF - 12" DRAINAGE PIPE - OPTION @ 24.9%
PROP. CBCI (7-21)
80 LF - 24" DRAINAGE PIPE - OPTION @ 0.7%
PROP. DMH (7-09)
15 LF - 12" CLASS V RCP @ 3.4%
PROP. CBCI (7-23)
14 LF - 12" CLASS V RCP @ 0.7%
PROP. CBCI (7-20)
144 LF - 24" DRAINAGE PIPE - OPTION @ 0.5%
PROP. DMH (7-19)
17 LF - 12" DRAINAGE PIPE - OPTION @ 0.9%
PROP. CBCI (7-18)
55 LF - 24" DRAINAGE PIPE - OPTION @ 0.7%
PROP. DMH (7-16)
31 LF - 24" DRAINAGE PIPE - OPTION @ 0.6%
PROP. OCS-3
1 LF - 12" DRAINAGE PIPE - OPTION @ 0.0%
188 LF - (2)12" CLASS V RCP @ 0.8%
PROP. DMH (7-32)
72 LF - (2)12" CLASS V RCP @ 1.39%
27 LF - 12" CLASS V RCP @ 0.8%
PROP. CB (7-33)
PROP. 5' DIA. DMH (7-27)

END PROJECT
STA. 319+20.77
MEET EXISTING
N3014857.1242
E748337.3382

BENCHMARK #23
MAG SET 1' ABOVE
GRADE, UP #138-195
EL=92.51'

0 20 50 100
SCALE: 1" = 20'

Appendix E: O&M Plan and LTPPP

- Stormwater Management System Operation and Maintenance (O&M) Plan
- Long-Term Pollution Prevention Plan (LTPPP)
- Illicit Discharge Compliance Statement (IDCS)

Reconstruction of Route 38 (Main Street)
Stormwater Management System

Wilmington, MA

Operation and Maintenance Plan
and
Long-Term Pollution Prevention Plan

January 2024

Reconstruction of Route 38 (Main Street)
Stormwater Management System Operation and Maintenance (O&M) Plan

This Stormwater Management System Operation and Maintenance (O&M) Plan provides for the inspection and maintenance of catch basins and structural Stormwater Control Measures (SCMs) and for measures to prevent pollution associated with the Route 38 roadway improvements in Wilmington, MA.

This document has been prepared per the requirements of Massachusetts Department of Environmental Protection (MassDEP) Regulations 310 CMR 10.05 (6)(k)(9) for the O&M Plan. This O&M Plan satisfies the requirements of Massachusetts Stormwater Standard 9.

Responsible Party

In accordance with Massachusetts Department of Transportation (MassDOT) standards, the MassDOT District 4 office located in Arlington, MA, is responsible for the maintenance of all stormwater management features on roads within the project area.

MassDOT will be responsible for the maintenance of the proposed subsurface infiltration systems, infiltration basin, and closed drainage system.

Questions or concerns regarding activities associated with the O&M Plan should be addressed to MassDOT's District 4 office located at 519 Appleton Street, Arlington, MA 02476, phone (857) 368-4000, Fax (781) 646-5115 during regular weekday hours, or to MassDOT's Highway Command Center (HCC) located in South Boston, MA at (800) 227-0608 during all other times and days, including weekends and holidays.

Maintenance Measures and Record-Keeping

See Figure 7

Figure 3: Proposed Watershed Plan
of the Stormwater Management Report for the proposed stormwater system within the project limits. The stormwater management system covered by this O&M Plan consists of the following components:

- *Deep Sump Catch Basins with Hoods*
- *1 Infiltration Basin*
- *2 Subsurface Infiltration Systems*

MassDOT is working toward a performance-based maintenance program for SCMs and catch basins. For SCMs, MassDOT's overall approach will be to inspect SCMs, and based on the results of the inspections, perform inspections and maintenance to maintain functionality. For catch basins, MassDOT's overall approach will be to perform maintenance at an interval that maintains the functionality of the catch basin (e.g. sump less than 50% full). Catch basin inspections, including documentation of sediment accumulation, and maintenance will generally occur simultaneously. Until MassDOT's maintenance program is fully developed, MassDOT inspects 15% of SCMs and 10% of catch basins annually and performs maintenance as needed.

MassDOT's maintenance program is data driven. Inspection and maintenance will be recorded by MassDOT personnel using hand-held tablets in the field to document sediment accumulation and other maintenance issues. Data will be recorded in MassDOT's asset management system which is accessible in the field or the office. The data will support the determination of optimal maintenance frequency for each asset.

Inspection and maintenance records will be made available through the asset management system through request with the MassDOT District 4 Environmental Engineer. Records will be kept for at least three years. Representatives of the Wilmington Conservation Commission, MassDEP, and US EPA may obtain access to these records during normal business hours, upon request.

Data to be collected during inspections includes the following:

For catch basins:

- Action performed (none, inspection, inspection and repair, inspection and cleaning)
- Overall condition
- Condition of grate opening (clogged or not)
- Level of sediment accumulation
- Follow-up action (none, rebuild, frame and grate replacement, structure cleaning, piping cleaning, other)

For SCMs:

- Overall condition
- Level of erosion
- Vegetative health
- Level of sediment accumulation

- Level of trash accumulation
- SCM accessibility
- Presence of standing water
- Emergency spillway condition
- Presence of woody vegetation
- Maintenance action needed

Maintenance actions will not occur at any set frequency, but rather will be based on condition and impact to functionality. Based on the results of the inspection, repairs will be made in accordance with MassDOT standard practices. Maintenance will be prioritized given the urgency of the required maintenance and availability of staff, contracts, etc. Maintenance may require contracting if existing contracts are unavailable to perform the work. More intensive remedial activities may require permitting and/or an engineering solution.

Erosion and Sediment Control Measures during Maintenance Activities

For maintenance activities that could result in discharges of sediments or other contaminants into wetlands, waterways, or other resource areas regulated under 310 CMR 10.00, the responsible maintenance personnel will employ measures to prevent migration of these sediments/contaminants. Such temporary measures may include, but are not necessarily limited to, the use of siltation barriers, catch basin covers, pipe plugs, cofferdams deployed within the stormwater structure, turbidity curtains, or other practices designed to prevent such discharges.

Where maintenance occurs in areas that are confined, with a low risk of discharge to adjacent water bodies, no special measures may be needed. Examples include, but are not limited to: (1) cleaning of a forebay under dry conditions when the work can be completed and exposed surfaces stabilized prior to placing it back into service; and (2) catch basin cleaning where the activity is limited to removing material from a sump below the elevation of the outlet pipe.

Access for Environmental Agency Inspection

Representatives of the MassDEP and US EPA may obtain access to observe and inspect roadway and associated stormwater management system components upon request to the District 4 Environmental Engineer. For non-emergency access, representatives of the agency should contact the District 4 Environmental Engineer at least 48 hours prior to the visit, to allow adequate safety protection to be provided during the visit. Representatives of the Lexington Conservation Commission also may obtain access to inspect the site upon request.

Under emergency conditions, agency representatives should contact the 24-Hour Transportation Operation Center at 800-227-0608.

Reconstruction of Route 38 (Main Street)

Long-Term Pollution Prevention Plan

In general, long-term pollution prevention and related maintenance activities will be conducted consistent with MassDOT Highway Division's National Pollutant Discharge Elimination System (NPDES) Transportation Separate Storm Sewer System (TS4) Permit and the measures outlined in MassDOT's Stormwater Management Plan (SWMP).

This LTPPP satisfies the requirements related to pollution prevention under Massachusetts Stormwater Standards 4, 5, 6, and 10.

Practices for Long-Term Pollution Prevention

For the facilities covered, long-term pollution prevention includes the following measures:

Litter Pick-up

MassDOT will conduct litter pick-up from the stormwater management facilities in conjunction with routine road maintenance activities.

Routine Inspection and Maintenance of SCMs

MassDOT will conduct inspection and maintenance of the stormwater control measures in accordance with the Project's O&M plan.

Maintenance of Landscaped Areas

Routine mowing will be conducted according to standard MassDOT practices. Embankments designed to impound water should be mowed as required to prevent establishment of woody vegetation.

Except in rare circumstances, MassDOT does not use fertilizers, herbicides, and pesticides for the maintenance of facilities. Exceptions include using fertilizer to ensure the survival of new plantings and herbicides to control invasive plants. Use of fertilizers and herbicides shall be reviewed and approved by the applicable MassDOT District Environmental Engineer and Landscape Division prior to application. Local Conservation Commission review may also be required.

Snow and Ice Management

Snow and Ice Management will be conducted consistent with the practices outlined in the MassDOT Snow and Ice Control Program Environmental Status and Planning Report (ESPR), formerly known as the Snow and Ice Control Generic Environmental Impact Report (GEIR).

In accordance with the Snow and Ice Control ESPR, no sand is used on MassDOT properties for snow and ice control. The exception to this rule is within reduced salt areas where high sodium levels have been found in drinking water sources.

Street Sweeping

Routine highway cleaning, with a brush-type street sweeper, will be conducted in accordance with standard MassDOT practices. Sweeping will occur annually in the Spring.

Prohibition of Illicit Discharges

The MassDEP Stormwater Management Standards prohibit illicit discharges to the stormwater management system. Illicit discharges are discharges that do not consist entirely of stormwater, except for certain specified non-stormwater discharges.

Examples of discharges from the following sources are not considered illicit discharges:

- Firefighting activities*
- Foundation drains
- Water line flushing
- Footing drains
- Landscape irrigation
- Residential car washing
- Uncontaminated groundwater
- Rising groundwater
- Riparian habitats/wetlands
- Potable water sources
- Dechlorinated swimming pool water
- Street sweeping
- Wash water from buildings (without detergents)
- Condensation from air conditioning units
- Run-on from private driveways caused by precipitation
- Lawn watering

*Water from firefighting activities is allowed under this permit and need only be addressed where they are identified as significant sources of pollutants to waters of the United States.

There are no known or proposed illicit connections associated with the Route 38 roadway improvements. Should an illicit discharge (e.g., evidence of contamination of surface water discharge by non-stormwater sources) be detected, MassDOT's District 4 Maintenance Engineer and/or Environmental Engineer will be notified to assist in determining the nature and source of the discharge for the purpose of eliminating the illicit discharge.

Invasive Species Management

If the stormwater facility inspector observes the presence of invasive species within the stormwater control measure, the inspector will notify the District Environmental Engineer, who will coordinate with the District 4 maintenance personnel and if applicable, the Landscape Division, to initiate corrective action. Control of invasive plants will be conducted in accordance with MassDOT standard specifications for this practice and will be in compliance with all state and federal regulatory requirements for such practices.

Spill Prevention and Response

This project does not discharge to a Zone I, Zone A, or Outstanding Resource Water (ORW). The project is located within Zone II surface water supply protection area.

Response procedures will be implemented at the proposed subsurface infiltration systems and infiltration basin for any significant release of hazardous materials such as fuels, oils, or chemical materials that have the potential of discharging to Zone II.

Reportable quantities will immediately be reported to the applicable Federal, State, and local agencies as required by law. Reportable quantities of chemical, fuels, or oils are established under the Clean Water Act and enforced through MassDEP. The MassDEP Emergency Response Program shall be immediately notified in accordance with required procedures for the report of a release (telephone 888-304-1133).

In the case of a spill, applicable containment and clean-up procedures will be performed immediately. The Wilmington Fire Department will be the first responders. MassDOT will provide the Wilmington Fire Department with a plan delineating the drainage system discharging to Zone II. MassDOT will be on-site to aid with traffic control and to provide clean-up supplies as necessary. Spill material collected during the response will be promptly removed and disposed of in accordance with Federal, State, and local requirements. If necessary, a licensed emergency response contractor will assist in cleanup of releases depending on the amount of the release and the ability of the responsible party to perform the required response.

Illicit Discharge Compliance Statement

Per Standard 10 of the Massachusetts Stormwater Handbook, the following is an Illicit Discharge Compliance Statement:

The design plans submitted for the Notice of Intent have been designed in full compliance with current standards.

The Long-Term Pollution Prevention Plan is part of the Operation and Maintenance Plan and includes measures to prevent illicit discharges. There are no known combined sewer outfalls and to the best of our knowledge all closed stormwater systems discharge per Massachusetts DEP requirements. Based on observations during a site visit in October 2020 the site does not contain any known existing illicit discharges.

Registered Professional Engineer Block and Signature

Signature and Date

GREEN
A Lochner Company

MEMORANDUM

May 22, 2025

To:	Heidi Davis, MassDEP (via heidi.davis@mass.gov) Ryan Hale, MassDEP (via ryan.hale@mass.gov)
Cc:	Jill Provencal, DEP NERO (via jill.provencal@mass.gov) Kevin M Newton, USACE (via kevin.m.newton@usace.army.mil) Dan Vasconcelos, USACE (via daniel.b.vasconcelos@usace.army.mil) Cameron Lynch, Wilmington Conservation Commission (via clynch@wilmingtonma.gov) Erica Larner, MassDOT (via melissa.lenker@dot.state.ma.us) Kevin Thompson, MAssDOT (via kevin.s.thompson@dot.state.ma.us) Melissa Lenker, MassDOT (via melissa.lenker@dot.state.ma.us) Eamon Kernan, MassDOT (via eamon.kernan@dot.state.ma.us)
From:	Oxana Fartushnaya, Green International Affiliates, Inc. (via ofartushnaya@greenintl.com)
Date:	May 22, 2025
Project Name:	Reconstruction of Route 38 (Main Street) from Route 62 to the Woburn City Line in Wilmington, MA
MassDOT Project No:	608051
Subject:	Response to MassDEP Administrative Completeness and Technical Deficiency Review letter for 401 WQC Transmittal No. 25-WW26-0013-APP

This memorandum provides the responses to MassDEP Administrative Completeness and Technical Deficiency Review letter for 401 WQC Transmittal No. 25-WW26-0013-APP. It has been noted that MassDEP cannot complete technical review of the WQC application until the Massachusetts Environmental Policy Act (MEPA) process has concluded.

Please note that the Public Notice for the 401 WQC filing was published in the 5/7/2025 edition of the Environmental Monitor (Volume 98, Issue 8) per Section 24 of Chapter 79 of the Acts of 2014.

Responses to each technical review comment are noted below in **Bold**.

1. Comments 2 through 7 in the email from the U.S. Army Corps of Engineers (USACE) to MassDOT dated April 17, 2025, are hereby incorporated by reference.

The USACE comments were incorporated, and the responses were submitted on 4/23/2025. MassDEP was copied on the responses.

2. Relative to USACE Comment 5, it is not clear why the permanent Bordering Vegetated Wetland (BVW) impacts at the intermittent stream culvert replacement (approximate Station 218+00) could not be temporary and the BVW restored. Please clarify the proposed final condition of this area and demonstrate the permanent BVW impacts are required, if applicable.

The area of BVW permanent impacts was considered to be up to the "slope limits" which was assumed to have involved minor regrading around the proposed riprap within this BVW, therefore, it was considered as a "permanent" impact. However, the comment prompted us to further evaluate these impacts, and it was determined that most of this area outside of the riprap placed in the stream for scour protection will remain a BVW upon completion of work with restoration measures performed to reestablish the natural wetland conditions in accordance with the MassDOT Special Provisions for Wetlands Restoration. In addition, the impacts at this culvert were revised based on the response to comment #4 below. All impact areas were revised accordingly; the impacts in wetland A-series outside of the riprap are now shown as all temporary. (see attached WQC/ACOE impacts Plan-1, last revised 5/21/2025).

3. Please evaluate installation of a retaining wall along the west side of Route 38 from approximate Stations 138+50 to 241+00 to avoid or minimize permanent BVW impacts. If a retaining wall is not practicable, please evaluate a steeper slope (i.e., 1.5:1 as opposed to 2:1).

The option to install a retaining wall along the west side of Route 38 from STA. 238+50 to STA. 241+00 was previously evaluated and determined to be impractical. This was due to the proximity of the wetlands within 3 feet from the back of sidewalk and the placement of the wall footing in poor soil conditions within the wetland. Additionally, the retaining wall would need to extend an additional 177 feet into Butters Row from STA. 241+00 to avoid a short gap between the two walls. This wall extension would result in increases to temporary and permanent wetland impacts of 117 SF and 68 SF, respectively. An alternative using a 1.5:1 slope with modified rockfill was also considered to reduce wetland impacts. However, this option did not offer significant improvements over the 2:1 slope. While using a steeper slope can typically reduce impacts, this case would've required us to install standard post guardrail with a level 3'-7" bench beyond the back of sidewalk for safety and constructability reasons per the latest edition of the AASHTO Roadside Design Guide. With a 2:1 slope, we were able to propose a deep post guardrail option, which eliminated the need for the 3'-7" bench behind the sidewalk. Because deep post guardrail cannot be embedded into modified rockfill, this was not an option with the 1.5:1 slope. Therefore, the 2:1 slope with a deep post guardrail was selected as the preferred alternative to avoid the additional 125 SF of wetland impacts present in the 1.5:1 slope option.

4. The application states that the culvert at the intermittent stream at STA 218+00 is 3.5 feet wide and the proposed culvert is 3.0 feet wide. Please provide the measured bankfull width and evaluation of how the proposed 3-foot-wide culvert meets the MA Stream Crossing Standards to the Maximum Extent Practicable. In addition, please provide an evaluation of whether the culvert may be further widened to better meet Stream Crossing Standard 3. Note the width of the culvert beneath the railroad tracks upstream of this crossing does not preclude and has no bearing on the potential widening of this structure.

The existing culvert is 3' W by 1.5' D as shown on the plans and confirmed during the field check on 5/6/2025. The permit reports and hydraulic analysis inadvertently used the incorrect width of the existing culvert based on the old record plans.

We have reevaluated the opportunities to improve the crossing in order to comply with the State Stream Crossing Standards to the Maximum Extent Practicable (MEP) as discussed below. As a result, the Hydraulic Analysis Memo was revised to address the proposed widened box culvert on 5/21/2025 and is attached to these Responses.

Response to MassDEP Administrative Completeness and Technical Deficiency Review letter for 401 WQC Transmittal No. 25-WW26-0013-APP
May 22, 2025

Below please find the revised compliance discussion for the replacement of the subject stream crossing with the Massachusetts River and Stream Crossing Standards:

Table 1: Compliance with Massachusetts River and Stream Crossing Standards – Culvert at STA. 218+00

Stream Crossing (Sta. #)	SCGS #1	SCGS #2	SCGS #3	SCGS #4	SCGS #5	SCGS #6
Culvert Replacement at Sta. 218+00	MEP	MEP	Met	Met	Met	MEP

SCGS #1 posits that "*Spans (bridges, 3-sided box culverts, open-bottom culverts or arches) that preserve the natural stream channel are strongly preferred*."

- **The existing 3'x1.5' obstructed culvert is not an open bottom structure and will be replaced with the proposed 4'x3' precast concrete box culvert. This culvert conveys an intermittent stream that does not have a year-round flow and it outfalls into a Vegetated Wetland (VW) (A-series). There is another culvert upstream of the culvert inlet conveying this intermittent stream beneath the MBTA railroad tracks, which is not being replaced as part of this project. Both of the existing culverts beneath the MBTA railroad tracks and Route 38 are not an open bottom structure, and replacement of the culverts with open bottom structures is not feasible due to constructability constraints related to existing utilities and will cause more impacts to the surrounding VWs. However, despite it not being an open bottom crossing, the proposed 4'W x 3'D box culvert will still be embedded and have natural streambed materials restored to effectively have a natural bottom. Therefore, <u>this standard is met to the maximum extent practicable.</u>**

SCGS #2 provides recommendations for a culverted crossing to be embedded a minimum of 2 feet.

- **The existing culvert is not embedded 2 feet or more. The proposed replacement culvert will be embedded less than 2 feet (approximately 18") due to the distance needed to be maintained for the existing utilities while the trenching for the culvert and the proposed utilities that will pass below the culvert are installed. Natural streambed material proposed at the bottom of the proposed culvert will be at the same elevation as the existing surface. <u>Therefore, this standard is met to the maximum extent practicable.</u>**

SCGS #3 calls for a new span to incorporate a width that, at a minimum, equals 1.2 times bankfull width of the stream.

- **The existing structure does not comply with the SCGS #3. We have reevaluated the opportunities to improve the crossing in order to comply with the State Stream Crossing Standards to the Maximum Extent Practicable (MEP). Since the unnamed intermittent stream flows north of the culvert into a small phragmites marsh (Wetland Series "A"), where standing water is present, there are no clearly defined bankfull indicators for this intermittent stream. The soils are predominantly histosols, and the vegetation is primarily non-woody (consisting mainly of phragmites). Under these conditions, the banks of the stream would be interpreted as the edge of the marsh itself. However, measuring the width from the edges of the marsh would not provide representative measurements of the stream's bankfull width. Instead, measurements should be taken further downstream, where the stream exits the phragmites marsh and clearly defined banks are present. The bankfull width for this stream can only be estimated using StreamStats approximately 700 feet northwest of the crossing, where the**

stream is within the extensive marsh area. The bankfull width (BFW) is 3.14 ft (based on the Bankfull Statistics Parameters [USA Bieger 2015], Bankfull Statistics Flow Report [Area-Averaged]). Based on the constraints imposed by the crossing telephone, water and gas utilities, the maximum practicable size of the proposed culvert is a 4'-wide and 3'-deep structure. Because the existing utilities need to be maintained while the trenching for the culvert and the proposed utilities that will pass below the culvert are installed, the maximum size of this culvert is 4'x3'. Widths over 4' require different strategies for the support of excavation which will be disruptive to critical utilities.

Considering the observed existing conditions and hydraulic calculations for this site as discussed above, widening the proposed crossing to 4' would slightly exceed the 1.2 x BWF measurement and will provide the improved crossing for wildlife under proposed conditions. This standard is fully met.

SCGS #4 calls for placement of natural substrate within the structure.

- **As shown in the plans, the proposed replacement of the culvert at Sta. 218+00 will incorporate natural substrate as part of the streambed restoration. In addition, rip rap placed at the inlet and outlet for scour protection will be fully covered in a layer of natural streambed material. This standard is fully met.**

SCGS #5 calls for "*… bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows*."

- **The proposed replacement of the culvert at Sta. 218+00 will maintain bed forms and streambed characteristics comparable to those found in the natural channel at a variety of flows. Natural streambed materials will be placed at the same elevation to match the existing streambeds which will allow for a smooth transition from upstream to downstream of the crossing upon completion of construction. This standard is fully met.**

SCGS #6 provides a desired level of "*openness*" for stream crossings so that wildlife will utilize the crossing for passage beneath a roadway. The desired ratio of cross-sectional area of opening to passage length is a minimum value of 0.82 feet.

- **The existing cross-sectional area is 4.5 square feet divided by the existing passage length of 47.65 feet, yields a value of 0.09 feet, therefore, the existing culvert does not meet Standard #6 by providing a minimum level of openness of 0.82 feet. However, the project proposes the replacement of the existing 3'x1.5' obstructed culvert with a 4'x3' precast concrete box culvert. The size of the opening will be increased under the proposed conditions with a 12" layer of natural stream bottom placed in the culvert body. The proposed cross-sectional area of 8 square feet divided by a proposed passage length of 55.32 feet, both as shown in the Plans, yields a value of 0.14 feet, which is an improvement from the existing conditions. Substantial enlargement of the structure is not feasible due to constructability constraints discussed above under SCGS #3 and additional impacts to adjacent protected resource areas (VW A-series). Therefore, this standard is met to the maximum extent practicable.**

5. The amount of proposed riprap within and adjacent to the Maple Meadow Brook crossing appears excessive for this type of headwater low energy system. Potential solutions that have been incorporated into previous projects include reshaping the riprap fill areas to follow more natural drainage patterns and removing riprap from adjacent BVWs to the extent practicable. Please

evaluate these measures, and any other practicable measures, to reduce the footprint of riprap within and adjacent to Maple Meadow Brook. A reduction in BVW alteration may result in a commensurate reduction in the required BVW replication.

The hydraulic requirements to mitigate scour were reevaluated and the amount of riprap on the downstream side was reduced outside of the area of the channel's flow. The reduction of riprap on the upstream side is not recommended in order to protect against contraction scour through the bridge opening. The limit of the scour protection is designed in accordance with FHWA HEC-23 guidelines and limited to the area of the flow as it approaches the bridge opening.

After further evaluation, additional reduction of impacts was achieved at the Maple Meadow Brook crossing. The Impacts Plans were revised throughout all permit applications to address the changes to the proposed structure as discussed above. The revised 401/404 Impacts Plans are attached to these Responses.

The following table provides the updated 401/404 Impacts for the entire project:

Table 2: VW and LUW/WOTUS Impacts - Revised 5/22/2025

Resource Area	Permanent Impacts (SF)	Temporary Impacts (SF)	Total Per Area
VW	2,630	2,834	5,464
LUW/WOTUS	2,195	601	2,796
Total	**4,825**	**3,435**	**8,260**

Due to application of multiple avoidance and minimization strategies at both stream crossing locations and project-wide, the overall cumulative impacts subject to 401 WQC Application Transmittal No. 25-WW26-0013-APP were reduced. The permanent impacts to VWs were reduced from 3,292 SF to 2,630 SF, and the temporary impacts to VWs were also slightly reduced; the cumulative permanent LUW/WOTUS impacts were reduced from 2,380 SF to 2,195 SF, while temporary LUW/WOTUS impacts were reduced form 710 SF to 601 SF.

All permanent and temporary impacted LUW/WOTUS areas and all temporary impacted VW areas will be restored upon completion of work in accordance with applicable Special Provisions included in the Contract and in the 401/404 application. We will consider reduction of the replication area accordingly.

6. Please evaluate installing a Stormwater Control Measure (SCM) within the proposed compensatory flood storage area to better meet the Stormwater Management Standards to the maximum extent practicable.

The goal of the proposed design for the Compensatory Flood Storage Area is to protect/retain the existing mature trees in this area as much as feasible, which is why the limit of work is irregular. This floodplain mitigation measure is located within a 0-100ft segment of the vegetated Riverfront Area. The mature vegetation within Riverfront Areas is known to provide a natural buffer for stormwater discharging into this area to go through prior to reaching the surface waters. Groundwater is typically high in such areas due to close proximity to Wetland "G", therefore surface SCM is likely not feasible. Subsurface SCM would likely require removal of trees. Compensatory flood storage area was designed to provide compensation on a foot-by-foot basis as well as to minimize impacts adjacent to wetland. Therefore, SCM is not feasible.

7. It appears Stormwater Management Standard 3 has been met using the macro approach, rather than met to the maximum extent practicable. Standard 3 requires the annual recharge from the post-development site to approximate the annual recharge from pre-development conditions. MassDEP notes that providing the required recharge for the net increase in impervious surface meets Standard 3.

Correct. The standard 3 is met to the MEP by providing (and exceeding) recharge volume for the net increase in impervious area.

8. The narrative states there will be two 11-foot-wide southbound travel lanes for 900 feet south of the intersection of Route 62 and Route 38. Please clarify whether the roadway will be widened a lane width or more in this area, and if so, full compliance with the Stormwater Management Standards is required for that portion of the project.

The proposed two (2) 11-foot-wide southbound travel lanes extending for 900 feet just south of the intersection of Route 62 and Route 38 consist of a combination of box-widening and restriping of the existing paved roadway. Therefore, the proposed shoulder widening between 6'-6" and 7'-6" does not constitute an addition of a new single lane. Throughout this segment of roadway, the existing lane and shoulder widths are approximately 12'-6" and 2'-6", respectively. The proposed widening between 6'-6" and 7'-6" aims to achieve the goal of creating adequate shoulder and buffer width for safe bicycle accommodations. Therefore, it is our understanding that the proposed widening at this segment does not constitute an addition of a new single lane, and the project meets the definition of both the "Limited Project" under the WPA and the "Redevelopment" project under the MA Stormwater Management Standards.

9. MassDEP requests a meeting to discuss how the Estimated Seasonal High Groundwater (ESHGW) was determined for the infiltration SCMs, as well as to discuss the conclusions regarding ESHGW for SCM-2. Redoximorphic features used to identify ESHGW were not identified in the test pits or boring logs. Additional investigation may be needed to establish ESHGW at the infiltration SCMs.

The ESHGW for SCMs was determined through observations of the moisture content in the borings, which were analyzed the same day as they were performed (as indicated in the boring logs). In addition, the geotechnical team confirmed through the site photos that redox features were not present in the test pits or boring samples that were used to analyze ESHGW below the proposed SCMs.

For SCM-1, boring hole BH #2 from Lamson's Geotechnical report was used to determine the ESHGW elevation. BH #2 extended 15' below the surface at elevation 79.4' and no groundwater was encountered, which is more than 2' below the bottom of SCM-1. Based on engineering judgement, we believe SCM-1 has more than 2' of separation to ESHGW.

For SCM-3, boring hole BH #3 from Lamson's Geotechnical report was used to determine the ESHGW elevation. Groundwater was encountered 9' below the surface in BH #3, which is more than 2' below the bottom of SCM-3. Based on engineering judgement, we believe SCM-1 has more than 2' of separation to ESHGW.

For SCM-2, the test pit TP #4 and boring hole BH #3 from Lamson's Geotechnical report were used to determine the ESHGW elevation. TP #4 was located within proposed SCM-2 and did not encounter ESHGW (bottom of test pit was at 83.8', bottom of SCM-2 is at elevation 85.0'). TP #4 located within the proposed

SCM-2 did not have any indication of moisture content. BH #3, though it is outside of the immediate area of SCM-2, is within the same watershed and ground elevation. It was used to demonstrate more than 2' separation to groundwater from the bottom elevation of the infiltration basin (GW is at 80.7' per BH #3), since TP #4 was 1.2' below the bottom of the proposed basin. The grade difference between the existing surface elevation at SCM-2 and BH #3 surface elevation are close (89.7' versus ~90'), which is why proceeded with this approach.

See photos BH #3 (Sample 4) and TP #4 below:

Picture 1 *– Boring # 3 (Sample 4)*

Picture 2 *– Test Pit # 4*

Due to the accelerated project schedule and the anticipated advertisement date in August 2025, if DEP finds that a new test pit at SCM-2 is required, we request this to be added as a special permit condition for this work to be completed. If acceptable, we will perform the test pit before advertising the project in order to adjust the depth of the basin as needed, based on the observed groundwater table.

10. SCM inspection and maintenance frequencies need to be in accordance with Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook.

We have revised the O&M Plan to include DEP maintenance frequencies. MassDOT strives to achieve maintenance frequencies outlined in MassDEP's Stormwater Handbook for the inspection and maintenance of their SCMs as listed in the table below. However, it is a challenge for MassDOT to meet the stated frequencies set forth by MassDEP as a statewide agency. As a result of this, MassDOT is in the process of developing a Programmatic Operation and Maintenance Plan (POMP) which will allow for the O&M of the stormwater assets to be executed using a data driven approach. Once established, the POMP will supersede the project-specific O&M plan.

Table 3: SCM Inspection and Maintenance Frequencies (Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook)

Activity	Frequency
Subsurface Chamber System: Inspect inlets (SCM-1 and SCM-3)	**Twice a year. Remove any debris that might clog the system.**

Inspect sediment forebays (SCM-2)	**Monthly**
Clean sediment forebays (SCM-2)	**Four times per year and when sediment depth is between 3 to 6 feet.**
Infiltration Basin: Preventative maintenance (SCM-2)	**Twice a year**
Infiltration Basin: Inspect to ensure proper functioning (SCM-2)	**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.**
Infiltration Basin: 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 (SCM-2)	**Twice a year**
Infiltration Basin: Inspect and clean pretreatment devices (SCM-2)	**Every other month recommended and at least twice a year and after every major storm event.**

11. Please sign and date the Illicit Discharge Compliance Statement at the end of the Stormwater Management Report.

Noted. The unsigned version of the Stormwater Report was inadvertently sent with the WQC submission. The latest version of the report includes signed IDCS and is attached to these Responses.

Enclosed with this letter response are the following documents:

- Administrative Completeness and Technical Deficiency Review Letter, dated 5/1/2025
- Hydraulic Memo for Culvert Structure No. 1, dated 5/20/2025
- Revised 401 WQC Plan Sheets, dated 5/22/2025
- Revised Drainage and Utility Plans (selected sheets), dated 5/22/2025
- Revised Special Drainage Structure No. 1 Sheets, dated 5/22/2025
- Revised Bridge Sheet No. 1, dated 5/22/2025
- Stormwater Report, dated March 2025 (bound separately)

ATTACHMENTS

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
100 Cambridge Street Suite 900 Boston, MA 02114 • 617-292-5500

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

May 1, 2025

Massachusetts Department of Transportation Highway Division
Ten Park Plaza, Room 7360
Boston, MA 02116
ATTN: Erica Larner

RE: 401 WATER QUALITY CERTIFICATION
Administrative Completeness and Technical Deficiency Review
401 WQC Transmittal No: 25-WW26-0013-APP

AT: Reconstruction of Route 38 (Main Street)
Route 62 to the Woburn City Line
Wilmington, MA

Dear Ms. Larner:

The Massachusetts Department of Environmental Protection (MassDEP) Wetlands Program Highway Unit has completed its Administrative Completeness Review of the application for the above-referenced Water Quality Certification (WQC) application. The application requires proof of public notice in the Environmental Monitor per Section 24 of Chapter 79 of the Acts of 2014 to be administratively complete Please also note MassDEP cannot complete technical review of the WQC application until the Massachusetts Environmental Policy Act (MEPA) process has concluded.

MassDEP has completed a preliminary Technical Review of the above-referenced application pending conclusion of the MEPA process, and requests that you submit the following additional information:

1. Comments 2 through 7 in the email from the U.S. Army Corps of Engineers (USACE) to MassDOT dated April 17, 2025, are hereby incorporated by reference.

This information is available in alternate format. Please contact MassDEP at 617-292-5500.
TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

2. Relative to USACE Comment 5, it is not clear why the permanent Bordering Vegetated Wetland (BVW) impacts at the intermittent stream culvert replacement (approximate Station 218+00) could not be temporary and the BVW restored. Please clarify the proposed final condition of this area and demonstrate the permanent BVW impacts are required, if applicable.

3. Please evaluate installation of a retaining wall along the west side of Route 38 from approximate Stations 138+50 to 241+00 to avoid or minimize permanent BVW impacts. If a retaining wall is not practicable, please evaluate a steeper slope (i.e., 1.5:1 as opposed to 2:1).

4. The application states that the culvert at the intermittent stream at STA 218+00 is 3.5 feet wide and the proposed culvert is 3.0 feet wide. Please provide the measured bankfull width and evaluation of how the proposed 3-foot-wide culvert meets the MA Stream Crossing Standards to the Maximum Extent Practicable. In addition, please provide an evaluation of whether the culvert may be further widened to better meet Stream Crossing Standard 3. Note the width of the culvert beneath the railroad tracks upstream of this crossing does not preclude and has no bearing on the potential widening of this structure.

5. The amount of proposed riprap within and adjacent to the Maple Meadow Brook crossing appears excessive for this type of headwater low energy system. Potential solutions that have been incorporated into previous projects include reshaping the riprap fill areas to follow more natural drainage patterns and removing riprap from adjacent BVWs to the extent practicable. Please evaluate these measures, and any other practicable measures, to reduce the footprint of riprap within and adjacent to Maple Meadow Brook. A reduction in BVW alteration may result in a commensurate reduction in the required BVW replication.

6. Please evaluate installing a Stormwater Control Measure (SCM) within the proposed compensatory flood storage area to better meet the Stormwater Management Standards to the maximum extent practicable.

7. It appears Stormwater Management Standard 3 has been met using the macro approach, rather than met to the maximum extent practicable. Standard 3 requires the annual recharge from the post-development site to approximate the annual recharge from pre-development conditions. MassDEP notes that providing the required recharge for the net increase in impervious surface meets Standard 3.

8. The narrative states there will be two 11-foot-wide southbound travel lanes for 900 feet south of the intersection of Route 62 and Route 38. Please clarify whether the roadway will be widened a lane width or more in this area, and if so, full compliance with the Stormwater Management Standards is required for that portion of the project.

9. MassDEP requests a meeting to discuss how the Estimated Seasonal High Groundwater (ESHGW) was determined for the infiltration SCMs, as well as to discuss the conclusions

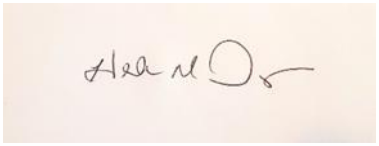
regarding ESHGW for SCM-2. Redoximorphic features used to identify ESHGW were not identified in the test pits or boring logs. Additional investigation may be needed to establish ESHGW at the infiltration SCMs.

10. SCM inspection and maintenance frequencies need to be in accordance with Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook.
11. Please sign and date the Illicit Discharge Compliance Statement at the end of the Stormwater Management Report.

Please note that MassDEP may have further comments upon review of the plan revisions delivered to MassDEP NERO on May 1, 2025. Upon receipt of all requested supplemental information, MassDEP has 30 calendar days in which to issue or deny a certification.

Should you have any questions relative to this letter, please contact me at heidi.davis@mass.gov or Ryan Hale at ryan.hale@mass.gov.

Sincerely,



Heidi M. Davis
Highway Unit Supervisor

Ecc: DEP NERO – Jill Provencal
USACE – Dan Vasconcelos
USACE – Kevin Newton
MassDOT – Kevin Thompson
Green International – Oxana Fartushnaya
Wilmington Conservation Commission – Cameron Lynch, Conservation Agent

Hydraulic Memo for Culvert Structure No. 1

MEMORANDUM

To:	Eamon Kernan P.E.
Cc:	Hanan Fouad, P.E.
From:	Andrew Feingold, P.E.
Date:	May 21, 2025
Project Name:	Reconstruction on Route 38 (Main Street)
Project Number:	MassDOT Project No. 608051
Subject:	Dublin Avenue Hydraulic Memo

The project MassDOT Project No. 608051 consists of the reconstruction/rehabilitation of Route 38 (Main Street) from the Woburn Town Line to the Route 62 (Burlington Avenue/Church Street) intersection (approximately 2.2 miles). The proposed roadway curb to curb width is 32 feet with sidewalk(s) along the project corridor. The proposed improvements consist of maintenance and improvement of the existing roadway. The work includes improving existing drainage systems, improving existing water system, constructing sidewalks, repaving, and minor sewer improvements.

As part of the drainage improvements, the existing 3’ x 1.5’ box culvert crossing Main Street between Dublin Avenue and Montrose Avenue will be replaced by a 36-inch diameter reinforced concrete culvert. The purpose of this report is to present the results of a capacity and scour analysis study analyzing both the existing and proposed conditions at this crossing.

PROJECT DESCRIPTION

EXISTING CONDITIONS

The existing culvert is nearly 46 feet long, with a 3-foot wide and 1.5-foot tall rectangular cross section. It is oriented south to north and is downstream of a 2.5’ x 2.5’ box culvert that crosses the MBTA tracks that run parallel to Main Street on the southwestern side. The MBTA culvert acts as a control structure from a wetland storage area *P-1* to the southwest of the train tracks. There are three additional culverts attached to the same wetland storage area *P-1*. Two of the additional culverts discharge to the same wetland *W-1* as the Dublin Avenue culvert, and the third discharges to a separate wetland *W-2*. The locations of the culverts and wetlands are shown in Figure 1.

PROPOSED CONDITIONS

Under proposed conditions, the existing 3’ x 1.5’ box culvert will be replaced with a 56-foot long 4’x3’ reinforced concrete culvert. The proposed 4’x3’ box culvert will have 1’ of fill comprised of natural stream bed material and stone for pipe end, resulting in a hydraulic opening of 4’x2’.

Figure 1– Box culvert outlet under railroad tracks west of Route

Figure 2– Box culvert inlet on the western side of Route 38

ENGINEERING METHODS

GENERAL

Topographic survey data and MassMapper GIS Contour Lines were used to determine catchment and wetland areas. A summary of the watershed area is provided in Table 1.

Table 1: Summary of Watershed Area

Ground Cover Type	Area (Acres)	CN
Water Surface	33.46	98
Impervious	44.96	98
Forested	47.21	77
Total	**125.63**	**90**

The contours and topographic data were used to model the wetland storage area in HydroCAD, and the model used to calculate the peak flow through the four outlet culverts (Appendix A). Record plans provided by the Town of Wilmington were used to model the three additional culverts outside of the project area. Based on the record information, the invert of the Dublin Avenue culvert is higher than the other three culverts. For the purposes of the model, the inverts of all the culverts were assumed to be equal in order to model the worst-case scenario. The peak flows through the Dublin Avenue culvert are shown in Table 2.

Table 2: Summary of Peak Flows Through Dublin Avenue Culvert

Design Storm	Peak Flow
25-yr	39.4 cfs
50-yr	41.1 cfs
100-yr	43.2 cfs

Hydraflow Express Extension for Autodesk was used to model the culvert under existing and proposed conditions. For the purposes of the hydraulic model, it was assumed that the culvert is free of sediment and obstructions, other than the 1' of material placed at the bottom. The water surface elevation is calculated to be 85.48', with 2.52' of freeboard remaining to the roadway surface. This meets the requirements of the MassDOT Project Development Design Guide.

SCOUR/STABILITY ANALYSIS

We calculated the scour hole dimensions (length, width, and depth) using the Hydraulic Engineering Circular (HEC) No. 14; "Hydraulic Design of Energy Dissipators for Culverts and Channels" Chapter 5:

"Estimating Scour at Culvert Outlets" and using equation 5.1 for cohesionless soils shown below:

$$\left[\frac{h_s}{R_c}, \frac{W_s}{R_c}, \frac{L_s}{R_c}, \frac{V_s}{R_c^3}\right] = C_s C_h \left(\frac{\alpha}{\sigma^{1/3}}\right) \left(\frac{Q}{\sqrt{g}(R_c^{2.5})}\right)^{\beta} \left(\frac{t}{316}\right)^{\theta}$$

The equations are based on tests that were conducted to determine the maximum scour for the given

condition and therefore represent what might be termed worst case scour geometries.

We utilized the flows with the highest exit velocities for analyzing the scour hole dimensions of each culvert. No scour potential under current conditions was calculated although the site conditions were reviewed to assess the current scour conditions.

The scour calculations were performed with the understanding that the channel downstream of the culvert will be lined with Type I Riprap. The results of the scour analyses are shown in Table 5.1.

Table 5.1 – Summary of Calculated Scour

Alternative	Return Frequency	Scour Hole Depth (Feet)	Scour Hole Width (Feet)	Scour Hole Length (Feet)	Scour Hole Volume (Cubic Feet)	Location of Maximum Scour (Feet)
Dublin Avenue	Peak Velocity Flow (43.2 cfs during a 100-year event)	3.95	17.1	33.8	1,103	13.5

The values shown in the table above are not supported by the field observation. The observed scour hole measures approximately 10' wide by 10' long by 2' deep. The likely reason that Equation 5.1 is calculating a higher amount of scour is that the tailwater depth is not directly considered by the equation. The culvert at this location is regularly submerged after smaller storm events. A higher tailwater condition will reduce the velocity and the amount of scour within the channel. In order to minimize impacts within the wetland the area that is protected by the scour mitigation will be limited to the area of observed scour in the existing conditions.

Scour Countermeasures

The scour/stability analyses were performed using Hydraulic Engineering Circular (HEC) No. 14; "Hydraulic Design of Energy Dissipators for Culverts and Channels" Chapter 10: "Riprap Basins and Aprons" and using equation 10.4 shown below:

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

Table 5.2 displays dimensions for riprap apron at the proposed culverts.

Table 5.2 – Summary of Countermeasure Design

Alternative	Riprap Size D_{50} (Inches)	Riprap Class	Riprap Apron Length-Upstream (Feet)	Riprap Apron Length-Downstream (Feet)	Riprap Apron Depth (Feet)	Riprap Apron Width (Feet)
Dublin Avenue	6.5	Class 1	10*	10.7	1.9	15.1

*Channel is only open 10’ upstream before the next culvert opening.

In order to minimize impacts on the wetland the area the scour mitigation will be limited to the area of observed scour. The proposed hydraulic opening of the culvert is larger than the existing hydraulic opening, therefore, discharge velocities and scour will be reduced at the culvert outlet, and protecting the area of observed scour will be sufficient.

CONCLUSIONS

- The project hydraulic model indicates that the proposed culvert replacement will safely convey the 50-year design flood event.
- By increasing the hydraulic opening of the culvert the scour potential at the outlet is reduced.
- The scour protection apron at the eastern embankment must be 14 feet length to protect against the Design Scour event. However, in order to minimize permanent impacts to the wetland the protection will be limited to the area of observed scour.
- The design incorporates the scour countermeasures, as described above.

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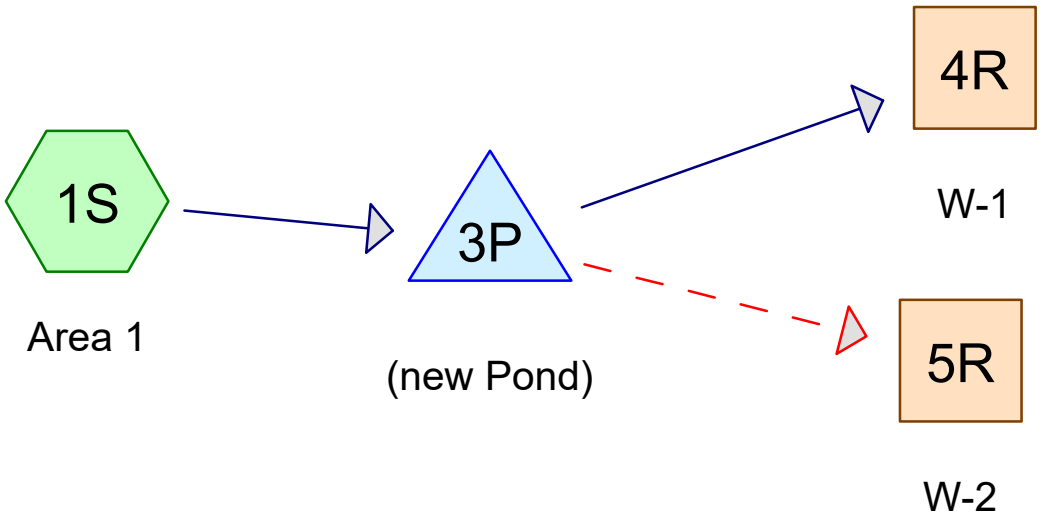
HYDRAULICS
HYDRAFLOW EXPRESS
MODEL



Subcat Reach Pond Link

Routing Diagram for Wilmington Culvert 1
Prepared by Green International Affiliates, Inc.. by V. Palma, Printed 10/26/2023
HydroCAD® 10.00-24 s/n 06415 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
33.455	98	Paved parking, HSG D (1S)
44.958	98	Water Surface, HSG D (1S)
47.212	77	Woods, Good, HSG D (1S)
125.625	**90**	**TOTAL AREA**

Wilmington Culvert 1
Prepared by Green International Affiliates, Inc.. by V. Palma Printed 10/26/2023
HydroCAD® 10.00-24 s/n 06415 © 2018 HydroCAD Software Solutions LLC

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
125.625	HSG D	1S
0.000	Other	
125.625		**TOTAL AREA**

Wilmington Culvert 1

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3P	83.00	82.52	10.0	0.0480	0.014	36.0	36.0	0.0
2	3P	83.00	82.52	54.8	0.0088	0.014	24.0	24.0	0.0
3	3P	83.00	82.52	54.8	0.0088	0.014	24.0	24.0	0.0
4	3P	83.00	82.52	54.8	0.0088	0.014	12.0	0.0	0.0

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

Subcatchment1S: Area 1 Runoff Area=5,472,214 sf 62.42% Impervious Runoff Depth>4.28"
Flow Length=2,880' Slope=0.0512 '/' Tc=23.0 min CN=90 Runoff=372.78 cfs 44.801 af

Reach 4R: W-1 Inflow=105.73 cfs 41.558 af
Outflow=105.73 cfs 41.558 af

Reach 5R: W-2 Inflow=5.65 cfs 3.169 af
Outflow=5.65 cfs 3.169 af

Pond 3P: (new Pond) Peak Elev=86.49' Storage=417,777 cf Inflow=372.78 cfs 44.801 af
Primary=105.73 cfs 41.558 af Secondary=5.65 cfs 3.169 af Outflow=111.38 cfs 44.726 af

Total Runoff Area = 125.625 ac Runoff Volume = 44.801 af Average Runoff Depth = 4.28"
37.58% Pervious = 47.212 ac 62.42% Impervious = 78.413 ac

Summary for Subcatchment 1S: Area 1

Runoff = 372.78 cfs @ 12.32 hrs, Volume= 44.801 af, Depth> 4.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
1,958,378	98	Water Surface, HSG D
1,457,297	98	Paved parking, HSG D
2,056,539	77	Woods, Good, HSG D
5,472,214	90	Weighted Average
2,056,539		37.58% Pervious Area
3,415,675		62.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	2,880	0.0512	2.09		**Lag/CN Method,**

Summary for Reach 4R: W-1

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

Inflow Area = 125.625 ac, 62.42% Impervious, Inflow Depth > 3.97" for 25-Year event
Inflow = 105.73 cfs @ 12.85 hrs, Volume= 41.558 af
Outflow = 105.73 cfs @ 12.85 hrs, Volume= 41.558 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: W-2

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

Inflow = 5.65 cfs @ 12.85 hrs, Volume= 3.169 af
Outflow = 5.65 cfs @ 12.85 hrs, Volume= 3.169 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 3P: (new Pond)

[82] Warning: Early inflow requires earlier time span

Inflow Area = 125.625 ac, 62.42% Impervious, Inflow Depth > 4.28" for 25-Year event
Inflow = 372.78 cfs @ 12.32 hrs, Volume= 44.801 af
Outflow = 111.38 cfs @ 12.85 hrs, Volume= 44.726 af, Atten= 70%, Lag= 31.7 min
Primary = 105.73 cfs @ 12.85 hrs, Volume= 41.558 af
Secondary = 5.65 cfs @ 12.85 hrs, Volume= 3.169 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 86.49' @ 12.85 hrs Surf.Area= 0 sf Storage= 417,777 cf

Plug-Flow detention time= 23.5 min calculated for 44.570 af (99% of inflow)
Center-of-Mass det. time= 22.5 min (791.5 - 768.9)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	7,386,022 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	0	0
86.00	13,729	13,729
87.00	825,465	839,194
88.00	1,738,264	2,577,458
89.00	2,221,557	4,799,015
90.00	2,587,007	7,386,022

Device	Routing	Invert	Outlet Devices
#1	Primary	83.00'	**36.0" W x 36.0" H Box Culvert** L= 10.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0480 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 9.00 sf
#2	Primary	83.00'	**24.0" W x 24.0" H Box Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 4.00 sf
#3	Primary	83.00'	**24.0" W x 24.0" H Box Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 4.00 sf
#4	Secondary	83.00'	**12.0" Round Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=105.73 cfs @ 12.85 hrs HW=86.49' (Free Discharge)
- **1=Culvert** (Inlet Controls 52.48 cfs @ 5.83 fps)
- **2=Culvert** (Inlet Controls 26.63 cfs @ 6.66 fps)
- **3=Culvert** (Inlet Controls 26.63 cfs @ 6.66 fps)

Secondary OutFlow Max=5.65 cfs @ 12.85 hrs HW=86.49' (Free Discharge)
- **4=Culvert** (Barrel Controls 5.65 cfs @ 7.19 fps)

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

Subcatchment1S: Area 1 Runoff Area=5,472,214 sf 62.42% Impervious Runoff Depth>5.27"
Flow Length=2,880' Slope=0.0512 '/' Tc=23.0 min CN=90 Runoff=454.67 cfs 55.193 af

Reach 4R: W-1 Inflow=110.77 cfs 51.385 af
Outflow=110.77 cfs 51.385 af

Reach 5R: W-2 Inflow=5.84 cfs 3.724 af
Outflow=5.84 cfs 3.724 af

Pond 3P: (new Pond) Peak Elev=86.69' Storage=583,418 cf Inflow=454.67 cfs 55.193 af
Primary=110.77 cfs 51.385 af Secondary=5.84 cfs 3.724 af Outflow=116.61 cfs 55.108 af

Total Runoff Area = 125.625 ac Runoff Volume = 55.193 af Average Runoff Depth = 5.27"
37.58% Pervious = 47.212 ac 62.42% Impervious = 78.413 ac

Summary for Subcatchment 1S: Area 1

Runoff = 454.67 cfs @ 12.32 hrs, Volume= 55.193 af, Depth> 5.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 50-Year Rainfall=7.00"

Area (sf)	CN	Description
1,958,378	98	Water Surface, HSG D
1,457,297	98	Paved parking, HSG D
2,056,539	77	Woods, Good, HSG D
5,472,214	90	Weighted Average
2,056,539		37.58% Pervious Area
3,415,675		62.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	2,880	0.0512	2.09		**Lag/CN Method,**

Summary for Reach 4R: W-1

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

Inflow Area = 125.625 ac, 62.42% Impervious, Inflow Depth > 4.91" for 50-Year event
Inflow = 110.77 cfs @ 12.93 hrs, Volume= 51.385 af
Outflow = 110.77 cfs @ 12.93 hrs, Volume= 51.385 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: W-2

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

Inflow = 5.84 cfs @ 12.93 hrs, Volume= 3.724 af
Outflow = 5.84 cfs @ 12.93 hrs, Volume= 3.724 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 3P: (new Pond)

[82] Warning: Early inflow requires earlier time span

Inflow Area = 125.625 ac, 62.42% Impervious, Inflow Depth > 5.27" for 50-Year event
Inflow = 454.67 cfs @ 12.32 hrs, Volume= 55.193 af
Outflow = 116.61 cfs @ 12.93 hrs, Volume= 55.108 af, Atten= 74%, Lag= 36.7 min
Primary = 110.77 cfs @ 12.93 hrs, Volume= 51.385 af
Secondary = 5.84 cfs @ 12.93 hrs, Volume= 3.724 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 86.69' @ 12.93 hrs Surf.Area= 0 sf Storage= 583,418 cf

Plug-Flow detention time= 32.8 min calculated for 54.914 af (99% of inflow)
Center-of-Mass det. time= 31.8 min (796.5 - 764.7)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	7,386,022 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	0	0
86.00	13,729	13,729
87.00	825,465	839,194
88.00	1,738,264	2,577,458
89.00	2,221,557	4,799,015
90.00	2,587,007	7,386,022

Device	Routing	Invert	Outlet Devices
#1	Primary	83.00'	**36.0" W x 36.0" H Box Culvert** L= 10.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0480 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 9.00 sf
#2	Primary	83.00'	**24.0" W x 24.0" H Box Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 4.00 sf
#3	Primary	83.00'	**24.0" W x 24.0" H Box Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 4.00 sf
#4	Secondary	83.00'	**12.0" Round Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=110.77 cfs @ 12.93 hrs HW=86.69' (Free Discharge)
- **1=Culvert** (Inlet Controls 55.36 cfs @ 6.15 fps)
- **2=Culvert** (Inlet Controls 27.71 cfs @ 6.93 fps)
- **3=Culvert** (Inlet Controls 27.71 cfs @ 6.93 fps)

Secondary OutFlow Max=5.84 cfs @ 12.93 hrs HW=86.69' (Free Discharge)
- **4=Culvert** (Barrel Controls 5.84 cfs @ 7.43 fps)

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

Subcatchment1S: Area 1 Runoff Area=5,472,214 sf 62.42% Impervious Runoff Depth>6.47"
Flow Length=2,880' Slope=0.0512 '/' Tc=23.0 min CN=90 Runoff=552.59 cfs 67.706 af

Reach 4R: W-1 Inflow=116.94 cfs 63.280 af
Outflow=116.94 cfs 63.280 af

Reach 5R: W-2 Inflow=6.07 cfs 4.330 af
Outflow=6.07 cfs 4.330 af

Pond 3P: (new Pond) Peak Elev=86.95' Storage=798,303 cf Inflow=552.59 cfs 67.706 af
Primary=116.94 cfs 63.280 af Secondary=6.07 cfs 4.330 af Outflow=123.01 cfs 67.610 af

Total Runoff Area = 125.625 ac Runoff Volume = 67.706 af Average Runoff Depth = 6.47"
37.58% Pervious = 47.212 ac 62.42% Impervious = 78.413 ac

Summary for Subcatchment 1S: Area 1

Runoff = 552.59 cfs @ 12.32 hrs, Volume= 67.706 af, Depth> 6.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
1,958,378	98	Water Surface, HSG D
1,457,297	98	Paved parking, HSG D
2,056,539	77	Woods, Good, HSG D
5,472,214	90	Weighted Average
2,056,539		37.58% Pervious Area
3,415,675		62.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	2,880	0.0512	2.09		**Lag/CN Method,**

Summary for Reach 4R: W-1

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

Inflow Area = 125.625 ac, 62.42% Impervious, Inflow Depth > 6.04" for 100-Year event
Inflow = 116.94 cfs @ 13.03 hrs, Volume= 63.280 af
Outflow = 116.94 cfs @ 13.03 hrs, Volume= 63.280 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 5R: W-2

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

Inflow = 6.07 cfs @ 13.03 hrs, Volume= 4.330 af
Outflow = 6.07 cfs @ 13.03 hrs, Volume= 4.330 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 3P: (new Pond)

[82] Warning: Early inflow requires earlier time span

Inflow Area = 125.625 ac, 62.42% Impervious, Inflow Depth > 6.47" for 100-Year event
Inflow = 552.59 cfs @ 12.32 hrs, Volume= 67.706 af
Outflow = 123.01 cfs @ 13.03 hrs, Volume= 67.610 af, Atten= 78%, Lag= 42.5 min
Primary = 116.94 cfs @ 13.03 hrs, Volume= 63.280 af
Secondary = 6.07 cfs @ 13.03 hrs, Volume= 4.330 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 86.95' @ 13.03 hrs Surf.Area= 0 sf Storage= 798,303 cf

Plug-Flow detention time= 45.0 min calculated for 67.369 af (100% of inflow)
Center-of-Mass det. time= 44.0 min (805.0 - 761.0)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	7,386,022 cf	**Custom Stage Data**Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	0	0
86.00	13,729	13,729
87.00	825,465	839,194
88.00	1,738,264	2,577,458
89.00	2,221,557	4,799,015
90.00	2,587,007	7,386,022

Device	Routing	Invert	Outlet Devices
#1	Primary	83.00'	**36.0" W x 36.0" H Box Culvert** L= 10.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0480 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 9.00 sf
#2	Primary	83.00'	**24.0" W x 24.0" H Box Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 4.00 sf
#3	Primary	83.00'	**24.0" W x 24.0" H Box Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 4.00 sf
#4	Secondary	83.00'	**12.0" Round Culvert** L= 54.8' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 83.00' / 82.52' S= 0.0088 '/' Cc= 0.900 n= 0.014 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=116.93 cfs @ 13.03 hrs HW=86.95' (Free Discharge)
- **1=Culvert** (Inlet Controls 58.84 cfs @ 6.54 fps)
- **2=Culvert** (Inlet Controls 29.05 cfs @ 7.26 fps)
- **3=Culvert** (Inlet Controls 29.05 cfs @ 7.26 fps)

Secondary OutFlow Max=6.07 cfs @ 13.03 hrs HW=86.95' (Free Discharge)
- **4=Culvert** (Barrel Controls 6.07 cfs @ 7.73 fps)

HYDROLOGY
HYDROCAD MODEL

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, May 21 2025

Box Culvert

Invert Elev Dn (ft)	=	82.12
Pipe Length (ft)	=	46.00
Slope (%)	=	0.26
Invert Elev Up (ft)	=	82.24
Rise (in)	=	24.0
Shape	=	Box
Span (in)	=	48.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

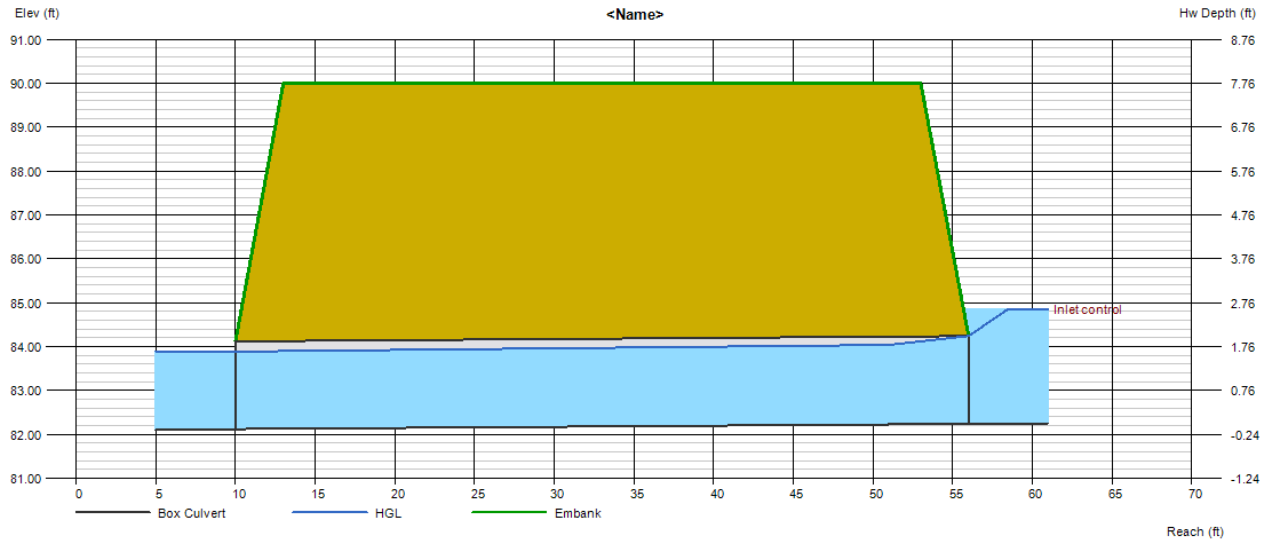
Top Elevation (ft)	=	90.00
Top Width (ft)	=	40.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	43.00
Qmax (cfs)	=	43.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	43.00
Qpipe (cfs)	=	43.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.09
Veloc Up (ft/s)	=	5.92
HGL Dn (ft)	=	83.89
HGL Up (ft)	=	84.06
Hw Elev (ft)	=	84.86
Hw/D (ft)	=	1.31
Flow Regime	=	Inlet Control



HEC-14
EQUATION 5.1
SCOUR LIMITS

GREEN
A Lochner Company
Green International Affiliates, Inc.
100 Ames Pond Drive, Suite 200, Tewksbury, MA 01876
T: (978) 923-0400 | www.greenintl.com

JOB	16043		
SHEET NO.	1	OF	1
CALCULATED BY	AF	DATE	5/21/2025
CHECKED BY		DATE	
DESCRIPTION	Culvert near Dublin Avenue		
SCALE			

U.S. Department of Transportation

Federal Highway Administration

Hydraulic Engineering Circular No. 14 - Estimating Scour at Culvert Outlets

5.1 COHESIONLESS SOILS

The general expression for determining scour geometry in a cohesionless soil at the culvert outlet is:

$$\left[\frac{h_s}{R_c}, \frac{W_s}{R_c}, \frac{L_s}{R_c}, \frac{V_s}{R_c^3}\right] = C_s C_h \left(\frac{\alpha}{\sigma^{1/3}}\right)\left(\frac{Q}{\sqrt{g(R_c^{2.5})}}\right)^{\beta}\left(\frac{t}{316}\right)^{\theta} \quad (5.1)$$

where,

- h_s = depth of scour, m (ft)
- W_s = width of scour, m (ft)
- L_s = length of scour, m (ft)
- V_s = volume of scour, m^3 (ft^3)
- R_c = hydraulic radius at the end of the culvert (assuming full flow)
- Q = discharge, m^3/s (ft^3/s)
- g = acceleration of gravity, 9.81 m/s^2 (32.2 ft/s^2)
- t = time in minutes
- σ = $(D_{84}/D_{16})^{0.5}$, material standard deviation
- α, β, θ are coefficients, see Table 5.1
- C_s = slope correction coefficient, see Table 5.2
- C_h = drop height adjustment coefficient, see Table 5.3

Input:

Q (cfs)	43.2
Slope (%)	0.27
Time (min)	23
Dia (ft)	2.67
R_c *(ft)*	1.33
g (ft/s^2)	32.2
D_{84}	0.75
D_{16}	0.37
σ	1.42

Output:

Depth, h_s *(ft)*	3.95
Width, W_s *(ft)*	17.10
Length, L_s *(ft)*	33.79
Volume, V_s (ft^3)	1103.29
Location of maximum scour ($L_m = 0.4L_s$) *(ft)*	13.51

Table 5.1. Coefficients for Culvert Outlet Scour in Cohesionless Soils

	α	β	θ
Depth, h_S	2.27	0.39	0.06
Width, W_S	6.94	0.53	0.08
Length, L_S	17.10	0.47	0.10
Volume, V_S	127.08	1.24	0.18

Table 5.2. Coefficient C_h for Outlets above the Bed

H_d[1]	Depth	Width	Length	Volume
0	1.00	1.00	1.00	1.00
1	1.22	1.51	0.73	1.28
2	1.26	1.54	0.73	1.47
4	1.34	1.66	0.73	1.55

[1] H_d is the height above bed in pipe diameters.

Table 5.3. Coefficient C_s for Culvert Slope

Slope %	Depth	Width	Length	Volume
0	1.00	1.00	1.00	1.00
2	1.03	1.28	1.17	1.30
5	1.08	1.28	1.17	1.30
>7	1.12	1.28	1.17	1.30

HYDRAULIC TOOLBOX
CULVERT OUTLET PROTECTION

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Tuesday, May 20, 2025

Project Units: U.S. Customary Units

Notes:

Riprap Analysis: Riprap Analysis

Notes:

Input Parameters

Riprap Type: Culvert Outlet Protection

Flow: 43.2 cfs

Culvert Diameter: 2.67 ft

Normal Depth in Culvert: 1.29721 ft

Tailwater Depth: 3 ft

If tailwater is unknown, use 0.4D

flow is sbcritical

Result Parameters

Tailwater Depth Used in Computations: 3 ft

Culvert Diameter Used in Computations: 2.67 ft

Computed D50: 81.6952 mm

Riprap Class

Riprap shape should be angular

Riprap Class Name:CLASS I

Riprap Class Order:1

The following values are an 'average' of the size fraction range for the selected riprap class.

D100: 304.80 mm

D85: 228.60 mm

D50: 165.10 mm

D15: 114.30 mm

Layout Recommendations

Apron Length: 10.68 ft

Apron Depth: 1.89583 ft

Apron Width (at end): 15.13 ft

Report for channel

Channel Analysis: Channel Analysis

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width 10.00 ft

Longitudinal Slope: 0.0027 ft/ft

Manning's n: 0.0300

Flow 43.0000 cfs

Result Parameters

Depth 1.2972 ft

Area of Flow 16.3376 ft^2

Wetted Perimeter 15.8013 ft

Hydraulic Radius 1.0339 ft

Average Velocity 2.6320 ft/s

Top Width 15.1888 ft

Froude Number: 0.4472

Critical Depth 0.7868 ft

Critical Velocity 4.7223 ft/s

Critical Slope: 0.0154 ft/ft

Critical Top Width 13.15 ft

Calculated Max Shear Stress 0.2186 lb/ft^2

Calculated Avg Shear Stress 0.1742 lb/ft^2

Revised 401 WQC Plan Sheets, dated 5/22/2025

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	6
PROJECT FILE NO.	608051		

IMPACT PLANS
SHEET 1 OF 3
REVISED 5/22/2025

608051_EV(IMPACT-PLANS).DWG Plotted on 22-May-2025 8:10 PM

Project No. 608051 - 132406

A000240 - 819

N

MUNEY REALTY, LLC
L.C.C. 6462 E
CERT. NO. 47179
DOC. NO. 325510
PARCEL ID 41–123

500 MAIN ST

S AND S REALTY TRUST
MOHAMADSHAFI MALEK, TRUSTEE
L.C.C. 6462 B
L.C.C. 6462 E
CERT. NO. 29030
DOC. NO. 128871
PACEL 41–122

496 MAIN ST

SUFALI PROPERTIES, LLC
PARCEL ID 41–121
BOOK 30730 PAGE 247

474 MAIN ST

DANA KIKLIS
L.C.C. 6462 B
CERT. NO. 36223
DOC. NO. 206007
PARCEL ID 41–128–A

508 MAIN ST

BENCHMARK #3
MAG SET 1' ABOVE
GRADE, UP #96
EL=89.45'

MASSACHUSETTS BAY
TRANSPORTATION AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 41–141

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

1951 TOWN LAYOUT

MAIN STREET (ROUTE 38)

PROP TEMP EASEMENT (TYP)
PROP PERM EASEMENT (TYP)
PROP LOAM & SEED
RET SIGN
PROP SAWCUT (TYP)
PROP 6' CEM CONC SW
STA 212+87 LT TO
STA 214+85 LT
PROP HMA DWY (TYP)
PROP CEM CONC SW AT DWY (TYP)
PROP GRAN CURB, TYPE VB
PROP SAWCUT IN EXIST CONC
RET BIT CURB
PROP BARK MULCH
RET SIGN
R&D EXIST CURB CORNER (TYP)
PROP FULL DEPTH RECONSTRUCTION
RET EXIST WALL
BRICK WALK REMOVED AND RELAID
MATCH EXISTING
RET SIGN
R&D EXISTING SW
PROP 5.5' CEM CONC SW (TYP)
PROP BARK MULCH
RET BIT PARKING
PROP CEM CONC PCR (TYP)
RET SIGN
R&R SB
R&R GRAN CURB (TYP)
PROP SLOPE LIMIT (TYP)
RET SIGN
PROP LOAM & SEED (TYP)
R&D EXIST GUARDRAIL
PROP CLEARING & GRUBBING
PROP GUARDRAIL
WETLAND RESTORATION AREA (FACW MEADOW WETLAND SEED MIX)
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP CLEARING & GRUBBING
RET SIGN
PROP. 4'-0"W X 3'-0"H PRECAST REINF. CONC. BOX CULVERT
PROP GUARDRAIL
PROP LOAM & SEED (TYP)
R&D EXISTING GUARDRAIL
PROP PERM EASEMENT (TYP)
PROP SPECIAL DRAINAGE STRUCTURE NO. 1
(SEE CULVERT REPAIR PLANS SHEETS 228 - 231)
PROP PERM EASEMENT (TYP)
PROP TEMP EASEMENT (TYP)
PROP 5.5' CEM CONC SW (TYP)
TREE PLANTING TRENCH (TYP)
PROP 72" CHAIN LINK GATE AND GATE POSTS
STA 211+40 RT TO STA 211+60 RT
PROP CLEARING & GRUBBING
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP 72" CHAIN LINK VINYL COATED FENCE
PROP TEMP FENCE
NATIVE SHORT SEED MIX
PROP SLOPE LIMIT (TYP)
RAILROAD ROW
APPROXIMATE RAILROAD SIDELINE

UNNAMED
INTERMITTENT STREAM
VW A IMPACTS (PERM.) = 11 SF
VW A IMPACTS (TEMP.) = 235 SF
LUW/WOTUS IMPACTS (PERM.) = 400 SF
LUW/WOTUS IMPACTS (TEMP.) = 30 SF
DREDGE/FILL VOLUME = 65 CY

PERMANENT VW IMPACT AREA = 2,630 SF ±
PERMANENT LUW/WOTUS IMPACT AREA = 2,195 SF ±
TOTAL DREDGE/FILL WITHIN LUW/WOTUS VOLUME = 715 CY
TOTAL PERMANENT IMPACT AREA = 4,825 SF ±
TEMPORARY VW IMPACT AREA = 2,834 SF ±
TEMPORARY LUW/WOTUS IMPACT AREA = 601 SF ±
TOTAL TEMPORARY IMPACT AREA = 3,435 SF ±
VW REPLICATION AREA = 3,510 SF

VEGETATED WETLAND (VW)
BANK/OHW (PERENNIAL STREAM)
BANK/OHW (INTERMITTENT STREAM)

0 20 50 100
SCALE: 1" = 40'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	2	6
PROJECT FILE NO.	608051		

IMPACT PLANS
SHEET 2 OF 3
REVISED 5/22/2025

608051_EVIMPACT-PLANS).DWG Plotted on 22-May-2025 8:06 PM

Proposal No. 608051 13

A00840 - 820

MAIN STREET (ROUTE 38)

PROP 1.5' MILLING MULCH STRIP (TYP)
PROP GUARDRAIL
PROP SAWCUT (TYP)
PROP CEM CONC SW AT DWY (TYP)
PROP HMA BERM, TYPE A-MODIFIED SEE DETAIL ON SHEET 222
RET GUARDRAIL
EXISTING PHRAGMITES PROVIDE INVASIVE SPECIES MANAGEMENT PLAN FOR PLANTS AND DISTURBED SOIL WHERE THEY ARE WITHIN THE LIMIT OF WORK
R&D SIGN
R&D EXIST BIT BERM (TYP)
PROP GRAN CURB TYPE VB (TYP)
R&D STUMP
RET SIDEWALK (TYP)
ONE CROSS LLC BOOK 35186 PAGE 80 PARCEL ID 40-11
CROSS ST
PROP TEMP EASEMENT (TYP)
PROP SLOPE LIMIT (TYP)
R&S SIGN
PROP SEDIMENT CONTROL BARRIER (TYP)
R&D EXISTING GUARDRAIL
PROP LOAM & SEED (TYP)
VERIZON NEW ENGLAND INC. PARCEL ID 40-12 BOOK 1212 PAGE 352
MAIN ST
PROP. SEDIMENT CONTROL BARRIER (TYP.)
PROP HMA DWY (TYP)
RET EXIST HEADWALL
SEE NOTE 1
PROP GUARDRAIL
PROP FULL DEPTH RECONSTRUCTION
PROP CONC HEADWALL
PROP STONE FOR PIPE END
PROP PERM EASEMENT (TYP)
PROP 5.5' CEM CONC SW (TYP)
PROP CLEARING & GRUBBING
PROP SEDIMENT CONTROL BARRIER (TYP)
R&D EXISTING GUARDRAIL
PROP SLOPE LIMIT (TYP)
PROP LOAM & SEED (TYP)
PROP TEMP EASEMENT
PROP PERM EASEMENT (TYP)
PROP CLEARING AND GRUBBING
R&D EXIST BIT BERM (TYP)
PROP SAWCUT & MATCH EXISTING
LIMIT OF WORK
END PAVEMENT FINE MILLING AND RESURFACING STA. 41+95.00
END FULL DEPTH RECONSTRUCTION MATCH EXISTING GRADE & ELEVATIO
STA. 40+70.00
RET BERM
PROP TEMP EASEMENT (TYP)
TOWN OF WILMINGTON PARCEL ID 40-13-A BOOK 35162 PAGE 138
CROSS ST
TAKING ON BEHALF OF THE TOWN
CROSS STREET
PROP GUARDRAIL - CURVED
PROP CLEARING & GRUBBING
PROP PERM EASEMENT (TYP)
2023 TOWN ALTERATION SECTION 3 (DEED BK 37867 PG 1) (PLAN BK 201 PG 43)
PROP TEMP EASEMENT (TYP)
LOCATION LINE OF 1910 STATE HIGHWAY LAYOUT (SHEET NO. 1315)
GRAN CURB PROPOSED UNDER PROJECT 608929
BUTTERS ROW
2023 TOWN ALTERATION SECTION 2 (DEED BK 37867 PG 51) (PLAN BK 251 PG 51)
TO VERIZON EASEMENT BOOK 36483 PAGE 73 (NOT PLOTTABLE)
SUBJECT TO VERIZON EASEMENT BOOK 36483 PAGE 73 (NOT PLOTTABLE)
TREES BOOK 37867 PAGE 1
WETLAND C
D-PUE-1-T BOOK 37867 PAGE 1
D-2-T BOOK 37867 PAGE 1
GR-PUE-1-T BOOK 37867 PAGE 1
WETLANDS
WF#C-1 START
WF#C-2
WF#C-3
WF#C-25
WF#C-26
WF#C-27
VW D
VW IMPACTS (PERM.) = 270 SF
VW IMPACTS (TEMP.) = 437 SF
VW C
VW IMPACTS (PERM.) = 2,315 SF
VW IMPACTS (TEMP.) = 1,443 SF

PERMANENT VW IMPACT AREA
TEMPORARY VW IMPACT AREA
TEMPORARY LUW/WOTUS IMPACT AREA
VEGETATED WETLAND (VW)
BANK/OHW (PERENNIAL STREAM)
BANK/OHW (INTERMITTENT STREAM)

0 20 50 100
SCALE: 1" = 40'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	3	3
PROJECT FILE NO.	608051		

IMPACT PLANS
SHEET 3 OF 3
REVISED 5/22/2025

Plotted on 22-May-2025 8:24 PM
608051_EV(IMPACT-PLANS).DWG
Proposal No. 608051 132106
A00840 - 821

MAPLE MEADOW BROOK
VW E IMPACTS (PERM.) = 5 SF
VW E IMPACTS (TEMP.) = 402 SF
LUW/WOTUS (PERM.) = 1,795 SF
LUW/WOTUS (TEMP.) = 540 SF
VW G IMPACTS (TEMP.) = 228 SF
DREDGE/FILL VOLUME = 650 CY

TOWN OF WILMINGTON
PARCEL ID 39-5
BOOK 26062 PAGE 215

9 CROSS ST

MAPLE MEADOW BROOK
VW E IMPACTS (PERM.) = 29 SF
VW E IMPACTS (TEMP.) = 89 SF
LUW/WOTUS (TEMP.) = 31 SF

MAPLE MEADOW BROOK

FLOW

OHW EL. 77.78' (NAVD88)

PROP SLOPE LIMIT (TYP)

PROP CLEARING & GRUBBING

TEXTRON SYSTEMS CORPORATION
PARCEL ID 48-73-A
BOOK 24103 PAGE 25
BOOK 35305 PAGE 130
BOOK 35305 PAGE 132

201 LOWELL ST

PROP LOAM & NATIVE SEED (TYP)

PROP SEDIMENT CONTROL BARRIER (TYP)

SUBJECT TO RECIPROCAL EASEMENTS
BOOK 37155 PAGE 258
(NOT PLOTTABLE)

PROP PERM EASEMENT (TYP)

PROP. CHANNEL ARMORING

PROP. FLOATING SILT FENCE (TYP)

PROP COFFERDAM (TYP)

BRIDGE NO. W-38-011 (802)

WETLAND RESTORATION AREA (FACW MEADOW WETLAND SEED MIX)

PROP. STONE FOR PIPE ENDS (TYP.)

PROP PERM EASEMENT (TYP)

PROP SEDIMENT CONTROL BARRIER

R&D EXIST GUARDRAIL

PROP GUARDRAIL

PROP GRAN CURB, TYPE VB (TYP)

STREET (ROUTE 38)

PROP HMA DWY (TYP)

(RET)

U-HAUL REAL ESTATE COMPANY
PARCEL ID 39-11-A
BOOK 5015 PAGE 103

687 MAIN ST

R&D EXISTING GUARDRAIL

PROP SAWCUT (TYP)

PROP CEM CONC SW AT DWY (TYP)

PROP TEMP EASEMENT (TYP)

PROP PERMANENT IMPACT ATTENUATOR, NON-REDIRECTIVE, TL-3

PROP EOP (TYP)

MAIN STREET (ROUTE 38)
(PUBLIC - 1911 STATE HIGHWAY LAYOUT)

PROP ROUTE 38 CONST BL

PROP TEMP PEDESTRIAN BRIDGE AND WALKWAY

PROP LOAM & NATIVE SEED
(STA 253+91 - 257+38)

PROP NATURAL STREAMBED MATERIAL OVER M2.02.2 (TYP)
SEE DRAINAGE AND UTILITY DETAIL SHEETS

PROP LOAM & NATIVE SEED
PROP JUTE MESH (STA 253+54 RT - 253+73 RT)

R&D EXISTING GUARDRAIL

PROP SLOPE LIMIT (TYP)

PROP 5.5' CEM CONC SW (TYP)

PROP CLEARING & GRUBBING

PROP GUARDRAIL

100-YEAR FLOOR ZONE (TYP)

LIMIT OF REPLICATION AREA

WETLAND E

PROP WETLAND REPLICATION AREA:
3,510 SF
(SEE SHEET 212)

ACCESS EASEMENT
BOOK 8693 PAGE 145
BOOK 35305 PAGE 33

100' WETLAND BUFFER ZONE

PROP HMA DWY (TYP)

RET SIGN

PROP SAWCUT (TYP)

PROP FULL DEPTH RECONSTRUCTION

1911 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1352)

100-YEAR FLOODPLAIN
UPSTREAM EL. 82.9'

REM TREE

COMPENSATORY FLOOD STORAGE AREA
SEE SHEET: 219

TOWN OF WILMINGTON
BOOK 2299 PAGE 288
PARCEL ID 39-9
MAIN ST

PERMANENT VW IMPACT AREA
TEMPORARY VW IMPACT AREA
TEMPORARY LUW/WOTUS IMPACT AREA
PERMANENT LUW/WOTUS IMPACT AREA

VEGETATED WETLAND (VW)
BANK/OHW (PERENNIAL STREAM)
BANK/OHW (INTERMITTENT STREAM)

VW REPLICATION AREA

0 20 50 100
SCALE: 1" = 40'

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

UTILITY PLAN

SEE SHEET 111

DRAINAGE PLANS
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	96	391
PROJECT FILE NO.	608051		

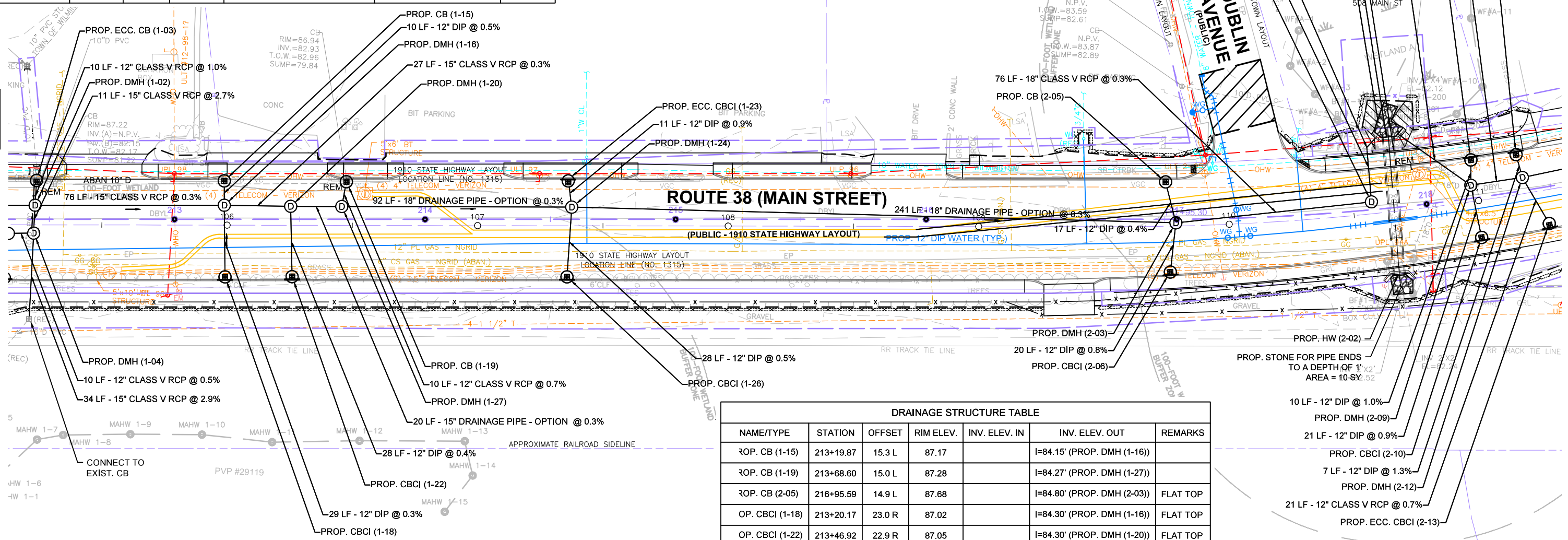
DRAINAGE PLANS - 3
REVISED 5/22/2025

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
OP. DMH (1-02)	212+44.37	5.6 L	87.60	I=83.76' (PROP. DMH (1-12)) I=84.15' (PROP. DMH (1-04)) I=83.86' (PROP. ECC. CB (1-03))	I=83.76' (PROP. DMH (1-16))	
OP. DMH (1-04)	212+43.79	5.5 R	87.60	I=84.60' (EXIST. CB (212+42 R)) I=84.45' (PROP. DMH (1-05))	I=84.45' (PROP. DMH (1-02))	
OP. DMH (1-05)	212+33.70	5.6 R	87.65	I=84.50' (PROP. ECC. CBCI (1-06))	I=84.50' (PROP. DMH (1-04))	
OP. DMH (1-16)	213+19.88	5.6 L	87.36	I=83.54' (PROP. DMH (1-02)) I=84.10' (PROP. CB (1-15)) I=84.20' (PROP. CBCI (1-18))	I=83.54' (PROP. DMH (1-20))	
OP. DMH (1-20)	213+46.38	5.2 L	87.40	I=83.47' (PROP. DMH (1-16)) I=84.20' (PROP. CBCI (1-22))	I=83.47' (PROP. DMH (1-27))	
OP. DMH (1-24)	214+58.54	4.9 L	87.92	I=84.75' (PROP. CBCI (1-26)) I=83.12' (PROP. DMH (1-27)) I=84.64' (PROP. ECC. CBCI (1-23))	I=83.12' (PROP. DMH (2-03))	
OP. DMH (1-27)	213+66.78	5.1 L	87.47	I=83.41' (PROP. DMH (1-20)) I=84.20' (PROP. CB (1-19))	I=83.41' (PROP. DMH (1-24))	
OP. DMH (2-02)	217+78.14	3.2 L	87.53	I=82.17' (PROP. DMH (2-03))	I=82.17' ()	
OP. DMH (2-03)	216+99.68	1.4 R	87.93	I=84.74' (PROP. CB (2-05)) I=82.39' (PROP. DMH (1-24)) I=82.95' (PROP. CBCI (2-06))	I=82.39' (PROP. DMH (2-02))	
OP. DMH (2-12)	218+39.42	5.2 L	87.45	I=84.00' (PROP. ECC. CBCI (2-13)) I=83.40' (PROP. CBCI (2-11)) I=82.36' (PROP. DMH (2-15))	I=82.36' (PROP. DMH (2-09))	

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
ROP. ECC. CB (1-03)	212+44.94	15.5 L	87.40		I=83.96' (PROP. DMH (1-02))	
OP. ECC. CBCI (1-06)	212+32.11	24.0 R	87.29		I=85.01' (PROP. DMH (1-05))	FLAT TOP
OP. ECC. CBCI (1-23)	214+57.13	16.0 L	87.69		I=84.74' (PROP. DMH (1-24))	FLAT TOP
OP. ECC. CBCI (2-13)	218+46.95	14.6 R	87.26		I=84.15' (PROP. DMH (2-12))	
PROP. HW (2-01)	217+87.51	26.9 L	85.95	I=82.12' ()		
PROP. HW (2-02)	217+86.35	26.1 R	0.00			



NOTES:
1. CONTRACTOR SHALL FIELD VERIFY GUARDRAIL POST SPACING CAN ACCOMMODATE PROPOSED AND EXISTING DRAINAGE.
2. EXCAVATE TO DEPTH OF RIPRAP AND MATCH EXISTING SURFACE. FINAL GRADE SHALL MATCH EXISTING GRADE.

0 20 50 100
SCALE: 1" = 40'

FOR UTILITY PLAN:
SEE SHEET NO. 109

AU0840 - 822

608051_UT03(DRAINAGE-PLANS).DWG Plotted on: 22-May-2025 3:26 PM

Project No. 608051 - 132406

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

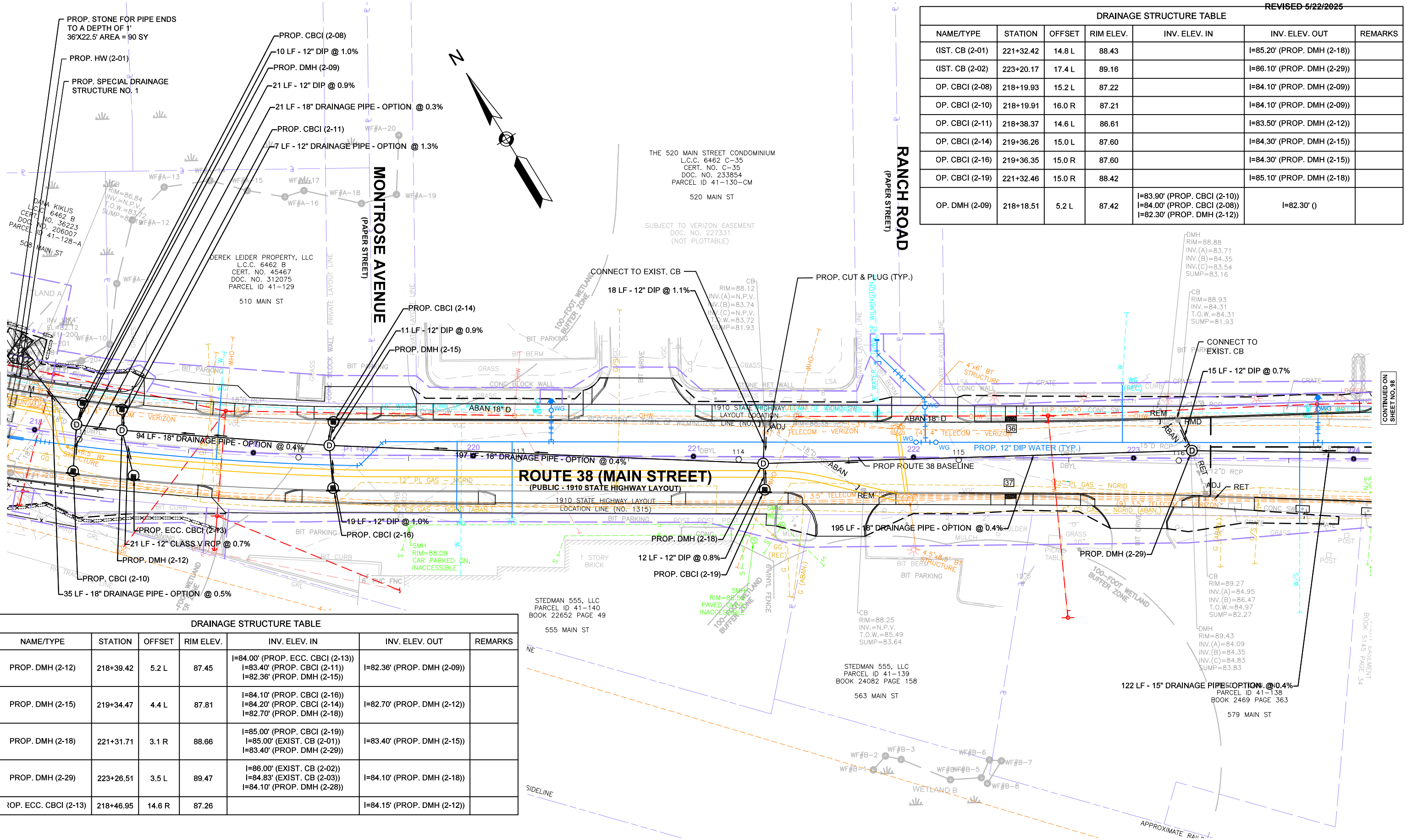
UTILITY PLAN

SEE SHEET 112

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	97	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 4
~~**REVISED 5/22/2025**~~



DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
(IST. CB (2-01)	221+32.42	14.8 L	88.43		I=85.20' (PROP. DMH (2-18))	
(IST. CB (2-02)	223+20.17	17.4 L	89.16		I=86.10' (PROP. DMH (2-29))	
OP. CBCI (2-08)	218+19.93	15.2 L	87.22		I=84.10' (PROP. DMH (2-09))	
OP. CBCI (2-10)	218+19.91	16.0 R	87.21		I=84.10' (PROP. DMH (2-09))	
OP. CBCI (2-11)	218+38.37	14.6 L	86.61		I=83.50' (PROP. DMH (2-12))	
OP. CBCI (2-14)	219+36.26	15.0 L	87.60		I=84.30' (PROP. DMH (2-15))	
OP. CBCI (2-16)	219+36.35	15.0 R	87.60		I=84.30' (PROP. DMH (2-15))	
OP. CBCI (2-19)	221+32.46	15.0 R	88.42		I=85.10' (PROP. DMH (2-18))	
OP. DMH (2-09)	218+18.51	5.2 L	87.42	I=83.90' (PROP. CBCI (2-10)) I=84.00' (PROP. CBCI (2-08)) I=82.30' (PROP. DMH (2-12))	I=82.30' ()	

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
PROP. DMH (2-12)	218+39.42	5.2 L	87.45	I=84.00' (PROP. ECC. CBCI (2-13)) I=83.40' (PROP. CBCI (2-11)) I=82.36' (PROP. DMH (2-15))	I=82.36' (PROP. DMH (2-09))	
PROP. DMH (2-15)	219+34.47	4.4 L	87.81	I=84.10' (PROP. CBCI (2-16)) I=84.20' (PROP. CBCI (2-14)) I=82.70' (PROP. DMH (2-18))	I=82.70' (PROP. DMH (2-12))	
PROP. DMH (2-18)	221+31.71	3.1 R	88.66	I=85.00' (PROP. CBCI (2-19)) I=85.00' (EXIST. CB (2-01)) I=83.40' (PROP. DMH (2-29))	I=83.40' (PROP. DMH (2-15))	
PROP. DMH (2-29)	223+26.51	3.5 L	89.47	I=86.00' (EXIST. CB (2-02)) I=84.83' (EXIST. CB (2-03)) I=84.10' (PROP. DMH (2-28))	I=84.10' (PROP. DMH (2-18))	
ROP. ECC. CBCI (2-13)	218+46.95	14.6 R	87.26		I=84.15' (PROP. DMH (2-12))	

NOTES:
1. CONTRACTOR SHALL FIELD VERIFY GUARDRAIL POST SPACING CAN ACCOMMODATE PROPOSED AND EXISTING DRAINAGE.
2. EXCAVATE TO DEPTH OF RIPRAP AND MATCH EXISTING SURFACE. FINAL GRADE SHALL MATCH EXISTING GRADE.

0 20 50 100
SCALE: 1" = 40'

FOR UTILITY PLAN:
SEE SHEET NO. 109

Proposal No. 608051 - 132406
Plotted on 22-May-2025 3:27 PM
608051_UT03(DRAINAGE-PLANS).DWG
AU0840 - 823

HIGHWAY GUARD DETAILS

SEE SHEET 33

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 133

DRAINAGE DETAILS

SEE BELOW

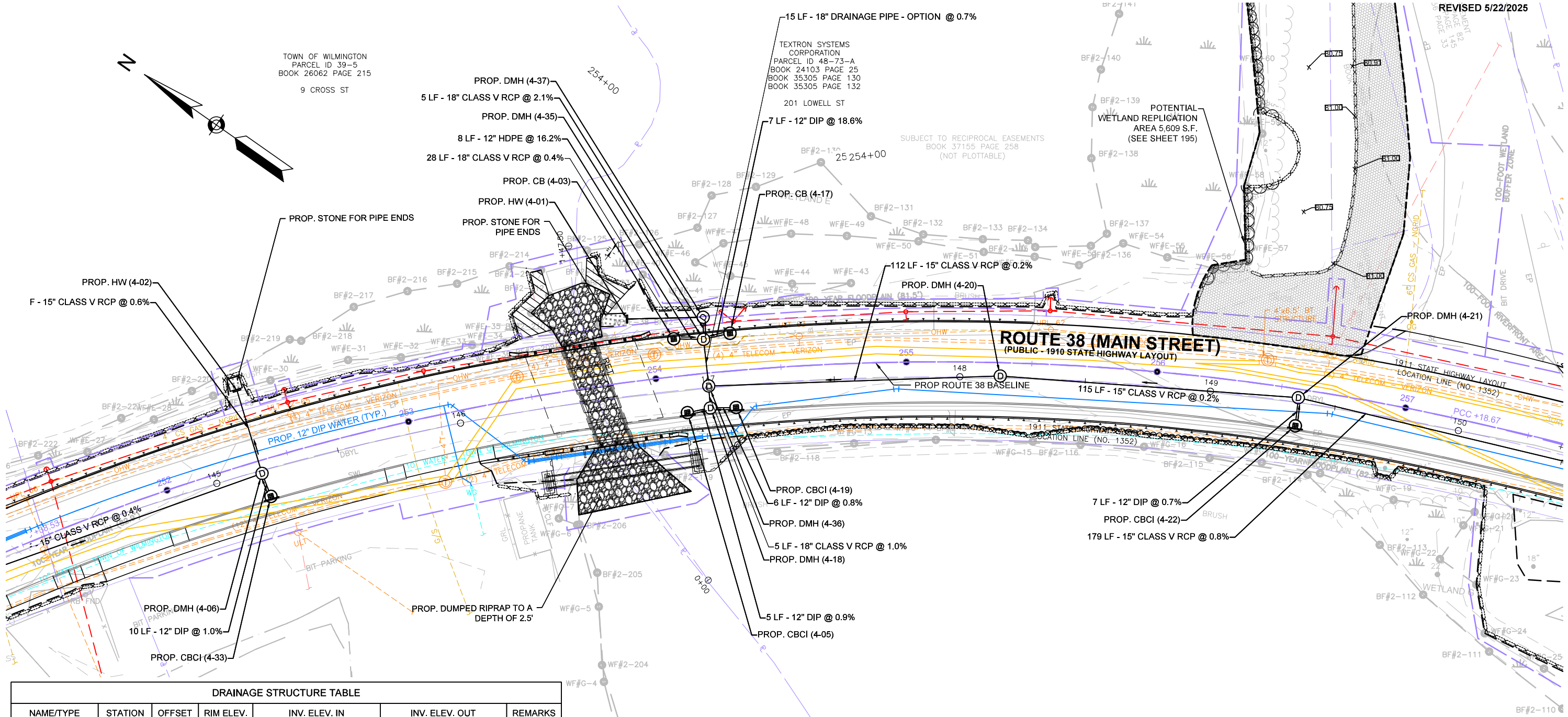
UTILITY PLAN

SEE SHEET 118

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	103	391
PROJECT FILE NO.	608051		

DRAINAGE PLANS - 10
REVISED 5/22/2025



DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
OP. DMH (4-20)	255+37.54	5.3 R	82.38	I=78.92' (PROP. DMH (4-21))	I=78.92' (PROP. DMH (4-36))	
OP. DMH (4-21)	256+57.15	3.4 R	83.10	I=79.10' (PROP. CBCI (4-22)) I=79.26' (PROP. DMH (4-24))	I=79.10' (PROP. DMH (4-20))	
OP. DMH (4-35)	254+20.43	13.5 L	82.69	I=78.20' (PROP. DMH (4-36)) I=78.10' (PROP. CB (4-03)) I=78.10' (PROP. CB (4-17))	I=78.20' (PROP. DMH (4-37))	
OP. DMH (4-36)	254+20.67	5.2 R	82.12	I=78.40' (PROP. DMH (4-18)) I=78.67' (PROP. DMH (4-20))	I=78.30' (PROP. DMH (4-35))	
OP. DMH (4-37)	254+21.11	22.3 L	82.40	I=78.10' (PROP. DMH (4-35))	I=79.44' (PROP. HW (4-01)) I=78.10' ()	
OP. HW (4-01)	253+91.64	25.0 L	81.07	I=79.40' (PROP. DMH (4-37))		
OP. HW (4-02)	252+38	29.3 L	80.14	I=78.20' (PROP. DMH (4-06))		

DRAINAGE STRUCTURE TABLE

NAME/TYPE	STATION	OFFSET	RIM ELEV.	INV. ELEV. IN	INV. ELEV. OUT	REMARKS
ROP. CB (4-03)	254+08.81	14.9 L	82.67		I=79.40' (PROP. DMH (4-35))	
ROP. CB (4-17)	254+30.98	15.0 L	82.65		I=79.40' (PROP. DMH (4-35))	
OP. CBCI (4-05)	254+11.04	14.8 R	81.79		I=78.50' (PROP. DMH (4-18))	
OP. CBCI (4-19)	254+30.81	14.7 R	81.78		I=78.58' (PROP. DMH (4-18))	
OP. CBCI (4-22)	256+57.67	14.7 R	82.71		I=79.15' (PROP. DMH (4-21))	
OP. CBCI (4-33)	252+38.95	14.9 R	82.37		I=79.30' (PROP. DMH (4-06))	
OP. DMH (4-06)	252+38.17	5.1 R	82.72	I=78.40' (PROP. DMH (4-07)) I=79.20' (PROP. CBCI (4-33))	I=78.40' (PROP. HW (4-02))	
OP. DMH (4-18)	254+20.47	13.9 R	81.81	I=78.53' (PROP. CBCI (4-19)) I=78.45' (PROP. CBCI (4-05))	I=78.45' (PROP. DMH (4-36))	

NOTES:
1. CONTRACTOR SHALL FIELD VERIFY GUARDRAIL POST SPACING CAN ACCOMMODATE PROPOSED AND EXISTING DRAINAGE.
2. EXCAVATE TO DEPTH OF RIPRAP AND MATCH EXISTING SURFACE. FINAL GRADE SHALL MATCH EXISTING GRADE.

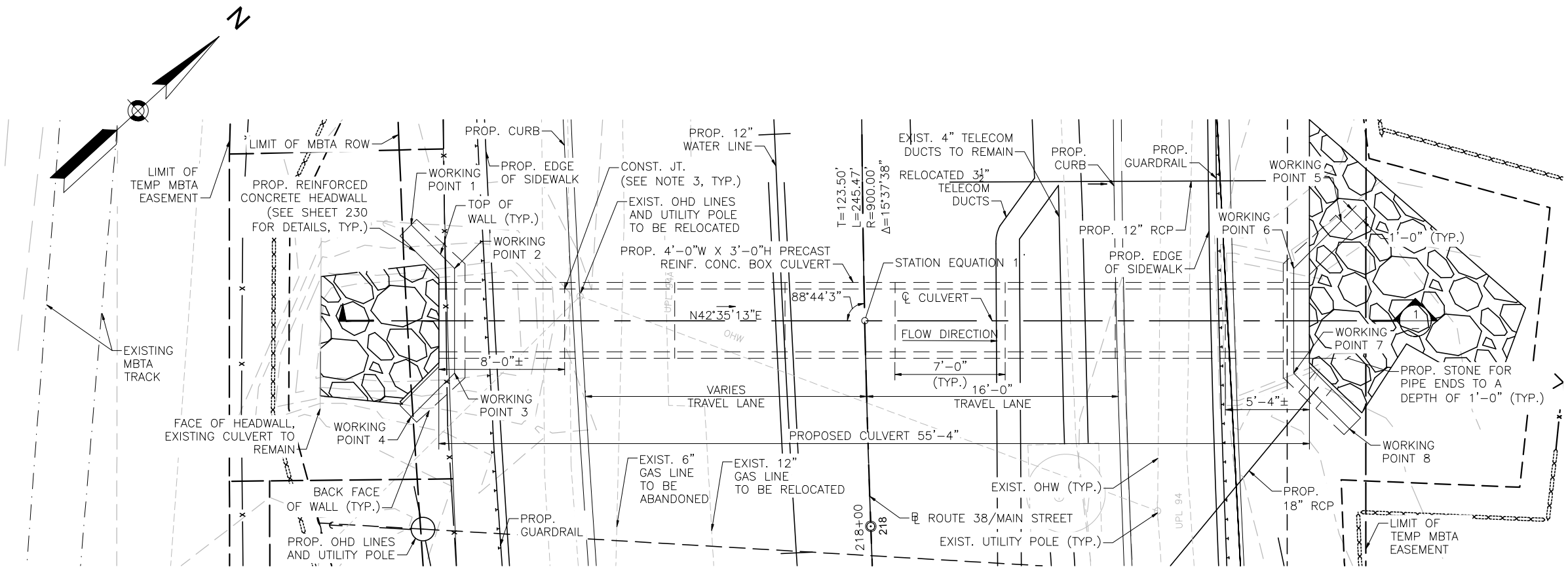
0 20 50 100
SCALE: 1" = 40'

FOR UTILITY PLAN:
SEE SHEET NO. 109

A00840 - 824
Project No. 608051_13
608051_UT03(DRAINAGE-PLANS).DWG Plotted on 22-May-2025 3:27 PM
S1 - 132406

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	228	391
PROJECT FILE NO.	608051		

SPECIAL DRAINAGE STRUCTURE NO. 1 PLAN AND ELEVATION



WORKING POINT	STA.	OFFSET R, FT	NORTHING	EASTING
1	217+80.39	28.72	3023401.72	744848.12
2	217+83.11	26.00	3023401.89	744852.03
3	217+89.59	26.15	3023397.38	744856.93
4	217+92.20	28.99	3023393.47	744857.10
5	217+81.02	−30.42	3023445.45	744887.95
6	217+84.10	−27.33	3023441.16	744888.13
7	217+90.97	−27.18	3023436.66	744893.03
8	217+94.74	−30.63	3023436.87	744898.06

STATION EQUATION 1: RT 38 CONSTRUCTION ℄ STA. 217+86.85 = CULVERT CENTERLINE

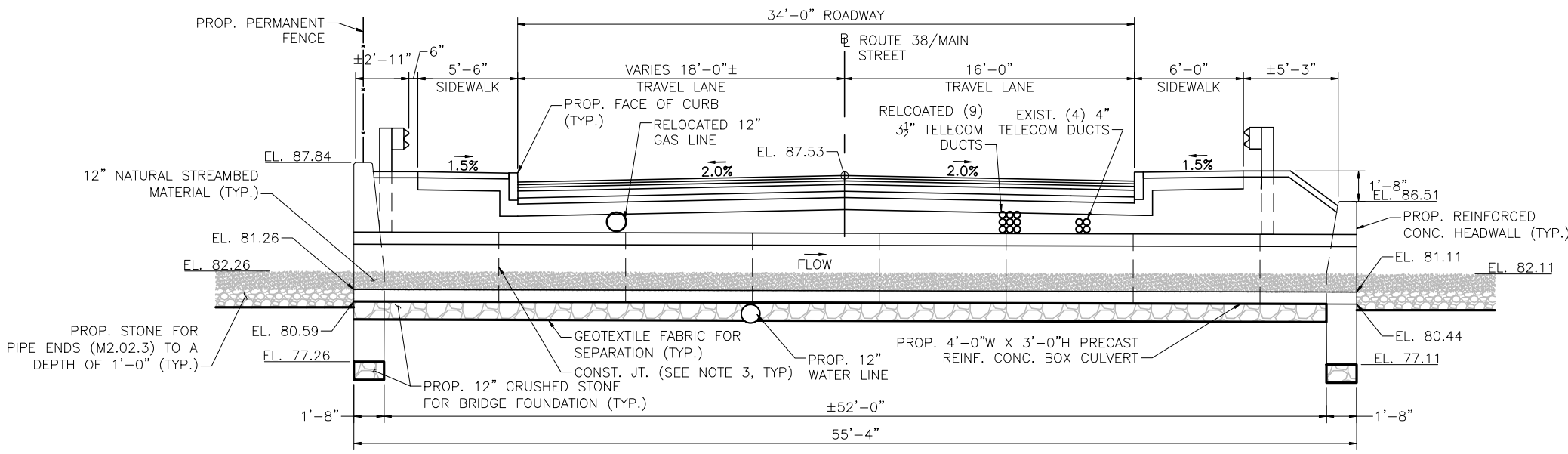
SPECIAL DRAINAGE STRUCTURE NO. 1 PLAN

SCALE: ⅛" = 1'−0"

4 0 4 8
SCALE IN FEET

NOTES:

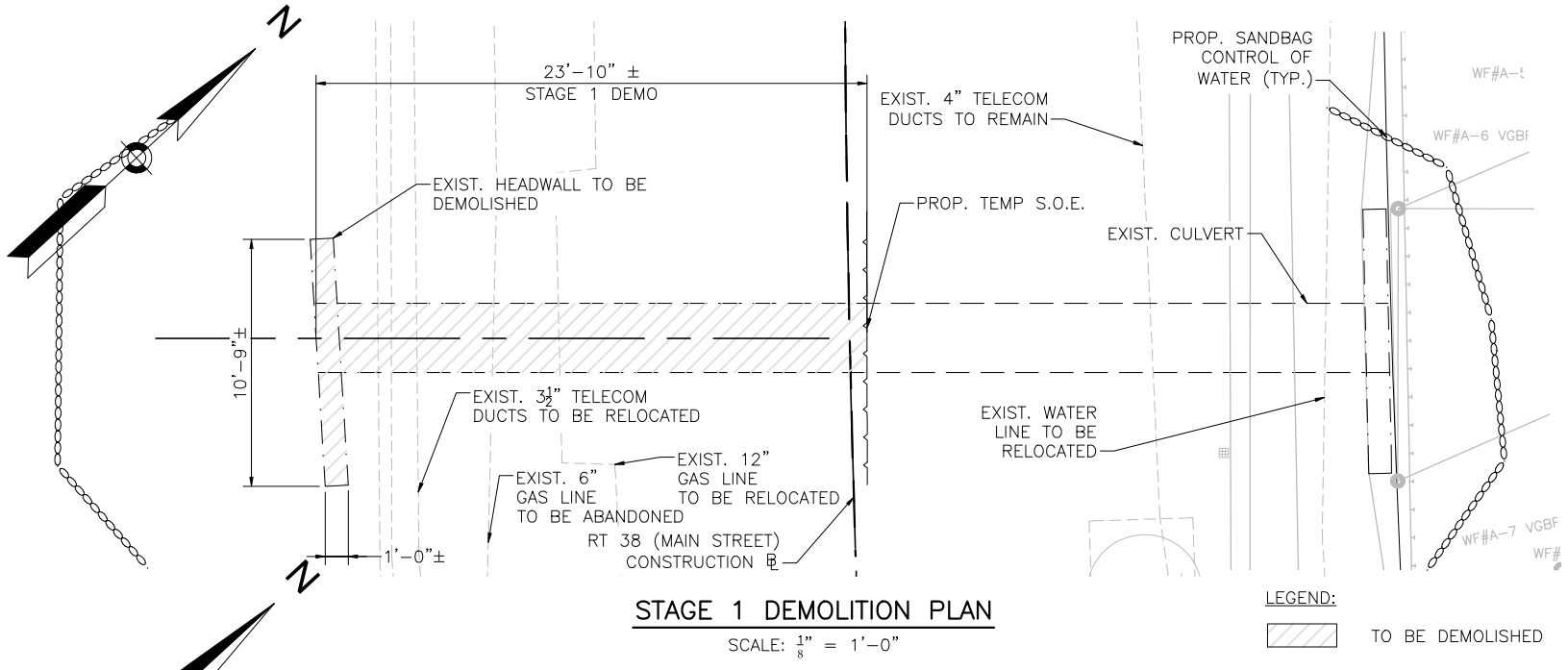
1. GUARDRAIL WILL SPAN OVER PROPOSED CULVERT SECTION.
2. SEE SHEETS 15 – 19 FOR TYPICAL APPROACH/ROADWAY CROSS SECTION AT CULVERT LOCATION.
3. PRECAST REINFORCED CONCRETE CULVERT CONSTRUCTION JOINT SPACING WILL VARY PER PRECASTER UP TO 7'−0" MAXIMUM SPACING.



SECTION (DOWNSTATION) 1/–

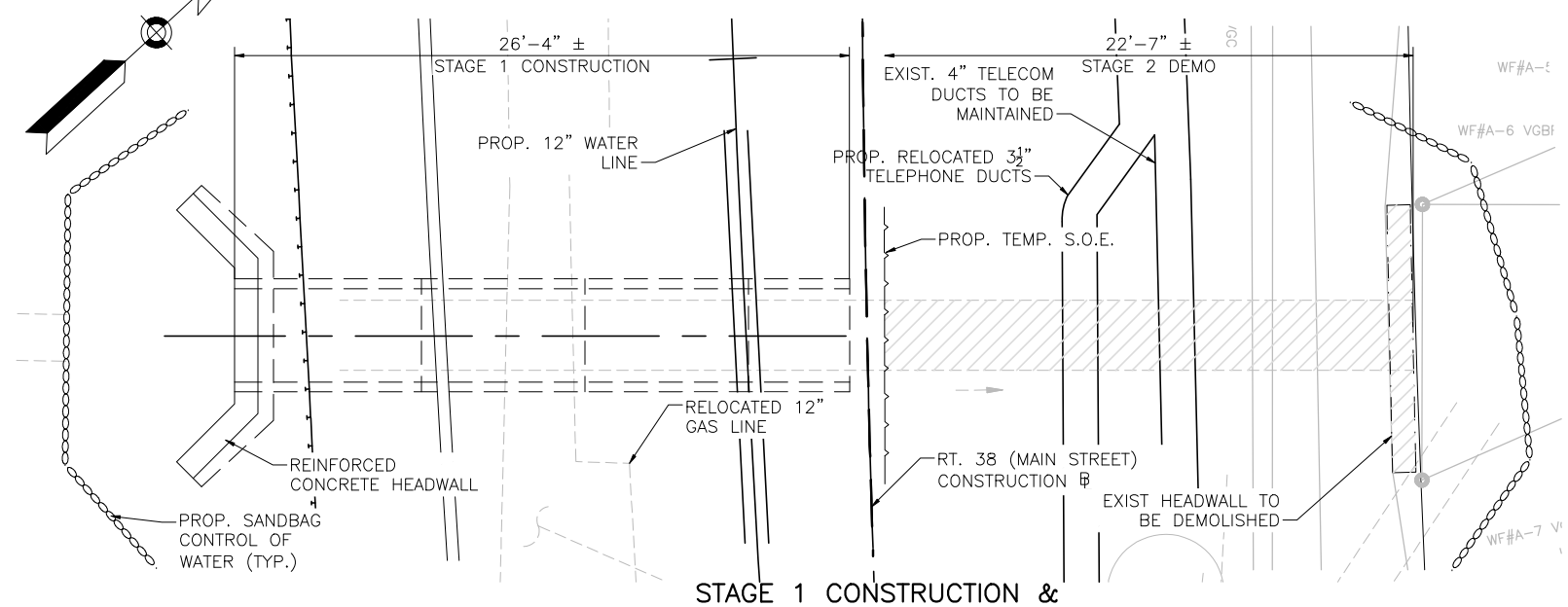
SCALE: ⅛" = 1'−0"

Plotted on 22-May-2025 9:13 AM
6080051_BR01.DWG
Proposal No. 608051 - 132406
A00840 - 825



STAGE 1 DEMOLITION PLAN

SCALE: $\frac{1}{8}$" = 1'–0"



STAGE 1 CONSTRUCTION & STAGE 2 DEMOLITON PLAN

SCALE: $\frac{1}{8}$" = 1'–0"

4 0 4 8

SCALE IN FEET

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	229	391
PROJECT FILE NO.	608051		

CULVERT DEMOLITION PLAN

GENERAL STAGE CONSTRUCTION NOTES:

1. THE SUPPORT OF EXCAVATION IS DESIGNED AS A TEMPORARY STRUCTURE.
2. SURCHARGES AND STOCKPILES SHALL BE LIMITED TO 250 PSF.
3. LOCATE ALL UTILITIES, EXISTING, AND PROPOSED STRUCTURES PRIOR TO THE START OF WORK.
4. INSTALL SUPPORT OF EXCAVATION (S.O.E.) TO THE REQUIRED DEPTHS AS DESIGNED BY THE CONTRACTOR.
5. UNLESS OTHERWISE NOTED, DETAILS SHOWN ON ANY DRAWING ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITIONS.
6. VERIFY NEARBY STRUCTURES WILL NOT BE AFFECTED BY PROPOSED WORK.

SUGGESTED SEQUENCE OF CONSTRUCTION:

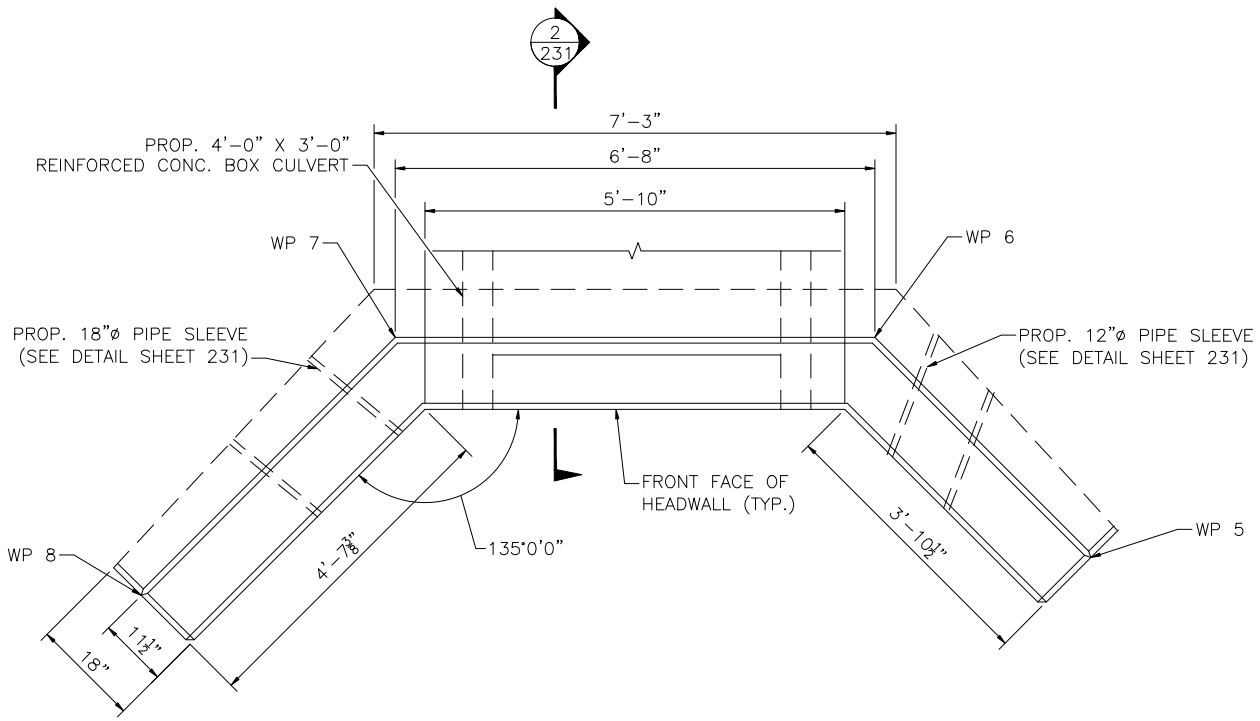
1. INSTALL SANDBAG CONTROL OF WATER AT THE UPSTREAM AND DOWNSTREAM ENDS OF THE CULVERT. INSTALL S.O.E. LONGITUDINALLY ALONG CULVERT. S.O.E. SHALL BE PLACED TO MAINTAIN ON THE EXISTING CULVERT A MINIMUM OF AN 11'–0" LANE WITH 1'–0" SHOULDERS, LIMITED DEFLECTION BARRIER (TL–3) AND DEFLECTION SPACE, AND A 4'–0" SIDEWALK.
2. EXCAVATE AND REMOVE EXISTING CULVERT TO STAGE 1 LIMITS SHOWN.
3. INSTALL PROPOSED 12" WATER LINE AND RELOCATE EXISTING 12" GAS LINE TO PROPOSED LOCATIONS.
4. CONSTRUCT STAGE 1 PORTION OF PROPOSED CULVERT. PROPOSED CULVERT WIDTH SHALL ACCOMMODATE A MINIMUM OF AN 11'–0" LANE WITH 1'–0" SHOULDERS, LIMITED DEFLECTION BARRIER (TL–3) AND DEFLECTION SPACE, AND A 5'–6" SIDEWALK.
5. EXCAVATE AND REMOVE EXISTING CULVERT TO STAGE 2 LIMITS SHOWN.
6. REMOVE TEMPORARY S.O.E. REMOVAL OF S.O.E. MUST NOT RESULT IN SETTLEMENT OF ANY PROPOSED WORK. CONTRACTOR TO PROVIDE MEANS TO ENSURE SOIL SUPPORTING THE PROPOSED STAGE 1 ROADWAY IS RETAINED THROUGHOUT STAGE 2 DEMOLITION AND CONSTRUCTION.
7. CONSTRUCT STAGE 2 PORTION OF PROPOSED CULVERT. CONSTRUCT PROPOSED TELECOM DUCTS AND CONDUIT ABOVE STAGE 2 PORTION OF PROPOSED CULVERT.

608051_BR03_RECOVER.DWG Plotted on 22-May-2025 9:14 AM
Proposal No. 608051 - 132406
608051 - 826

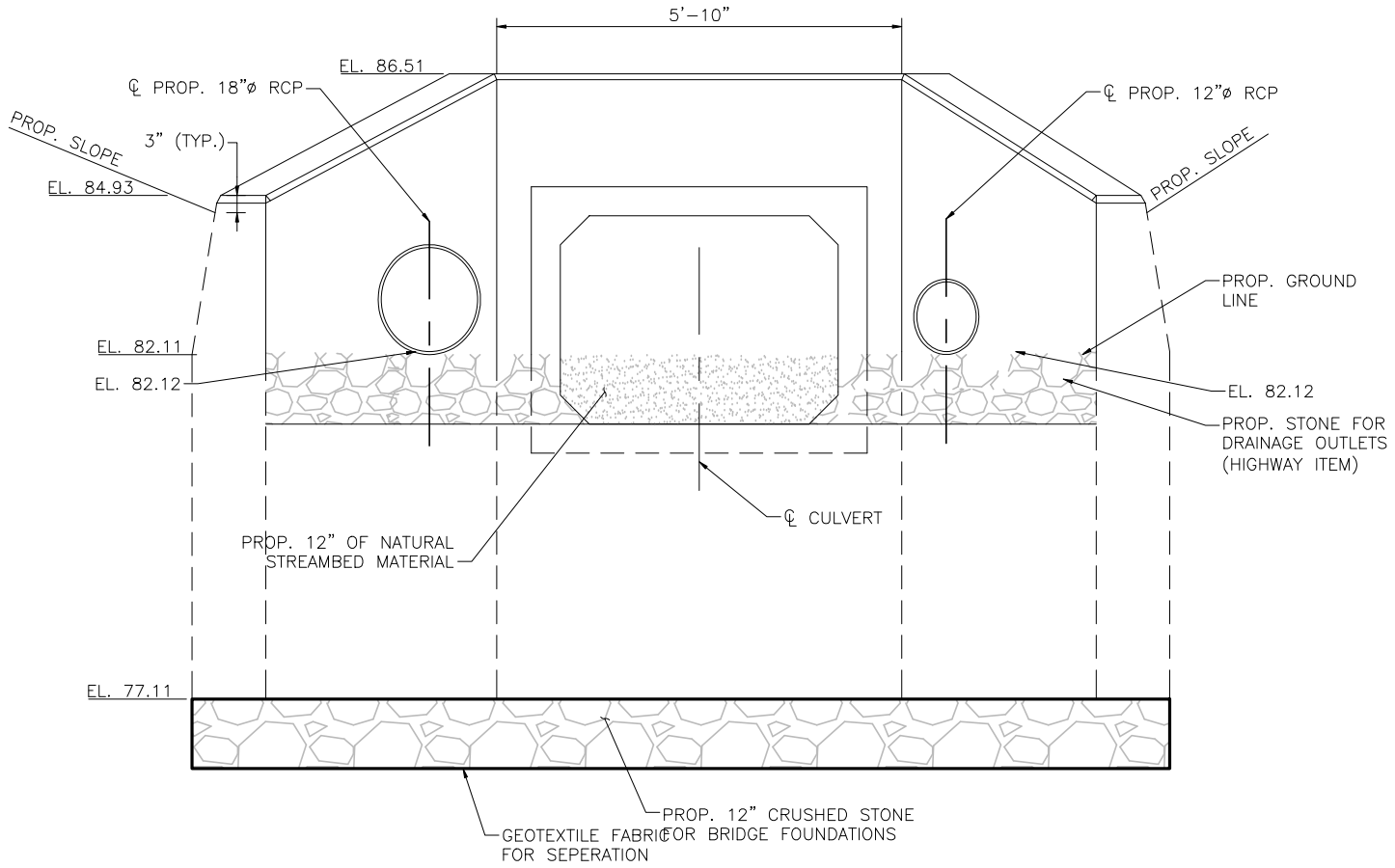
WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	230	391
PROJECT FILE NO.		608051	

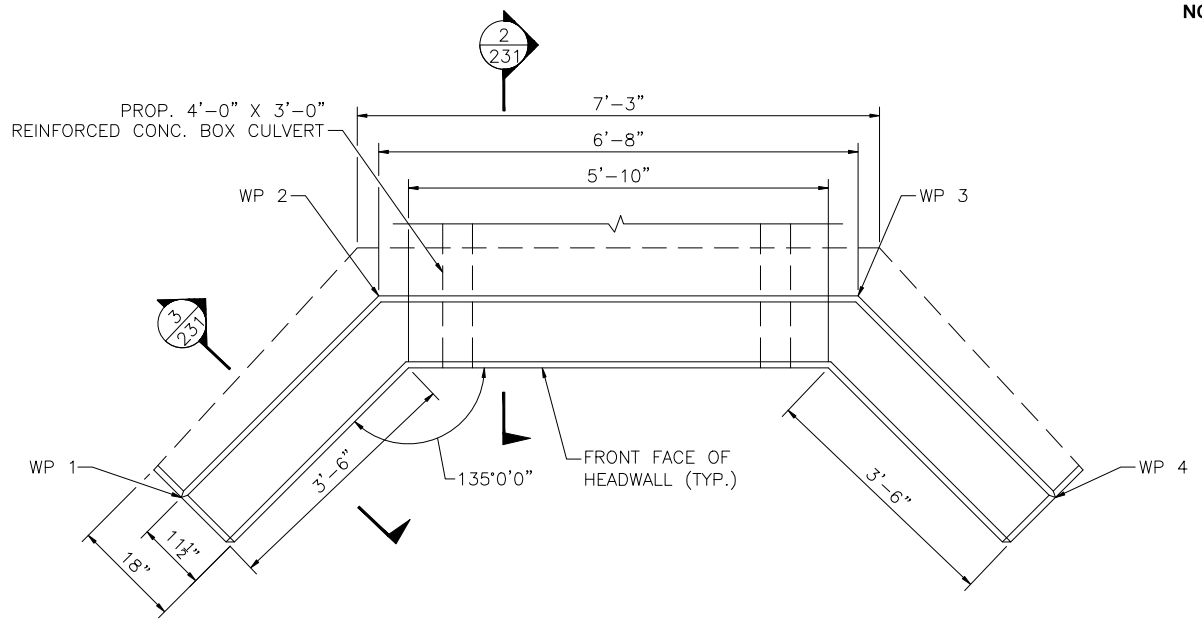
SPECIAL DRAINAGE STRUCTURE NO. 1 DETAILS



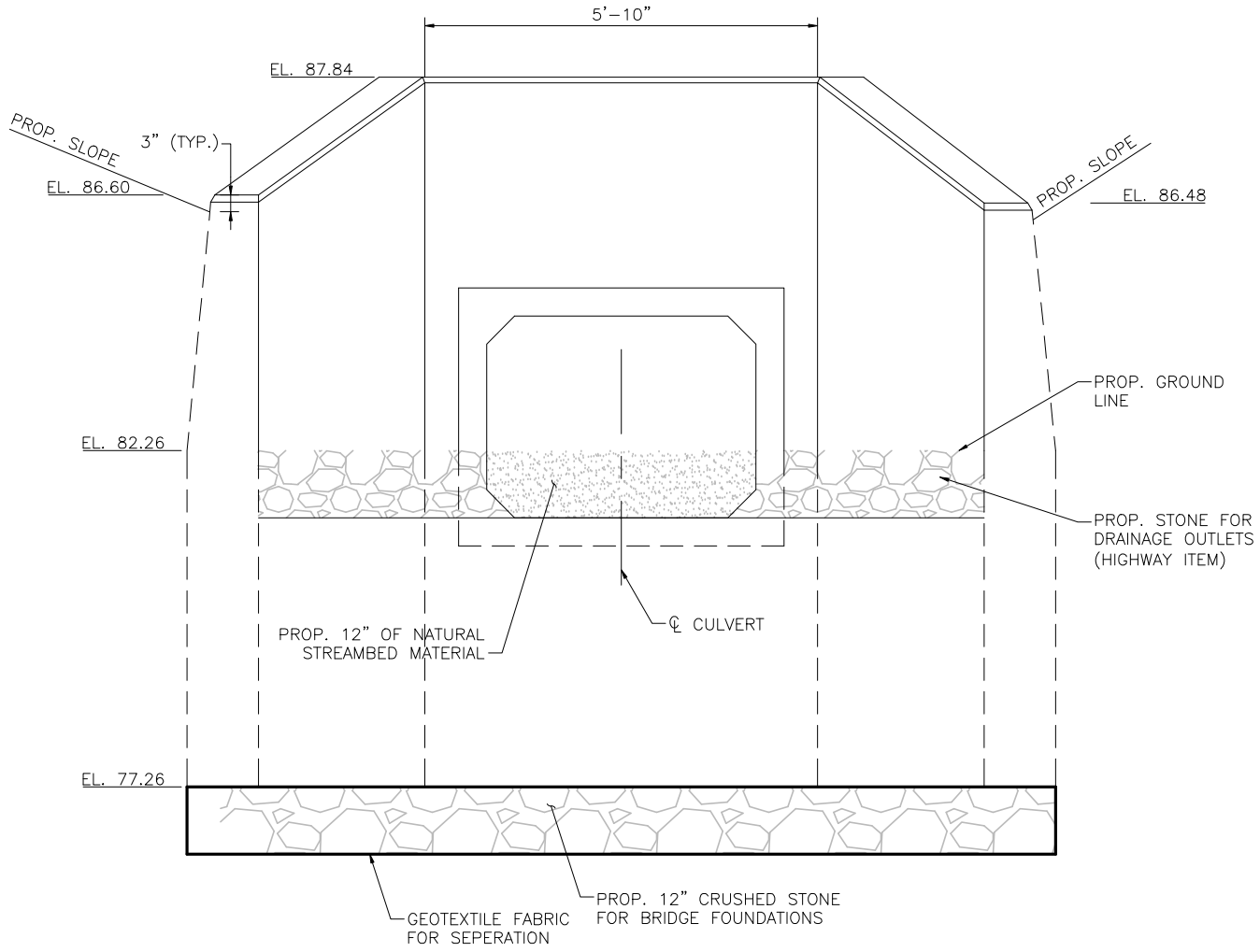
NORTH HEADWALL PLAN
SCALE: ⅜" = 1'–0"



NORTH HEADWALL ELEVATION
SCALE: ⅜" = 1'–0"



SOUTH HEADWALL PLAN
SCALE: ⅜" = 1'–0"



SOUTH HEADWALL ELEVATION
SCALE: ⅜" = 1'–0"

A008040 827

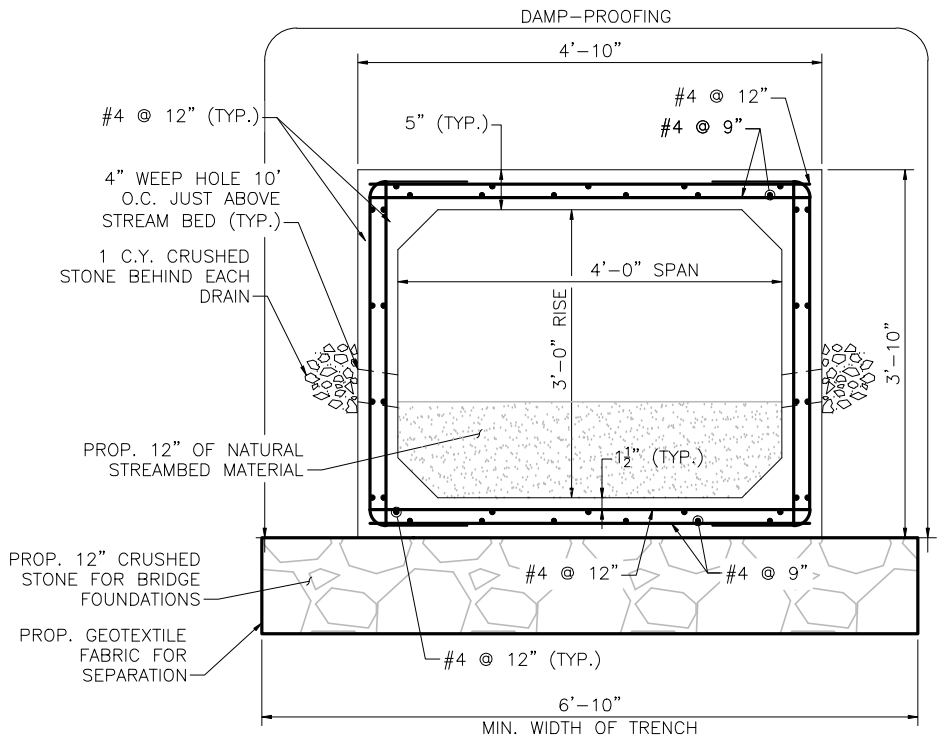
608051_BR02.DWG Plotted on 22-May-2025 9:14 AM

Proposal No. 608051 - 132406

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	231	391
PROJECT FILE NO.	608051		

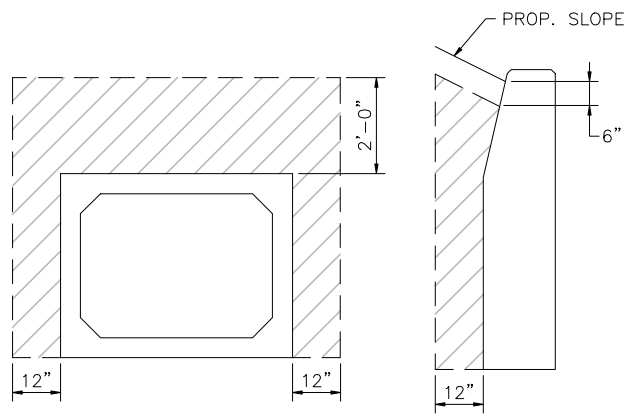
SPECIAL DRAINAGE STRUCTURE NO. 1 DETAILS



NOTES:
1. THE MAXIMUM FACTORED BEARING PRESSURE IS 2.02 KSF AS PER AASHTO LRFD BRIDGE SPECIFICATION STRENGTH 1 LOAD COMBINATION. FACTORED BEARING RESISTANCE IS 9.3 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE OF 20.7 AND A RESISTANCE FACTOR OF 0.45.
2. REFER TO GEOTECHNICAL REPORT, DATED OCTOBER 2020, PREPARED BY LAMSON ENGINEERING CORPORATION.
3. TRANSVERSE REINFORCING SHALL BE PLACED NORMAL TO THE ℄ OF THE CULVERT.
4. PRECAST CONCRETE CULVERT TO BE 5000 PSI, ¾ INCH, 686 HP CEMENT CONCRETE.

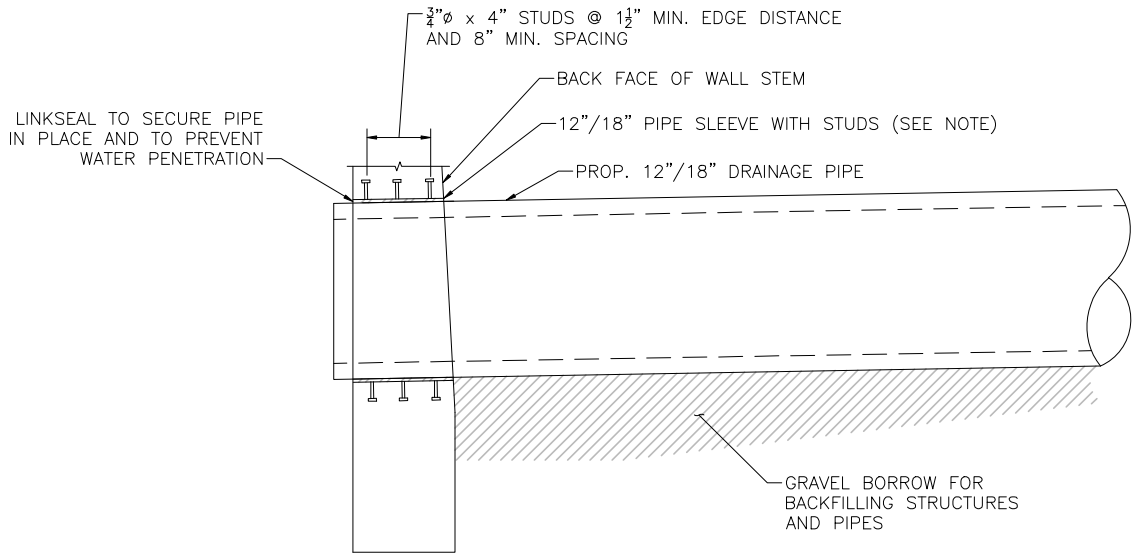
CULVERT REINFORCEMENT
SCALE: 1" = 2'-0"

1 0 1 2
SCALE IN FEET



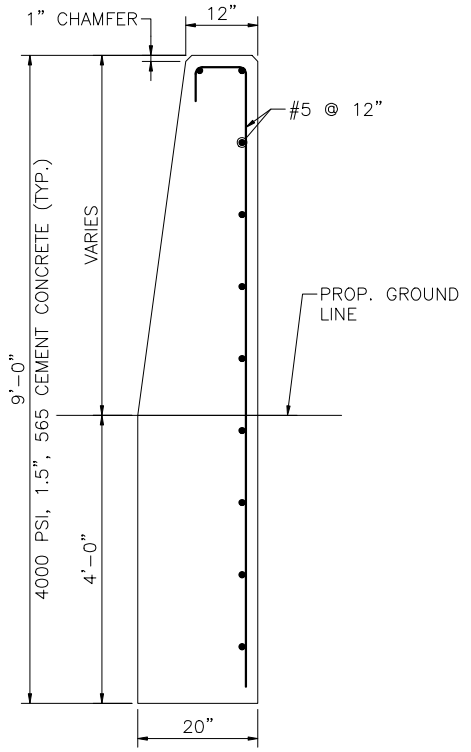
NOTE:
HATCHED AREA INDICATES LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES

LIMITS OF GRAVEL BORROW FOR BACK FILLING STRUCTURES AND PIPES
SCALE: ¼" = 1'-0"

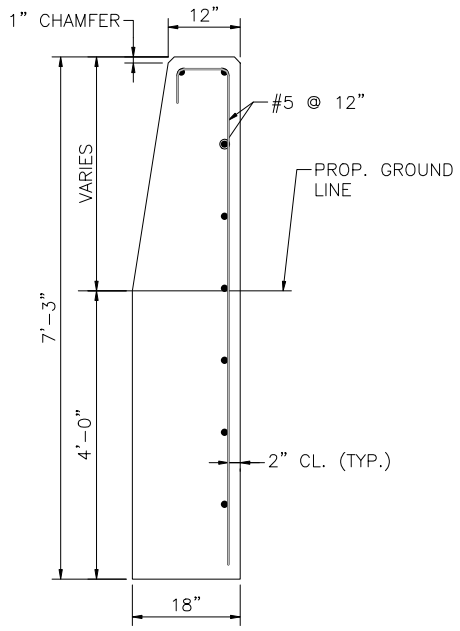


NOTE:
FOR CULVERT INVERT AND WALL ELEVATIONS, SEE SHEET 209.

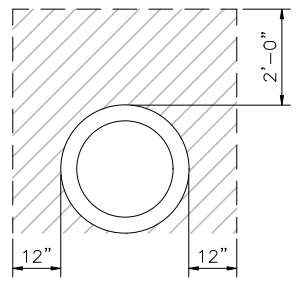
TYPICAL CULVERT WALL PENETRATION DETAIL
SCALE: ¼" = 1'-0"



SECTION 2
SCALE: ⅜" = 1'-0"

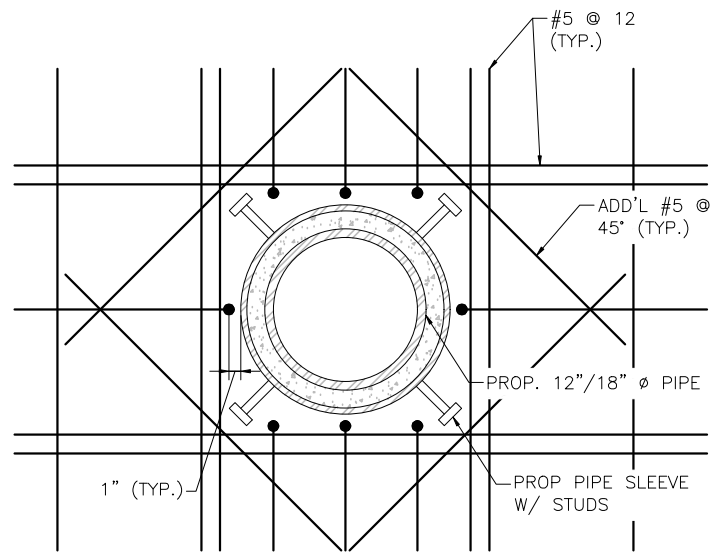


SECTION 3
SCALE: ⅜" = 1'-0"



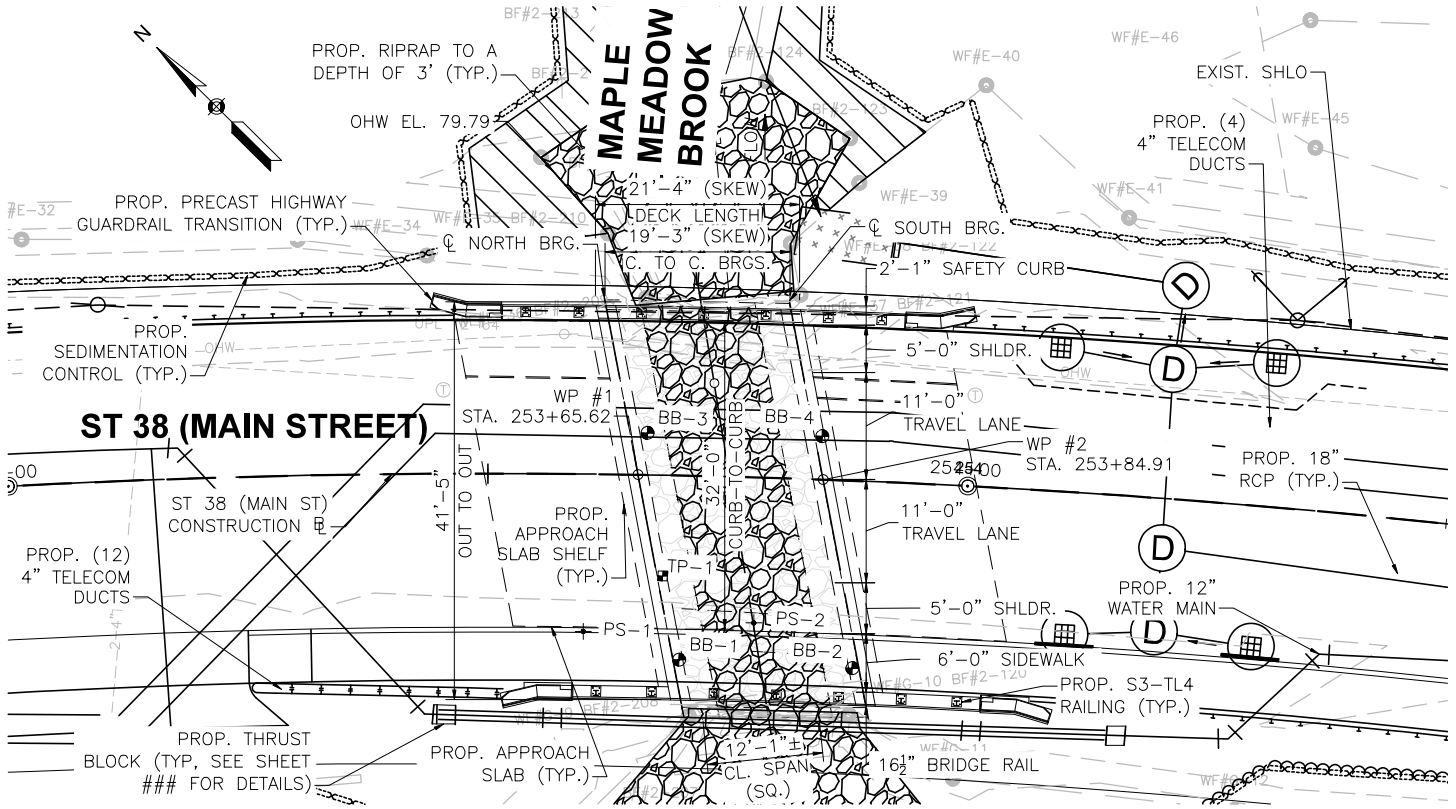
NOTE:
HATCHED AREA INDICATES LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES.

LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES
NOT TO SCALE



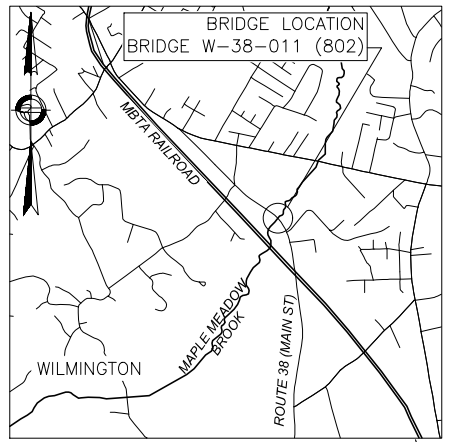
PIPE OPENING DETAIL
SCALE: ¾" = 1'-0"

Plotted on 22-May-2025 9:14 AM
608051_BR04.DWG
Proposal No. 608051 - 132406
4008(40-828



KEY PLAN

SCALE: 1" = 20'



LOCUS

SCALE: 1" = 4000'

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	#	210	399
PROJECT FILE NO.	608051		

TITLE SHEET

ESTIMATED QUANTITIES (NOT GUARANTEED)

REINFORCED CONCRETE EXCAVATION	5 CY
BRIDGE EXCAVATION	60 CY
GRAVEL BORROW FOR BRIDGE FOUNDATION	10 CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	22 CY
CONTROLLED DENSITY FILL, NON-EXCAVATABLE	5 CY
SUPERPAVE BRIDGE SURFACE COURSE	10 TON
SUPERPAVE BRIDGE PROTECTIVE COURSE	10 TON
CEMENT FOR POINTING	4 BAG
MASONRY CLEANING	1200 SF
TEMPORARY SUPPORT OF EXCAVATION, BRIDGE NO. W-38-011	45 SY
CONCRETE PENETRATING SEALER	1 GAL
CLEAN AND RE-POINT MASONRY JOINTS	207 LF
REPAIR OF VOIDS IN MASONRY	4 EA
CONCRETE CRACK REPAIR, BRIDGE NO. W-38-011	55 LF
REPAIRS TO CONCRETE, BRIDGE NO. W-38-011	8 SF
CONTROL OF WATER, BRIDGE NO. W-38-011	1 LS
ALTERATION TO BRIDGE STRUCTURE, BRIDGE NO. W-38-011	1 LS

INDEX OF DRAWINGS

TITLE	SHEET NO.
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GENERAL NOTES	2
BORING LOGS	3
PROBE AND TEST PIT LOGS	4
GENERAL PLAN AND ELEVATION	5
DEMOLITION PLAN & SECTIONS	6
SUGGESTED BRIDGE DEWATERING PLAN	7
DECK REPAIR PLAN	8
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ABUTMENT DETAILS	11
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PRECAST GUARDRAIL TRANSITION BASE DETAILS	13
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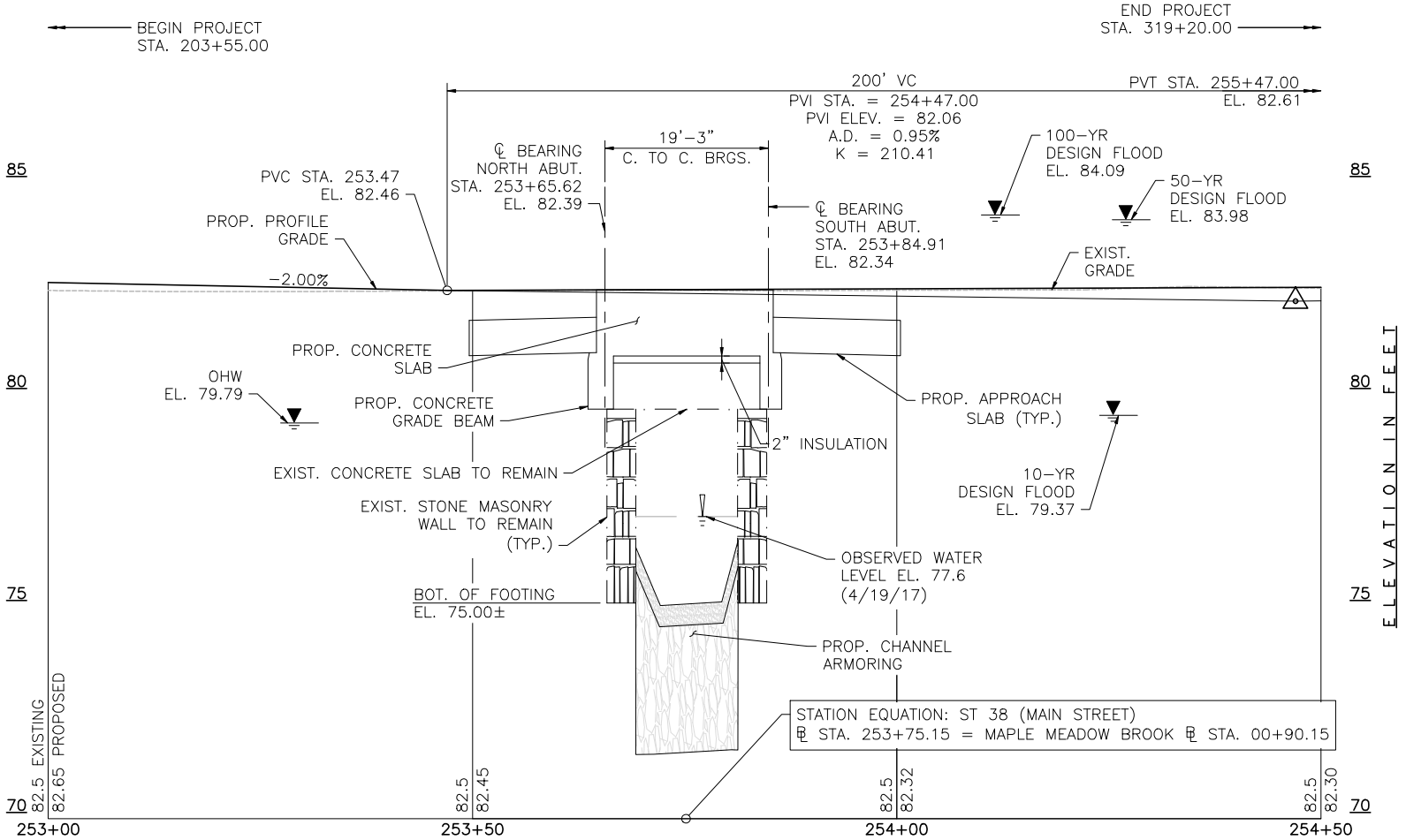
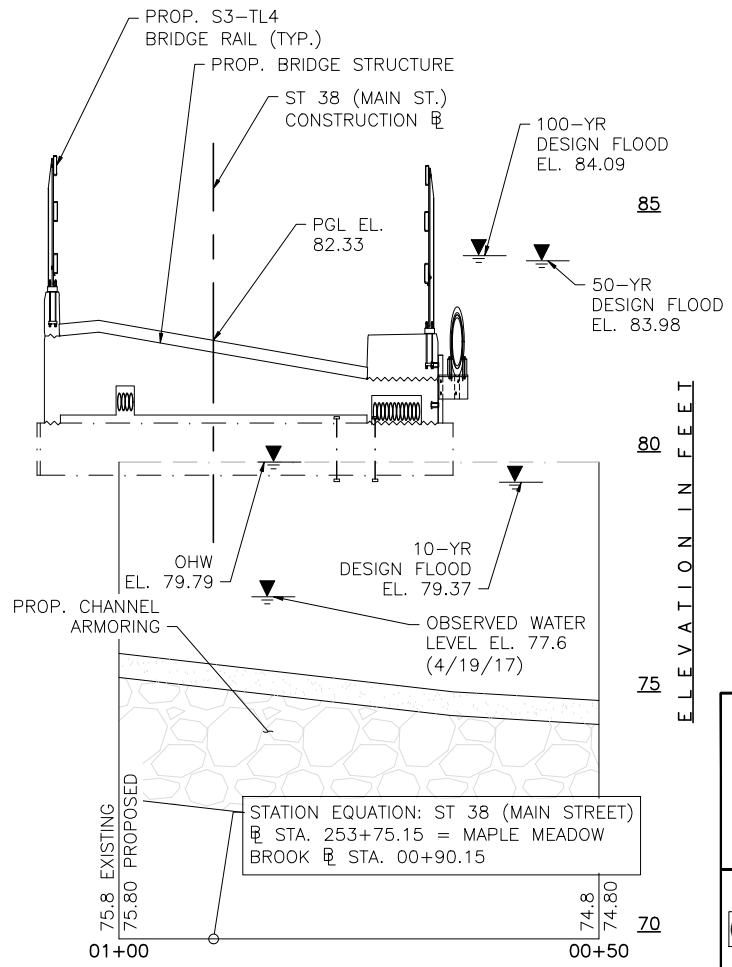
TOP OF PRECAST HIGHWAY GUARDRAIL FOR S3-TL4 RAILING	19



PROFILE – ST 38 (MAIN STREET)

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" =10'



PROFILE – MAPLE MEADOW BROOK

HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" =10'

MONTH DD, YYYY | ISSUED FOR CONSTRUCTION

massDOT Massachusetts Department of Transportation Highway Division

PROPOSED BRIDGE REHABILITATION
WILMINGTON
ROUTE 38 (MAIN STREET)
OVER MAPLE MEADOW BROOK

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Green International Affiliates, Inc. A Lochner Company 101 Arnas Pond Drive, Suite 200, Tewksbury, MA 01876

TITLE: _____ CHIEF ENGINEER

SHEET 1 OF 19 SHEETS BRIDGE NO. W-38-011 (802)

A008440 - 829

Proposal No. 608051 - 1324406

608051_BR01.DWG Plotted on 22-May-2025 3:59 PM

Second Structural Submission (S2) 19-January-2024

Stormwater Report, dated March 2025 (bound separately)

GREEN
A Lochner Company

MEMORANDUM

April 25, 2025

To:	Amina Miliani, EEA (via Amina.Miliani@mass.gov) Cameron Lynch, Wilmington Conservation Commission (via clynch@wilmingtonma.gov) Heidi Davis, MassDEP (via heidi.davis@mass.gov) Ryan Hale, MassDEP(via ryan.hale@mass.gov)
Cc:	Noah Boland, MassDOT (via noah.m.boland@dot.state.ma.us) Anne Canaday, MassDOT (via anne.c.canaday@dot.state.ma.us) Kevin Thompson, MassDOT (via kevin.s.thompson@dot.state.ma.us) Erica Larner, MassDOT (via erica.n.larner@dot.state.ma.us) Melissa Lenker, MassDOT (via melissa.lenker@dot.state.ma.us) Eamon Kernan, MassDOT (via eamon.kernan@dot.state.ma.us) Dennis Vertiyev, Green International Affiliates, Inc. (via dvertiyev@greenintl.com)
From:	Oxana Fartushnaya, Green International Affiliates, Inc. (via ofartushnaya@greenintl.com)
Date:	April 25, 2025
Project Name:	MassDOT (608051) Reconstruction of Route 38 (Main Street) Project in Wilmington, MA
Project Number:	Green Project No. 21058.01XX
Subject:	**Minor Revisions to Wetland Resource Area Impacts at Dublin Avenue Culvert (approx. STA. 218) [EEA File No. 16942, Wetland DEP File No. 344-1566, WQC Application No. 25-WW26-0013-APP, NAE-2016-02681]**

This memorandum provides the summary of minor revisions to the protected resource area impacts associated with the Reconstruction of Route 38 (Main Street) Project in Wilmington, MA. This project was submitted to multiple agencies/permitting authorities as noted in the MEPA Submission documents filed on April 15, 2025 (EEA File No. 16942).

The project team received the initial comments from the Unites States Army Corps of Engineers (USACE) on our 404 Pre-Construction Notification (PCN) filing on 4/17/2025. As a result of addressing these comments, minor changes to the impacts to resource areas were required at the Dublin Avenue culvert conveying the Unnamed Intermittent Stream beneath Route 38. These changes were requested based on the federal Section 404 of the Clean Water Act (CWA) interpretation of “permanent discharge of fill” in Waters of the United States as well as based on the classification of impacts within Land Under Water versus Vegetated Wetland impacts in areas where the intermittent stream flows through a wetland. To be consistent between all permit filings, the project team would like to accord the impacts between all permit applications with involved regulatory agencies/permitting authorities.

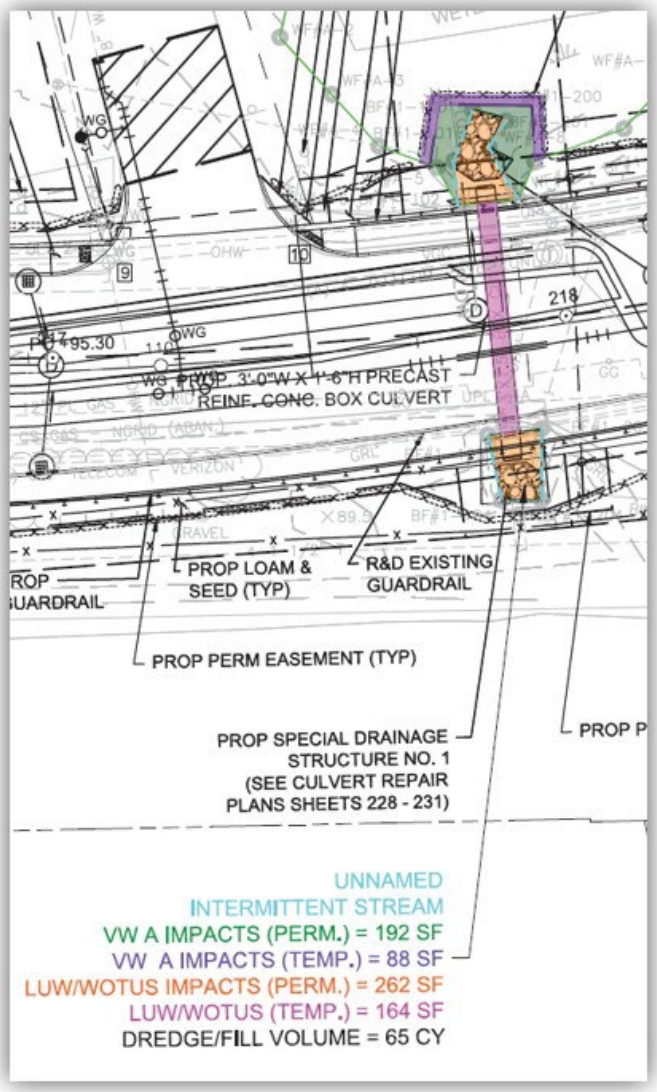
Below please find the table comparing the impacts at the subject culvert based on the original Joint Section 401/404 permit application submission to Massachusetts Department of Transportation (MassDEP) and the Unites States Army Corps of Engineers (USACE) and the revised impacts at this location to address the USACE comments:

Minor Revisions to Wetland Resource Area Impacts at Dublin Avenue Culvert (approx. STA. 218) [EEA File No. 16942, Wetland DEP File No. 344-1566, WQC Application No. 25-WW26-0013-APP, NAE-2016-02681]
April 25, 2025

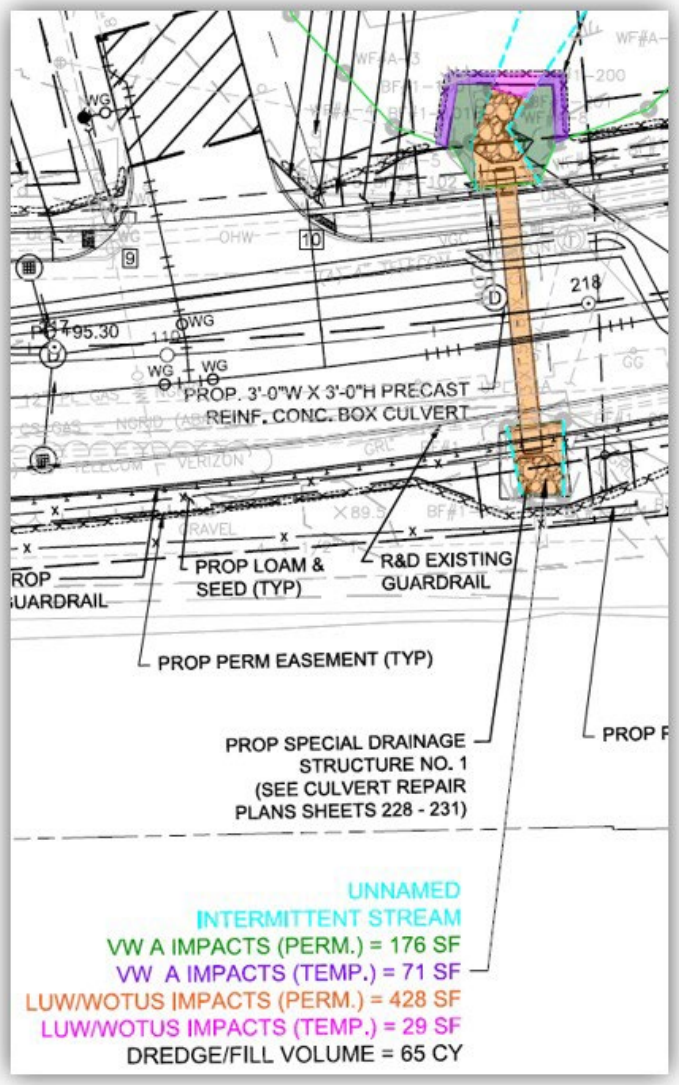
Project Component: Dublin Ave Culvert (STA. #218)	Original Impacts Submitted to Agencies (SF)	Revised Impacts based on 404 PCN Comments (SF)
Land Under Water (LUW) – permanent impacts	262	428
Land Under Water (LUW) – temporary impacts	164	29
Vegetated Vetland (VW) - permanent impacts	192	178
Vegetated Vetland (VW) - temporary impacts	88	71
TOTAL (CUMULATIVE IMPACTS)	**706**	**706**

The following screenshots depict the impacts and changes, as discussed above:

Original submission Impacts



Revised Impacts to address 404 comments



As demonstrated above, the total cumulative impacts at the Dublin Avenue culvert (VW + LUW, both temporary and permanent) remain at 706 square feet (SF). The minor "redistribution" of impacts between the resource areas and between temporary versus permanent impacts will not necessitate any changes to mitigation measures, as proposed:

- All Land Under Water areas will be restored regardless of the impacts being interpreted as "permanent" or "temporary"; the natural streambed is proposed within the culvert body and at the inlet and outlet areas.
- Vegetated Wetland (VW) impacts are being replicated in excess of what's being impacted by the proposed project; and the VW impacts actually experienced a minor reduction based on the requested changes.
- The minor changes to impacts at the Dublin Avenue culvert (approximate STA. 218) do not result in an overall increase of impacts throughout the project.

As a result, the Resource Area Impacts plan sheets were revised to reflect the changes discussed above (sheet 1 of 6 of the MEPA Plans, NOI Plans, and sheet 1 of the WQC/ACOE Plans).

Attachments:

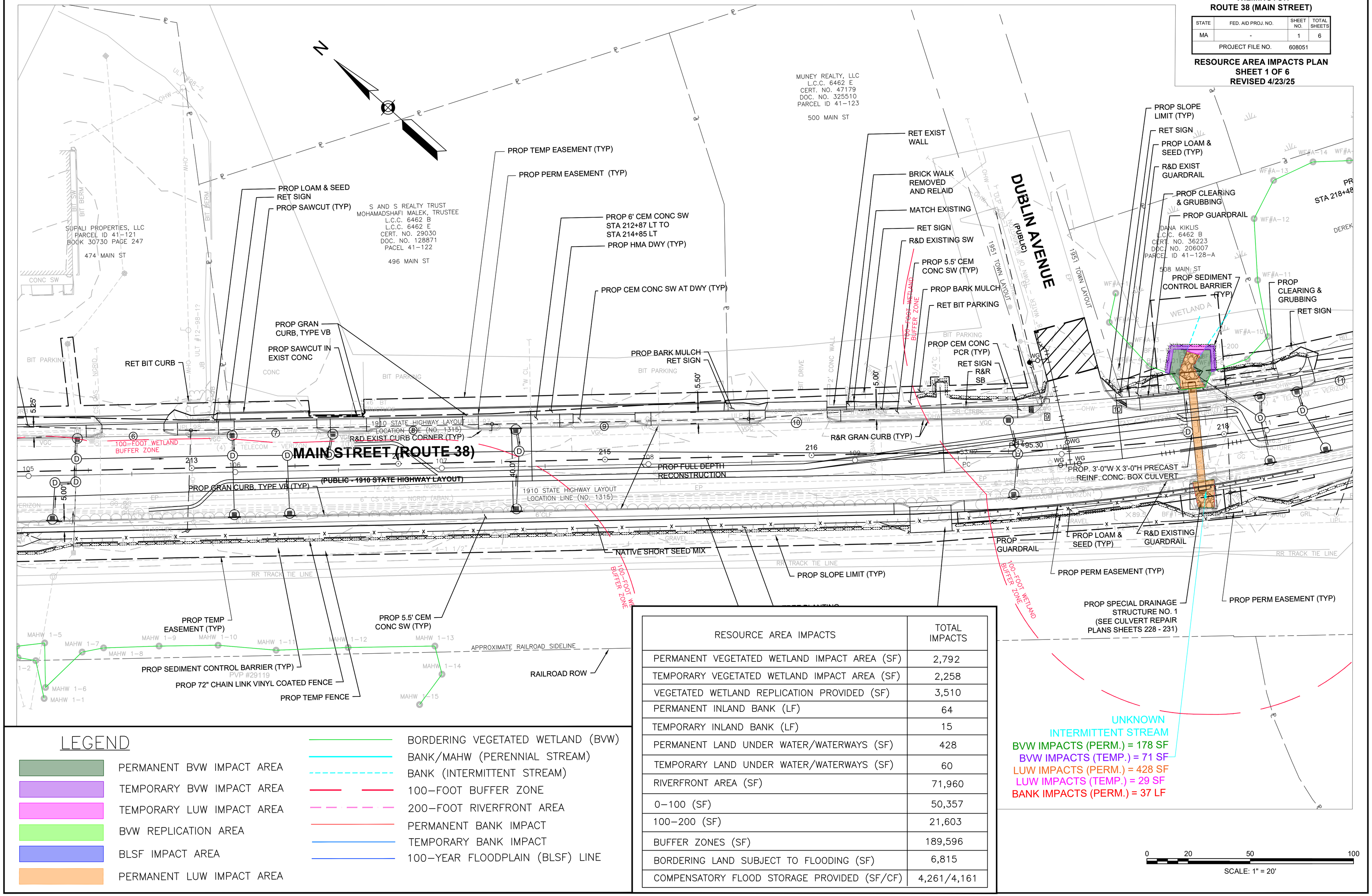
- Updated Resource Area Impacts Plans-1, dated 4/24/2024
- Updated WQC/ACOE Impacts Plans-1, dated 4/24/2024

\\Egnytedrive\Greenintl\Shared\Engineering\Projects\2013\13033\13033.19X - Wilmington Route 38\608051\DOCS\PERMITS\MEPA\MEPA Coordination\MEMO_Summary Of Minor Revisions To EEA# 16942_2025.04.25.Docx

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	1	6
PROJECT FILE NO.	608051		

RESOURCE AREA IMPACTS PLAN
SHEET 1 OF 6
REVISED 4/23/25



LEGEND

- PERMANENT BVW IMPACT AREA
- TEMPORARY BVW IMPACT AREA
- TEMPORARY LUW IMPACT AREA
- BVW REPLICATION AREA
- BLSF IMPACT AREA
- PERMANENT LUW IMPACT AREA

- BORDERING VEGETATED WETLAND (BVW)
- BANK/MAHW (PERENNIAL STREAM)
- BANK (INTERMITTENT STREAM)
- 100-FOOT BUFFER ZONE
- 200-FOOT RIVERFRONT AREA
- PERMANENT BANK IMPACT
- TEMPORARY BANK IMPACT
- 100-YEAR FLOODPLAIN (BLSF) LINE

RESOURCE AREA IMPACTS	TOTAL IMPACTS
PERMANENT VEGETATED WETLAND IMPACT AREA (SF)	2,792
TEMPORARY VEGETATED WETLAND IMPACT AREA (SF)	2,258
VEGETATED WETLAND REPLICATION PROVIDED (SF)	3,510
PERMANENT INLAND BANK (LF)	64
TEMPORARY INLAND BANK (LF)	15
PERMANENT LAND UNDER WATER/WATERWAYS (SF)	428
TEMPORARY LAND UNDER WATER/WATERWAYS (SF)	60
RIVERFRONT AREA (SF)	71,960
0-100 (SF)	50,357
100-200 (SF)	21,603
BUFFER ZONES (SF)	189,596
BORDERING LAND SUBJECT TO FLOODING (SF)	6,815
COMPENSATORY FLOOD STORAGE PROVIDED (SF/CF)	4,261/4,161

AM08640 - 834
608051_EV(IMPACT-PLANS).DWG Plotted on 23-Apr-2025 3:33 PM
Proposal No. 608051 - 132406

WILMINGTON
ROUTE 38 (MAIN STREET)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-		
PROJECT FILE NO.	608051		

IMPACT PLANS
SHEET 1 OF 3
REVISED 4/23/25

Plotted on 23-Apr-2025 9:33 AM
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Proposal No. 608051 - 132406

A00840 - 835

MAIN STREET (ROUTE 38)

SUPALI PROPERTIES, LLC
PARCEL ID 41–121
BOOK 30730 PAGE 247
474 MAIN ST

S AND S REALTY TRUST
MOHAMADSHAFI MALEK, TRUSTEE
L.C.C. 6462 B
L.C.C. 6462 E
CERT. NO. 29030
DOC. NO. 128871
PACEL 41–122
496 MAIN ST

MUNEY REALTY, LLC
L.C.C. 6462 E
CERT. NO. 47179
DOC. NO. 325510
PARCEL ID 41–123
500 MAIN ST

DANA KIKLIS
L.C.C. 6462 B
CERT. NO. 36223
DOC. NO. 206007
PARCEL ID 41–128–A
508 MAIN ST

DUBLIN AVENUE (PUBLIC)

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
BOOK 2226 PAGE 326
PARCEL ID 41–141

1910 STATE HIGHWAY LAYOUT
LOCATION LINE (NO. 1315)

1951 TOWN LAYOUT

PROP LOAM & SEED
RET SIGN
PROP SAWCUT (TYP)
PROP TEMP EASEMENT (TYP)
PROP PERM EASEMENT (TYP)
PROP 6' CEM CONC SW STA 212+87 LT TO STA 214+85 LT
PROP HMA DWY (TYP)
PROP CEM CONC SW AT DWY (TYP)
PROP GRAN CURB, TYPE VB
PROP SAWCUT IN EXIST CONC
RET BIT CURB
PROP BARK MULCH
RET SIGN
R&D EXIST CURB CORNER (TYP)
PROP GRAN CURB, TYPE VB (TYP)
(PUBLIC - 1910 STATE HIGHWAY LAYOUT)
PROP FULL DEPTH RECONSTRUCTION
RET EXIST WALL
BRICK WALK REMOVED AND RELAID
MATCH EXISTING
RET SIGN
R&D EXISTING SW
PROP 5.5' CEM CONC SW (TYP)
PROP BARK MULCH
RET BIT PARKING
PROP CEM CONC PCR (TYP)
RET SIGN
R&R SB
R&R GRAN CURB (TYP)
PROP SLOPE LIMIT (TYP)
RET SIGN
PROP LOAM & SEED (TYP)
R&D EXIST GUARDRAIL
PROP CLEARING & GRUBBING
PROP GUARDRAIL
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP CLEARING & GRUBBING
RET SIGN
PROP. 3'-0"W X 3'-0"H PRECAST REINF. CONC. BOX CULVERT
PROP LOAM & SEED (TYP)
R&D EXISTING GUARDRAIL
PROP PERM EASEMENT (TYP)
PROP SPECIAL DRAINAGE STRUCTURE NO. 1 (SEE CULVERT REPAIR PLANS SHEETS 228 - 231)
PROP PERM EASEMENT (TYP)
NATIVE SHORT SEED MIX
PROP SLOPE LIMIT (TYP)
TREE PLANTING TRENCH (TYP)
PROP 72" CHAIN LINK GATE AND GATE POSTS STA 211+40 RT TO STA 211+60 RT
PROP CLEARING & GRUBBING
PROP TEMP EASEMENT (TYP)
PROP 5.5' CEM CONC SW (TYP)
PROP SEDIMENT CONTROL BARRIER (TYP)
PROP 72" CHAIN LINK VINYL COATED FENCE
PROP TEMP FENCE
RAILROAD ROW
APPROXIMATE RAILROAD SIDELINE
PROP TEMP EASEMENT (TYP)
PROP PERM EASEMENT (TYP)
STA 218+48
WETLAND A
UNNAMED INTERMITTENT STREAM
VW A IMPACTS (PERM.) = 178 SF
VW A IMPACTS (TEMP.) = 71 SF
LUW/WOTUS IMPACTS (PERM.) = 428 SF
LUW/WOTUS IMPACTS (TEMP.) = 29 SF
DREDGE/FILL VOLUME = 65 CY

PERMANENT VW IMPACT AREA = 3,278 SF ±
PERMANENT LUW/WOTUS IMPACT AREA = 2,394 SF ±
TOTAL PERMANENT IMPACT AREA = 5,670 SF ±
TEMPORARY VW IMPACT AREA = 2,825 SF ±
TEMPORARY LUW/WOTUS IMPACT AREA = 575 SF ±
TOTAL TEMPORARY IMPACT AREA = 3,400 SF ±

VEGETATED WETLAND (VW)
BANK/OHW (PERENNIAL STREAM)
BANK/OHW (INTERMITTENT STREAM)
TOTAL DREDGE/FILL WITHIN LUW/WOTUS VOLUME = 715 CY

WQC PLANS SHEET 10 OF XX

0 20 50 100
SCALE: 1" = 40'

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